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Agricultural Science Teacher's Knowledge of Rice Production Technology in Edu and Patigi Local Government Areas of Kwara State, Nigeria

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Abstract

The study assessed the knowledge of agricultural science teachers on rice production technologies. A two-stage sampling procedure was used in selecting fifty-one agricultural science teachers for the study. Data were obtained using structured questionnaire The data was analysed by frequencies, percentages, means, standard deviation, and multiple regression. The result revealed that Internet ($\bar{x}$ =1.73) and Agricultural textbooks ($\bar{x}$ =1.53) were the major sources of information for rice production technology. The respondents had high knowledge (90.2%) of rice production technologies. Poor financial condition ($\bar{x}$ =2.57) was identified as the major constraint to accessing information on the technologies. Result also revealed that education, years of working experience and place of residence had significant influence ($p<0.05$) on the teachers' knowledge of the technologies. The study concluded that with the high knowledge of agricultural science teachers in rice production technologies, when properly equipped, they can serve in advisory capacity to farmers who may not have access to extension officers.

***Keywords**: Advisory service, agricultural science teachers, rice production technology*

Introduction

Rice is grown worldwide in almost 100 countries on about 165 million hectares of land with a total production of 750 MT (Pokhrel et al., 2021; The International Rice Research Institute, 2019). Rice is recognised as the world's largest food crop as it forms the staple diet of about half of the world's population (Sangeetha, et al*.,* 2020). It is a major staple food in Nigeria and has an immense contribution to food security in the country. Rice consumption in Nigeria is increasingly growing due to the changing choices of consumers.

Production of rice in Nigeria is generally driven by small-scale farmers. This system of production has not met the demand for the country's teeming population leading to a demand and supply gap. This has necessitated strategies causing a shift in local production to meet the demand of the growing population. Rice importation displaces local production, promotes domestic inflation, demotivates small-scale farmers, and stimulates unemployment. This situation has necessitated the need to capacitate farmers with knowledge to improve their productivity.

Farmers' knowledge gap in modern rice production technologies has been identified as the major cause of poor yield (Ayanda 2019, Hossain et al., 2021). Rural farmers often lack access to knowledge and information that could help them achieve maximum agricultural yield (Piabuo et al., 2020). Kelil et al. (2020), observed that insufficient rural information access is a major factor that has restricted farming headway in Africa.

According to Olabanji et al. (2021a), technological change and use of improved techniques can be linked to awareness and knowledge of the technology. Therefore, to reduce rice demand and supply gap, yield gaps in production should be closed through proper information dissemination.

Most farmers live in rural communities, often, these communities are detached from information sources and extension services due to poor infrastructure, especially electricity and road networks. To keep the farmers abreast of developments around the world, alternative sources of information have become necessary. One of such sources is agricultural science teachers in rural communities. Teachers of agricultural science in secondary schools have the primary responsibility of imparting knowledge, skills and attitudes in the area of their subject to the students (Olabanji et al., 2021b). In rural areas, teachers are often revered, respected and regarded as reservoirs of knowledge, making them potential subject matter specialists to farmers. They serve as strategic links for farmers to update their knowledge and receive information on modern technologies (Shubham & Kumar, 2024). Most of the rice producing communities in Kwara State have poor access to extension services due to bad road network. This leaves them with alternative sources of information. To be positioned as an effective information dissemination channel, the knowledge of the agricultural science teachers needs to be assessed. This assessment could help establish the competency needs of the teachers as advisory service providers.

Therefore, the broad objective of this study was to assess agricultural science teachers' knowledge of rice production technologies in Edu and Patigi Local Government Area of Kwara State. The specific objectives were to:

1. ascertain the sources of information accessible to the respondents on rice production technologies,
2. examine the respondents' knowledge level on rice production technologies and
3. identify the constraints to accessing agricultural information on rice production technologies in the study area.

Hypothesis

Ho_1: There is no significant relationship between selected sociodemographic characteristics and the knowledge level of the agricultural science teachers.

Methodology

This study was conducted in Edu and Patigi Local Government Areas (LGAs) in Kwara State, Nigeria. The state is situated between latitudes 7° 45' and 9°30' North and longitudes 2° 30’ and 6° 35’ East. Edu and Patigi LGAs are the major zones where rice is produced in large quantity in Kwara State. This is primarily due to their proximity to the river Niger which provides the requisite environment for rice production. The two LGAs have three districts each. Edu has Tsaragi, Shonga and Lafiagi districts while Patigi LGA has Pategi, Lade and Kpada districts.

A two-stage sampling technique was used in selecting the agricultural science teachers for the study. The first stage was a purposive selection of all secondary schools offering agricultural sciences in Edu and Patigi Local Government Areas. The second stage was a purposive selection of all agricultural science teachers in the schools making a total of 51 participants for the study.

Data for the study were collected using structured questionnaires. The data collected were presented using percentage, and analysed with mean count, standard deviation and multiple regression. To ascertain the sources of information accessible to the respondents on rice production technologies, a three-point Likert type scale of always accessible (2), sometime accessible (1) and not accessible (0) was used to measure accessibility to various information sources. The scale measured as $X = \Sigma x / n$ Where, X = Likert value, Σ = summation, n = total respondents / sample size was used to form the basis for deciding the accessibility. Thus, the decision rule holds that $X= (2 + 1 + 0) / 3 = 1.0$ so, sources > 1.0 were considered accessible while those < 1.0 were not accessible. To determine the knowledge level of the agricultural science teachers on rice production technology, eighteen knowledge-based questions on various aspects of the technology were asked. These include identification of healthy seeds and variety selection, nursery practices, transplanting techniques, water management, fertilizer application (urea deep placement), weed control, pest management, harvest and postharvest practices. The respondents were made to respond ‘true’ or ‘false’ to the questions. Each time a correct response was indicated; a score of 1 was given, and wrong responses were scored 0. A respondent can have a maximum score of 18 and minimum of 0. The respondents were categorized based on their scores into: high knowledge for 13-18 correct responses; moderate knowledge for 7-12 correct responses; low knowledge for 1-6 correct responses; and no knowledge: if no correct answers to the 18 questions was obtained. The responses to constraints inhibiting access to agricultural information on rice production technologies were assessed on four-point Likert type scale of most severe (3), severe (2), least severe (1) and not a constraint (1). The decision rule includes the summation of scores given to a particular constraint by all respondents and dividing the sum by the total number of respondents to form the weighted mean score (WMS). Thus, $WMS = (3+ 2 + 1 + 0) / 4 = 1.5$ so, constraints > 1.5 were considered major constraints while those < 1.5 were not major constraints. For all purposes, p-value of 0.05 was considered as the level of significance.

Results and Discussion

Sources of Information Accessible on Rice Production Technologies

Table 1 shows that the major source of information accessible by the agricultural science teachers on improved rice production technologies was internet sources ($\bar{x}$ =1.73), followed by agricultural textbooks ($\bar{x}$ =1.53) and radio sources ($\bar{x}$ =1.39). Internet, according to Eze and Nwambam (2019) and Sandeep et al. (2020) has turned into a wide and resourceful source of information for most learners and trainers around the world. It is fast becoming a relatively faster and cheaper medium of gaining access to agricultural information. Major developments and trends that are shaping current agriculture are often times accessible through the internet. Additionally, the results shows that information through Extension agents ($\bar{x}$ =0.80), television ($\bar{x}$ =0.63) and research articles ($\bar{x}$ =0.62) are the least accessible sources of information to the respondents. Bello et al. (2022) mentioned that though extension service delivery system is expected to disseminate information on improved practices and innovations from research points to the users, this expectation is hardly met due to the inadequate numbers of extension agents. Access and use of information channels provide opportunity for knowledge acquisition. Knowledge acquisition is a key activity in the learning cycle as it helps an individual to continuously develop and expand its knowledge base. Internet been a major source of information accessible to the respondents could be because of its repository advantage of having abundant free materials which can be beneficial for users.

Table 1: Sources of information accessible to the respondents on rice production technologies

Source of information	WMS	Standard Deviation
Radio	1.39	0.568
Television	0.63	0.799
Colleagues	1.29	0.576
Agricultural textbooks	1.53	0.674
Trainings attended	1.24	0.586
Research articles	0.62	0.774
Internet	1.73*	0.532
Extension agents	0.80	0.749

Source: Field Survey, 2022

Knowledge Level on Rice Production Technology

The Table shows that harvest and postharvest practices had the highest correct responses with a cumulative average of 97.1%. This was followed by transplanting techniques (94.2%) and fertilizer application (93.1). Others include pest and disease management (92.8%), weed control (92.2%), healthy seed and variety selection (86.9%), water management (84.3%), nursery practices (81.4%). It was observed that more than two-third of the teachers indicated correct answers to the knowledge test questions. Sound knowledge of subject enables teachers to mediate between actions surrounding teaching and learning encounters. Murray (2021) asserted that teachers' knowledge can be recognised as fundamental to effective teaching practice and is believed to be a key driver for innovation (Thang et al., 2020). By acting as intermediaries, teachers with adequate knowledge can help farmers adopt new technologies and practices that can lead to increased agricultural productivity and improved livelihoods.

Table 2: Distribution of respondents based on improved rice production technology knowledge test

Knowledge Items tested	Correct Answers %
Healthy Seeds and Variety Selection	
FARO 44 and 52 are suitable for lowland rainfed/ irrigated land	92.2
FARO 59 are adaptable to upland	88.2
In sorting seeds to plant, separate the heavier seeds from the lighter ones, soak them in 12% common salt solution for about two minutes	80.4
Cumulative Average	**86.9**
Nursery Practices	
Seeds should be soaked in water for 24 hours before raising on the nursery bed	94.1
To incubate the soaked seeds, spread on the floor, then cover with polyethylene bags for 48 hours to allow seed sprouting	68.6
Cumulative Average	**81.4**
Transplanting Techniques	
Seedlings should be transplanted 2-3 weeks when the leaves are 3-5	96.1
For lowland rice, sow rice seeds by drilling in rows at a spacing of 20 cm apart using a rate of 2–3 seedlings per hill, while for upland rice, sow 5–6 seeds.	92.2
Cumulative Average	**94.2**
Water Management	
Field bunds are essential for good water control	90.2
Water depth is expected to be maintained at about 10 cm all over the fields except when fertilizer is being applied	78.4
Cumulative Average	**84.3**
Fertilizer Application (Urea Deep Placement)	
Urea fertilizer is required for rice because of its need for plenty Nitrogen	94.1
Irrigation water should be drained before fertilizers are applied	92.2
Cumulative Average	**93.2**
Weed Control	
Weeding should be carried out twice, at 2–3 weeks and 5–6 weeks after sowing	96.1
Herbicides will not be effective if land preparation is poorly done	88.2
Cumulative Average	**92.2**
Pest and Disease Management	
For pest and disease, prevention is better than cure	96.1
Planting at the same time with plot neighbours can reduce impact of pest and diseases	96.1
Excessive application of fertilizers can increase susceptibility to certain pest and disease	86.3
Cumulative Average	**92.8**
Harvest and Postharvest Practices	
Harvesting long straw close to the ground at about 15-20 cm to allow hand threshing	96.1
Timely harvesting of rice is crucial for optimum quality of grains	98.0
Cumulative Average	**97.1**

Source: Field Survey, 2022

In categorising the respondents based on their knowledge of improved rice production practices, results in Table 3 show that 90.2% of the teachers had high knowledge of the technology, 5.9% had moderate knowledge, while 3.9% had low knowledge of the technology. The high knowledge level of the respondents may be due to their educational status, years of teaching experience and exposure to various information sources. Teachers with sufficient agricultural knowledge can provide up-to-date information on modern agricultural techniques to farmers and serve as a conduit for the latest research findings and technological advancements in agriculture.

Table 3: Categorization of respondents based on knowledge of improved rice production technology

Knowledge level	Percentages (n = 51)
Low knowledge (Scored 1 to 6)	3.9
Moderate knowledge (Scored 7 to 12)	5.9
High knowledge (Scored 13 to 18)	90.2

Source: Data Computation, 2022

Constraints faced in accessing information on improved rice production technologies

Table 4 reveals that poor financial condition to access information ($\bar{x}$=2.57), outdated textbooks ($\bar{x}$=2.53) and long distance from other information sources ($\bar{x}$ =2.47) were identified as the major constraints faced in accessing information sources. Financial limitations restrict teachers from purchasing necessary resources, subscribing to journals, and attending workshops or conferences. Outdated textbooks limits teachers' ability to provide current and relevant information to learners. The Table further revealed that absence of library and information centre ($\bar{x}$=2.31) and cost of purchasing data ($\bar{x}$=2.12) were other constraints facing the respondents in accessing rice production technologies**.** Libraries and information centres play a crucial role in disseminating agricultural knowledge. The lack of dedicated libraries and information centres can prevent teachers from accessing a wide range of agricultural information and resources**.** Also, the high cost of internet data is a significant barrier, especially in rural areas where internet access is often more expensive. This constraint limits the ability to conduct online research and access digital resources.

Table 4: Constraints faced by agricultural science teachers in accessing information on rice production technologies

Constraints	$\bar{x}$	Std Dev.
Poor power supply	2.10	0.900
Cost of purchasing data	2.12	0.612
Outdated textbooks	2.53	0.503
Poor financial condition to access information	2.57*	0.812
Poor expertise in the use of Internet search engines	2.04	0.547
Difficulties in locating the most appropriateinformation resources	1.90	0.732
Poor access roads for an easy community visit to search for information	1.88	0.567
Absence of library and information centre	2.31	0.534
Lack of knowledge about the subscription of newsletter, leaflets and other materials on agricultural information	1.80	0.611
Long distance from other information sources	2.47	0.489

Field Survey, 2022

Influence of Socio-demographic Characteristics on Agricultural Science Teachers' Knowledge of Rice Technology

Results in Table 5 indicate that among the six characteristics entered into the model, three were found to be statistically significant predictors at 5% level of significance. These include educational attainment (B=-1.035), years of teaching experience (B=0.230) and place of residence (B=0.479). The coefficient for educational attainment is negative and statistically significant indicating that higher educational attainment is associated with lower knowledge of rice technologies. This counterintuitive finding might be explained by the possibility that teachers with higher academic qualifications may focus more on theoretical aspects and less on practical, field-based knowledge. A study by Sennuga and Oyewole (2020) suggests that practical knowledge of specific agricultural technologies may not always correlate with higher formal education. The positive coefficient for years of teaching experience indicates that more experienced teachers have better knowledge of rice technologies. Also, place of residence showing positive coefficient indicates that teachers living in rural areas have better knowledge of rice technologies. Rural residency often involves closer interaction with agricultural activities and practical exposure. As noted by Starrett (2021), teachers in rural areas are more likely to engage directly with farming communities, leading to greater practical knowledge of agricultural technologies. The model explains approximately 69.3% of the variance in the knowledge of rice technologies among agricultural science teachers, indicating a good fit. The adjusted R^2 value of 0.529 further supports the model's robustness. The significant F-value suggests that the overall model is statistically significant. The high R^2 value signifies a strong explanatory power of the socio-demographic factors in predicting knowledge levels.

Table 4: Influence of socio-demographic characteristics on agricultural science teachers' knowledge of rice technologies

Variables	Coefficient (B)	SE	t-value
Sex	-0.017	0.018	-0.944
Age	0.087	0.030	2.938
Marital status	-0.593	0.055	-10.705
Education attainment	-1.035	0.103	-10.015*
Years of teaching Experience	0.230	0.072	3.208*
Place of residence	0.479	0.075	6.379*

R^2= 0.693, Adjusted R^2 = 0.529, F = 6.457, $p<0.05$

Conclusion and Recommendations

It was found that the teachers possess a high level of knowledge regarding various aspects of rice production, which positions them as valuable resources for disseminating agricultural information to farmers in rural communities. This high knowledge of the rice production technology was significantly influenced by levels of educational attainment, years of teaching experience and place of residence. The study therefore concluded that, agricultural science teachers when equipped and well positioned can serve in advisory capacity to farmers who may not have access to extension officers. Since the major constraint facing the agricultural science teachers from accessing information sources is caused by poor financial conditions, it was recommended that government should provide adequate support for the teachers to enable them access timely information for enhanced capacity.

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