



FACTORS INFLUENCING THE PERCEPTIONS OF SMALL-HOLDER RICE FARMERS ON THE ROLE OF AGRICULTURAL EXTENSION SERVICE ON THE PRODUCTIVITY OF RICE IN BAUCHI STATE, NIGERIA

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ABSTRACT

The study analyzed the factors influencing the perceptions of small-holder rice farmers on the role of agricultural extension service on the productivity of rice in Bauchi state, Nigeria. A Multistage sampling procedure was used to select 298 respondents. The study relied mainly on primary data which was achieved via a structured questionnaire. Descriptive statistics and inferential statistics were employed to achieve the stated objectives. Results on the socio-economic and institutional characteristics revealed that the rice farmers were in their active age with a mean age of 42 years and the majority (82.6%) were married. In addition, results on perceptions of rice small-holders of the roles of agricultural extension services on rice productivity, the majority of the respondents strongly agreed on the role of disseminating information to farmers on recommended agricultural practices, with a mean score of 1.43. Other roles acknowledged by the respondents included conducting farmer training (2.13) and organizing and encouraging farmers to form cooperatives/groups (2.11). Furthermore, factors influencing the perceptions of rice small-holder farmers of the role of Agricultural Extension service on rice productivity show that age ($P < 0.10$), level of education ($P < 0.05$), type of extension contact ($P < 0.01$), and membership of cooperatives ($P < 0.01$) influence the perceptions of rice small-holder farmers of the role of Agricultural Extension service on rice productivity in the study area. Based on this study, it was concluded that most rice farmers positively perceived agricultural extension services' role in enhancing rice productivity. It is recommended that both public and private extension agencies organize regular workshops, field demonstrations, and other training programs. This approach aims to sustain and improve farmers' understanding of the services designed to boost their knowledge and skills, ultimately leading to enhanced farm productivity.

Keywords: Factors, Perceptions, Extension, Rice, Production, Bauchi State

INTRODUCTION

Rice is a vital staple food crop in Nigeria, significantly contributing to food security and economic development (Oluwaseun *et al.*, 2024). Smallholder farmers predominantly engage in rice production in Nigeria, particularly in Bauchi State, where they depend heavily on agricultural extension services for improved practices, access to inputs, and market information. However, Nigeria is grappling with a serious challenge regarding the declining ratio of extension agents to farmers. In certain regions, this ratio can be as high as 1:10,000, far surpassing the FAO's recommended standard of 1:500. This shortage arises from inadequate funding, a lack of recruitment, and an ageing workforce, which culminates in many farmers having limited access to essential agricultural knowledge (FOA, 2020). In



response, private extension services such as those provided by the Sassakawa Africa Association (SAA), ThriveAgric, and others are working to bridge this gap. These organizations leverage technology by offering digital platforms that deliver crucial information such as weather updates and farming advice. Nevertheless, challenges like low internet access and limited literacy levels continue to pose barriers, underscoring the need for a hybrid model that combines traditional and digital approaches to reach a broader array of farmers (FAO, 2020).

Despite ongoing efforts to improve these services, many farmers still encounter significant hurdles in achieving optimal productivity due to restricted access to extension services, compounded by misconceptions regarding the potential roles of Agricultural Extension (Akinlagbe *et al.*, 2024; Alzahrani *et al.*, 2023). The effectiveness of agricultural extension in fulfilling its roles is influenced by numerous factors, spanning psychological, socioeconomic, institutional, and administrative dimensions (Kyambo, 2023). Therefore, understanding the elements that shape these perceptions is essential for designing targeted interventions aimed at enhancing extension services and sustainably boosting rice productivity.

The productivity of rice in Bauchi State remains suboptimal, primarily due to inefficiencies in the delivery of agricultural extension services and a reluctance among farmers to adopt recommended practices. Agricultural extension is intended to bridge the gap between research and practical application; however, farmers' perceptions of these services significantly impact their engagement and overall effectiveness. Previous studies, including those by Abdullahi *et al.* (2021), Yusuf & Tukur (2020), and Garba & Bala (2017), have evaluated farmers' perceptions regarding the effects of agricultural extension services on rice production in Bauchi State, Nigeria, revealing a disconnect between extension agents and farmers. This disconnect is further exacerbated by inadequate training for farmers, irregular field visits, and limited participatory approaches within the state. Nonetheless, these studies did not delve into the factors influencing farmers' understanding of the roles of extension workers in enhancing farm productivity, particularly concerning rice. These challenges highlight the necessity for a comprehensive investigation into the socio-economic and institutional factors that shape rice smallholder farmers' perceptions of agricultural extension services and their impact on rice productivity. Consequently, this study aims to explore the factors influencing the perceptions of rice smallholder farmers of the role of agricultural extension services in rice productivity in Bauchi State, Nigeria. The specific research objectives were to: (i) describe the socio-economic characteristics of smallholder farmers in the study area, (ii) determine the perceptions of rice smallholders of the roles of agricultural extension services on rice productivity, and (iii) determine the factors influencing the perceptions of rice smallholder farmers on rice productivity.

MATERIAL AND METHODS

Study Area

Bauchi State has a projected population of approximately 8,308,800 people, with a growth rate of 3.2% per annum, according to the National Population Census of 2006. It is situated between latitudes 9°30' and 10°48' north of the equator and longitudes 8°45' and 15°0' east of the Greenwich meridian. Rainfall in the state varies from 700 mm to 1,300 mm annually. In the savannah region, the rainy season begins in May and concludes in October, with rainfall variability increasing as one moves north. Relative humidity ranges from about 12% in February to approximately 68% in August. Bauchi State is divided into two main vegetation zones: the Sudan Savannah and the Sahel Savannah. The state shares its borders

with seven other states; to the north, it adjoins the Kano and Jigawa States, while the Taraba and Plateau States lie south. To the east, it is bordered by Gombe and Yobe, and to the west, it neighbours Kaduna State. Covering a total land area of 49,259 square kilometers, Bauchi State constitutes about 5.3% of Nigeria's landmass (Adaba, 2006). The major crops cultivated in the state include rice, maize, millet, cowpea, guinea corn, and groundnut. The prominent livestock raised here include sheep, goats, cattle, domestic poultry, and guinea fowl.

Sampling Procedure and Sample Size

A multistage sampling procedure was employed in this study. In the first stage, two (2) Local Government Areas (Zaki and Jama'are) in Bauchi state were purposively selected due to the predominance of rice production in the floodplain wetland of Hadejia-Jama'are rivers in Northern Nigeria, making them predominantly rice farming communities (Tanko, 2013). In the second stage, a random sampling technique such as balloting was used to select five (5) communities each from the (2) two Local Government Areas making a total of 10 communities. The lists of rice small-holder farmers in the (2) two Local Government Areas were obtained from the Bauchi State Agricultural Development Program (BSADP) office in the State which formed the sample frame of 1,168 rice farmers for the study and the sample size was randomly selected representing 25.5% of the sample frame. The sample size was calculated using the Taro Yamane formula. The formula is given as:

$$n = \frac{N}{1+N(e)^2} \quad \dots(1)$$

Where:

n = sample size,

N = total population,

1 = statistical constant,

e = the assumed error of margin or significance level which is taken as 0.05 i.e. 95% confidence level.

Method of Data Collection

Primary data were collected using a structured questionnaire which was administered to the farmers using the Kobocollect system. Information collected includes; the socioeconomic characteristics of rice small-holders, the perceptions of the following roles of Agricultural extension services on rice productivity; dissemination of information, training, encouraging farmers to form cooperatives, linking farmers to input dealers and so on and factors influencing the perceptions of rice small-holder farmers of the role of Agricultural Extension service on rice productivity in the study area. Two enumerators were used for this exercise which were supervised by the researcher.

Analytical Techniques

Descriptive statistics such as frequency, percentage and mean were used to summarize and achieve objectives i and ii while Ordered logit regression model was used to achieve objective iii.

The specification of the model is as follows;

$$\pi_{ij} = \frac{\exp(\alpha_j + \delta_j Z_i - X_i \beta)}{(1 + \exp(\alpha_j + \delta_j Z_i - X_i \beta))} - \frac{\exp(\alpha_{j-1} + \delta_{j-1} Z_i - X_i \beta)}{(1 + \exp(\alpha_{j-1} + \delta_{j-1} Z_i - X_i \beta))}$$

Where,

π_{ij} = is the probability that individual I have different perception level j

Z_i = is a set of exogenous variables (without a constant).

δ_j = is a vector of parameters to be estimate

β = is a vector of unknown parameters to be estimated

X_i = is a vector of exogenous variables (excluding a constant)

RESULTS AND DISCUSSION

Socioeconomic and Institutional Characteristics of Rice Farmers

The results presented in Table 1 indicate that a significant proportion (32.6%) of rice farmers fell within the age range of 40-49 years, with a mean age of 42 years. This suggests that rice production in the study area is largely undertaken by active individuals who possess the energy to maximize the potential within the rice sub-sector. This result aligned with the findings of Filli *et al.* (2023), who reported that 95% of rice producers in Taraba State were predominantly in their prime working age. Additionally, the results reveal that a substantial majority (82.6%) of the rice farmers were male. This indicates that rice production in the study area is primarily male-dominated, possibly due to the physically demanding nature of rice farming and the fact that resources, such as land, are mostly owned by men. This observation is supported by the study of Angba *et al.* (2020), who found that the majority of rice farmers in Taraba State were male.

Furthermore, the results indicate that a proportion (36.6%) of the rice farmers had secondary education and only 22% have tertiary education. The result implies that, since education plays a vital role in understanding new practices and services, rice farmers in the study area had enough education background to easily comprehend and make decisions on accepting or rejecting agricultural practices or services at their disposal. This aligns with the work of Rasaki *et al.* (2020), who found that the majority of rice farmers in Taraba State had one form of formal education or the other.

The result also indicated that majority (57.4%) of rice farmers operate on farmland ranging from 1 to 2 hectares, with an average size of 1.7 hectares. This suggests that the rice farmers in the study area are primarily small-scale cultivators, facing various constraints related to production factors that contribute to a rice production gap. This finding concords with the work of Mohammed *et al.* (2023), which indicated that most wheat farmers in Jigawa State are also small-scale operators with farms less than 1 hectare.

The respondents were quite experienced in rice farming in which nearly half (47.3%) of the rice farmers possess 6 to 10 years of farming experience, with a mean of 7.1 years. This implies that many respondents have substantial experience in rice farming, which could be advantageous in adapting to the evolving practices in rice production and enhancing their productivity. This observation corresponds with the findings of Nwaobiala and Uchechi (2016), who noted that farmers in Abia State also demonstrated significant years of farming experience.

Furthermore, the results revealed that a significant proportion (59.4%) of rice farmers had access to both physical and non-physical extension contacts. This indicates that rice farmers in Bauchi State have begun to embrace e-extension services while continuing to seek information from local extension agents. This innovative approach could provide farmers with a wealth of valuable information to boost their rice productivity.

Table 1: Distribution of Respondents according to their Socioeconomic Characteristics

Variables	Frequency	Percentage	Mean	Std. dev.
Age				
18-29	25	8.1		
30-39	85	28.5		
40-49	97	32.6	42	9.967
50-59	78	26.2		
60 above	14	4.7		
Sex				
Male	246	82.6		
Female	52	17.4		
Level of education				
Tertiary	68	22.8		
Secondary	109	36.6		
Primary	53	17		
Non-formal	68	22.8		
Farm size				
1-2	171	57.4	1.7	1.187
3-4	117	39.3		
5 above	10	3.4		
Farming experience				
1-5	123	41.3		
6-10	141	47.3	7.1	5.858
11-15	17	5.7		
16-20	6	2.0		
20 above	11	3.7		
Type of extension contact				
Physical	106	35.6		
Non-physical	15	5.0		
Both	177	59.4		

Source: Field survey, 2024

Institutional Characteristics of Rice Small-holder Farmers

Results in Table 2 revealed that almost all (98.3%) of rice farmers had an average of 2 extension contacts in a month. This implies that rice farmers in the study area could have at their disposal recent and viable rice production practices that can enhance their productivity. This agrees with Salau *et al.* (2017), who found that the majority of farmers in the Lafia Local Government Area of Nasarawa State had extension contact and a visit of 2 times a month.

Results further revealed that a large proportion (41.2%) of farmers who have received credit ranging from ₦400,001 - ₦500,000 with a mean of ₦342,606.06 have access to credit in the study area. This implies that rice farmers in Bauchi State had a considerable amount of credit to expand their rice farms thereby increasing their productivity. The results in Table 2 also revealed that the majority (80.2%) of the rice farmers were members of a cooperative society. This indicates that the majority of farmers were part of the farmers' group, which is advantageous for accessing credit, information, and services that could enhance their rice production.



Furthermore, the result in Table 2 revealed that more than half (51.0%) of the rice farmers enjoy agricultural subsidies from the government and non-governmental organizations. This implies that rice farmers in the State could produce rice at a low cost of production thereby increasing their profit.

Table 2: Distribution of Respondents according to their Institutional Characteristics

Variables	Frequency	Percentage	Mean	Std. dev.
Access to extension contact				
Yes	293	98.3		
No	5	1.7		
Extension visit				
1-2	220	75.1	2	0.949
3-4	69	23.5		
4 above	4	1.4		
Amount of credit received.				
<3000-200000	51	30.9		
200001-300000	16	9.7		
300001-400000	20	12.1		
400001-500000	68	41.2	342606.06	188501.462
500000 above	10	6.1		
Membership of cooperative				
Yes	239	80.2		
No	59	19.8		
Agricultural subsidies				
Yes	152	51.0		
No	146	49.0		

Source: Field survey, 2024

Perceptions of Rice Small-holders on the Role of Agricultural Extension Services on Rice Productivity

Table 3 shows that respondents strongly agreed with their perception of the role of dissemination of information to farmers on recommended agricultural practices by extension service, with a mean score of 1.43. Other roles acknowledged by the respondents include conducting farmer training (2.13), organizing and encouraging farmers to form cooperatives/groups (2.11), linking farmers to agro-input dealers (2.28), linking farmers to credit institutions (2.27), linking farmers to farm services (2.23), promoting the adoption of improved technologies (2.01), and involving farmers in program/project planning (2.36). This implies that rice farmers in the study area found these services crucial for their progress in rice production. Additionally, the results reveal a positive perception (index of 0.71–1.00) of the role of agricultural extension services on productivity, with 86.6% of respondents expressing a positive perception toward the services rendered to them. The result implies that rice farmers in the study area view agricultural extension services as essential for enhancing their productivity and overall success in rice farming which agrees with the work of Davis *et al.* (2016), who reported that farmers perceive diverse extension approaches as effective in addressing their varied demands and promoting rice farmer's productivity.

Table 3: Distribution of Rice Farmers according to their Perception on Role of Agricultural Extension Services on their Productivity

Perceptions of the Role Extension Services	Weighted mean	Mean score	Decision
Disseminates information to farmers on recommended Agricultural practices	457	1.43	Strongly Agree
Conduct farmers training	636	2.13	Agree
Organizing and encouraging farmers to form cooperatives/groups	629	2.11	Agree
Link farmers to agro-input dealers	680	2.28	Agree
Link farmers to credit institutions	679	2.27	Agree
Link farmers to farm services	665	2.23	Agree
Promote Farmer's adoption of improved technologies	559	2.01	Agree
Involve farmers to participate in program/project planning	706	2.36	Agree
Types of Perception Index		Frequency	Percentage
Negative	0.00-0.50	2	0.6
Neutral	0.51-0.70	38	12.8
Positive	0.71-1.00	258	86.6

Note: 1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree, 5 = strongly disagree

Factors Influencing the Perceptions of Rice Small-holder Farmers on the Role of Agricultural Extension Service on Rice Productivity

Table 4 shows that the chi-square is significant ($p = 0.000$), along with high Pseudo R^2 values (Nagelkerke $R^2 = 0.754$ and McFadden $R^2 = 0.667$), indicating the model has a good fit. Around 66.7% to 75.4% of the variation in the dependent variable is accounted for by the independent variables, suggesting a strong explanatory power of the model. Out of the nine explanatory variables included in the model, four (age, level of education type of extension contacts and membership of cooperative) were significantly influencing rice small-holder perception of the role of agricultural extension.

The coefficient of age (-5.721) was negative and significant at a 5% probability level, indicating that each additional year of age decreases the likelihood of rice farmers' perception shifting from neutral to positive or neutral to negative by 5.721 units. This suggests that as rice farmers' age continues to increase, factors such as established habits, reduced openness to new ideas, or limited access to resources may make them less likely to perceive or respond positively to the role of agricultural extension services in enhancing rice productivity. This finding aligns with Opondoh, (2023) who reported that age is a contributing factor influencing the utilization of extension services by smallholder farmers in developing countries.

The coefficient of level of education (1.432) was positive and statistically significant influenced rice farmers' perception of the role of agricultural extension service on rice productivity at 5% level of probability. This implies that, as the rice farmers' level of education increases, farmers are more likely to have a positive perception of Agricultural Extension services. The more educated a farmer is, the more likely they are to agree or strongly agree with the role of extension services in rice productivity by 1.432 units. This agrees with the study of Otubo, (2021), who reported that education plays a significant role in the utilization of extension services by smallholder farmers in developing countries.

Also, the coefficient of type of extension contact (1.426) was positive and statistically influenced rice farmers' perception of the role of agricultural extension service on rice productivity at 1% level of probability. This implies that rice farmers are 1.426 times less likely to have a positive perception of the role of agricultural extension services on rice productivity, if they have only non-physical contact or both physical and non-physical contact, compared to those who have exclusively physical contact with extension agents. This gives credit to the fact that face-to-face contact can still be more effective in information dissemination than online or e-extension. This aligns with the work of Bello and Danso-Abbeam (2020), who found that the type of extension contact had positively influenced the perception of rice farmers on improved rice varieties (IRV) adoption in rural Ghana.

However, the farmers' membership in cooperatives is positive and significant with (1.786) at the 1% probability level which implies that rice farmers who are not members of cooperative societies are 1.786 times less likely to have a positive perception of the role of agricultural extension services on rice productivity compared to those who belong to one or more cooperatives

Table 4: Ordered logit regression on factors influencing the Perceptions of Rice Small-holder Farmers of the role of Agricultural Extension Service on Rice Productivity

Variables	Estimates (coefficient)	Std. error	Wald	Sig
Threshold of Perception				
Neutral to positive = 1	2.312	11.607	7.130	0.000***
Neutral to negative = 2	-3.356	9.607	6.340	0.000***
Location				
Age	-5.721	2.742	4.354	0.037*
Sex	0.009	0.754	0.000	0.990
Farming experience	1.471	1.582	0.861	0.350
Level of education	1.423	0.779	6.339	0.028**
Types of extension contact	1.426	0.605	550.441	0.000***
Access to extension	1.472	1.584	0.864	0.353
Credit received	0.200	0.561	0.127	0.722
Membership of cooperative	1.786	0.658	7.373	0.007***
Agricultural subsidies	0.415	1.752	0.150	0.980
-2log likelihood = 73.520				
Chi-square = 164.131, sig = 0.000				
Cox and snell Pseudo R² = 0.427				
Nagelkerke Pseudo R² = 0.754				
Mc Fadden Pseudo R² = 0.667				

*** =significant at 1%, **=significant at 5%, *=significant at 10%

CONCLUSION AND RECOMMENDATION

Based on this study, it was concluded that most rice farmers positively perceive the role that agricultural extension services play in enhancing rice productivity. Consequently, it is recommended that both public and private extension agencies organize regular workshops, field demonstrations, and other training programs. This approach aims to sustain and improve farmers' understanding of the services designed to boost their knowledge and skills, ultimately leading to enhanced farm productivity. Additionally, it is suggested that the government and private extension organizations, such as Sasakawa Global 2000 and ThriveAgric, hire more extension staff to reduce the farmer-to-extension agent ratio. This



would facilitate greater physical contact with farmers and ensure that adequate funding and resources are available to improve extension services. Recognizing the importance of education in shaping farmers' perceptions and activities is crucial for enhancing their productivity.

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