



**FACTORS INFLUENCING ADOPTION OF NERICA-1 RICE AMONG
SMALLHOLDER FARMERS IN NORTH-EAST NIGERIA**

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ABSTRACT

The research investigated the factors influencing adoption of NERICA-1 rice in the north-east, Nigeria. A multistage sampling procedure was used to select 605 NERICA-1 rice farmers. The primary data and secondary information were used for this study. Frequencies, percentages, means, adoption index and Tobit regression model were used to analysed data. The result revealed that larger number (49%) of NERICA-1 rice farmers in north-east were within the age range of 21-30. The result showed that a majority (59%) of NERICA-1 rice farmers had ≤ 1.5 ha of land for rice cultivation. The result indicated that a majority (73%), (64%) and (56%) of NERICA-1 rice farmers adopted 70-100% of the production practices in in Adamawa, Bauchi and Taraba States respectively. The result established that marital status had positive coefficient (0.507) and significant influence on the adoption level of NERICA-1 rice at 1% probability level. It is concluded that NERICA-1 rice farmers in the north-east were smallholder, young and active. Educational level, marital status, membership of cooperative had significant influence on the level of adoption of NERICA-1 rice. It is recommended that Government at all levels (federal, state and local), NGOs, private and public extension workers should encourage farmers to have more involvement in the cooperative societies to assess more inputs and share information among them. This could be done through sensitisation of farmers on the benefits of participation in cooperative societies.

Keywords: Adoption, Factors, Farmers, Rice and Smallholder

INTRODUCTION

Rice is one of the major staple food crops globally and is therefore critical to food security and livelihood of millions of people. Rice production in Nigeria is regarded as the pivot for economic development as it facilitates employment opportunities for younger generation in rural areas; ensure food security (Izuogu *et al.*, 2025). As a source of employment, food and means of livelihood, the only method to improve smallholder farmers' lives is to increase agricultural productivity through the introduction of improved agricultural production practices. Therefore, the adoption of improved technologies remains a viable means to increase the productivity of smallholder farmers thereby fostering economic growth and improved well-being for millions of poor households (Alabi *et al.*, 2024).

Nigeria is the leading rice producer, consumer, and importer in Africa, with harvested area of 4,257,474 ha, which yielded 8,370,922 and consumed 7,415,666.6 tons of rice as well as per capita consumption of around 30kg annually (Uche *et al.*, 2021; Africa Exchange, 2024; & Namibian Agronomic Board, 2025). The consumption continues to increase in Nigeria because the crop status has been changes from festive and ceremonial events (*Salla*, Christmas, wedding,



and naming) to daily staple food across the country. Despite being the largest producer of rice, its production has not met the consumption demands of people; this led to rice importation into the country to fill the demand and supply gap.

The demand and supply gap creates food insecurity challenges among smallholder rice farmers. This could be related to the fact that most of the farmers producing rice rely on traditional technology with little use of improved technologies. Average rice yields per unit area in the country are low and range between 2.0 to 3.0 tons/hectare (t/ha) on the farm as compared to yields of 6–8 t/ha reported on research plots. Hence, this research was conducted to investigate the factors influencing adoption of Nerica-1 rice adoption in the north-east, Nigeria. The specific objectives were to: described the socio-economic characteristics of farmers in the study area, assess the level of adoption of Nerica-1 rice among farmers and determine the factors influencing adoption of Nerica-1 rice among farmers. It was hypothesised that socio-economic, institutional, and technological factors have no significant influence on level of adoption of NERICA-1 rice.

MATERIALS AND METHODS

The Study Area

The study was conducted in North-East Nigeria, which consists of six states. The states are Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe. The zone is located between Latitude 9° 08' to 14°N and Longitude 8° 68' to 15°E. It has a total land mass of 280,419 km² (National Bureau of Statistics (NBS), 2017). The region has a projected population of 29,470,062 people in 2025 based on a population growth rate of 3%. The main economic activities in the area include farming (crops and livestock), hunting, fishing, food processing, transportation, and crafts, with inputs largely sourced from the government (Murtala *et al.*, 2021). The region has three (3) different Savanna zones, which include Sahel, Sudan, and Guinea savanna. Its mean annual rainfall ranges from less than 250 mm in the Northern Sahel to 1500 mm in the derived savannah in line with the southern part, and it has a unimodal pattern (National Population Commission (NPC), 2010).

Sampling Techniques and Sample Size

A multistage sampling procedure was used to select respondents. Firstly, three (3) states were purposively selected consists of Adamawa, Bauchi, and Taraba. Secondly, one (1) LGA was selected randomly using balloting method from each Agricultural zone of each state. The third stage, purposive selection of three communities from each LGA selected was done based on the concentration of rice farmers in the communities. In the fourth stage, 605 NERICA-1 rice farmers were randomly selected. Primary data and secondary information were used for this study. The primary data and secondary information were used for this study. The descriptive statistics used include: frequencies, percentages, means, and adoption index were used.

The adoption index was used to assess the level of adoption of NERICA-1 rice. The formula is as follows:

$$Y_i = \sum \frac{a}{b} \quad ..(1)$$

Y_i = adoption index

\sum = Summation of

a = number of NERICA-1 rice production practices adopted by i^{th} farmer

b = total number of NERICA-1 rice production practices

Farmers with an adoption index of 0.1–0.4 were classified as low adopters, 0.5–0.6 as medium adopters, and 0.7–1.0 as high adopters.

Tobit regression analysis was used to achieve objective (iv) to determine the socio-economic, institutional, and technological factors influencing the level of adoption of NERICA-1 rice and test hypothesis (i) H_{01} Socio-economic, institutional, and technological factors have no significant influence on the level of adoption of NERICA-1 rice. Under Tobit regression models, it is assumed that adoption of NERICA-1 rice is a continuous decision by farmers. It expresses a farmer's adoption of production technologies as a functional linear combination of observable explanatory variables, some unknown parameters, and an error term (e).

The model is expressed as:

$$y_i^* = \beta_n x_i + \varepsilon \quad \dots(2)$$

$$Y_i = Y^* \text{ if } Y_i > 0 \quad \dots(3)$$

$$Y_i = 0 \text{ if } Y_i^* \leq 0 \quad \dots(4)$$

Algebraically expressed for i^{th} farmer, the Tobit model is explicitly presented as:

$$Y_i^* = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_k x_k + \varepsilon \quad \dots(5)$$

Where: y_i^* = Adoption level (Dependent variable), that is adoption of Nerica-1 rice;

α = constant

β_1 - β_k = Coefficients of independent variables (parameters)

ε_i = Random error term

x_1 - x_{14} = were the factors influencing the level of adoption of Nerica-rice (explanatory variables)

X_1 = Age (in years)

X_2 = Sex (Male = 1, Female = 0)

X_3 = Educational level (formal education = 1, Non-formal education = 0)

X_4 = Marital status (Single = 1, Married = 2)

X_5 = Household size (Number of people in the household)

X_6 = Farm size (ha)

X_7 = Farming experience (Years)

X_8 = Membership of cooperative (Number)

X_9 = Credit access (₦)

X_{10} = Extension contact (Number of visits)

X_{11} = Relative advantage (High = 1 and Low = 0)

X_{12} = Affordability of technology (High = 1 and Low = 0)

X_{13} = Compatibility of technology (High = 1 and Low = 0)

X_{14} = Simplicity of technology (High = 1 and Low = 0)

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The result in Table 1 revealed that larger number (49%) of NERICA-1 rice farmers in north-east were within the age range of 21-30. The mean age of NERICA-1 farmers was 34 years in the north-east region. The result implies that the majorities of the rural rice farmers in northeastern Nigeria were young and active and, hence could be able to participate and produce more rice crops to have an improvement in their livelihood. The finding from this study is similar to the study of Ephraim *et al.* (2021) who established that most of the rice farmers in Bauchi State were in the age range of 20–40. Likewise, the result revealed that a majority (71%) of NERICA-1 rice farmers' had a household size of 1-6 persons per house. The mean household size was 5 persons in a house in the north-east region. The size of the family shows the availability of labour to farmers. The finding suggests that farmers have more free labour available for farm activities.

The result is related to the finding of Bulus *et al.* (2023) and Alabi *et al.* (2024) who found that majority of the rice farmers' had household size ranging from 1-10 members with mean household size of 6 members.

The results in Table 1 revealed that a majority (59%) of NERICA-1 rice farmers had ≤ 1.5 ha of land for rice cultivation. The mean farm size of NERICA-1 rice farmers was 1.6 ha of land. The finding depicts that NERICA-1 rice farmers in the north-east are smallholders. Farm size plays a vital role in farmers' productivity. Though, no matter how small the farm size may be, if the farmers followed appropriate techniques in the NERICA-1 rice could have a greater result in terms of yield. The result is in agreement with that of Bala (2021) who revealed that most of NERICA 1 rice farmers had less than 1.5 ha of cultivated land with an average farm size of 1.5 ha in Gombe State, Nigeria.

Table 1: Distribution of farmers according to socioeconomic characteristics

Variable	Dominance variable	F	%	MN
Age	Majority falls within the age range of 21-30	150	49	34
Educational level	Large number of Nerica-1 rice farmers attended tertiary education while non-Nerica-1 have no education	124	41	NA
Household size	1-6	215	71	5
Farm size	≤ 1.5	181	59	1.6
Membership of cooperative	No involvement in cooperative	165	54	NA
Access to credit	Majority had no access to credit	158	52	NA

Source: Field survey (2024). MN = mean of NERICA-1, NA = not available

Level of Adoption of NERICA-1 Rice

The result in Figure 1 indicated that majority (73%) of NERICA-1 rice farmers adopted 70-100% of the improved production practices and very few (13%) adopted 10-40% of the practices in Adamawa State. Similarly, larger proportion (64%) of NERICA-1 rice farmers adopted 70-100% of the production practices in Bauchi State and the least (7%) of the famers adopted 50-60% of the production practices. On the other hand, more than half (54%) of NERICA-1 rice farmers adopted 70-100% the crop as a package in Taraba State with a very few (20%) adopted 10-40%. This implies that there is high level of adoption of NERICA1 rice production practices among farmers in each of the states. It is therefore suggested that there is high adoption of Nerica-1 rice in the north-east, Nigeria. The finding of this study concurs with that of Ephraim *et al.* (2021), Mhoja *et al.* (2021) and Assaye *et al.* (2023) reported that the majority of farmers were active adopters of improved rice technology. On the other hand, contradicts the findings of Bala *et al.* (2020) established that a greater proportion of the rice farmers were conservative and not ease adopters of innovations, with an adoption index of 10-39%.

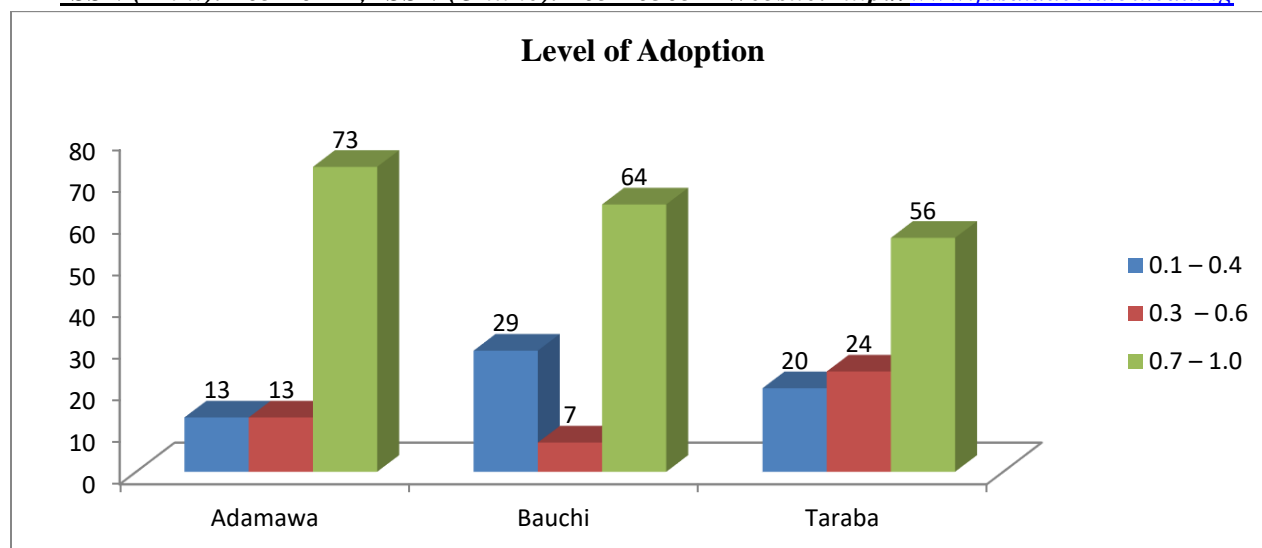


Figure 1: Distribution of farmers according to level of adoption

Factors Influencing Level of Adoption of NERICA-1 rice

As presented in the result, the log-likelihood function was -491.68484 and the chi-square value was 172.81 which were significant at a 1% probability level. This implies that the model fits significantly with the data. In the same vein, it means all the explanatory variables together influence the level of adoption of NERICA-1 rice by the farmers in northeast, Nigeria. Table 2 showed the estimation of Tobit regression on factors influencing adoption of NERICA-1 rice in north-east.

The coefficient of education was statistically significant at 10% probability level but negatively related to adoption of NERICA-1 rice as indicated by the coefficient (-0.058) and t-value (-1.66). The result from the Tobit regression model revealed that educational level reduces adoption of NERICA-1 rice in the study area by -5.8%. This differs from the earlier stated *a priori* expectation that education will have a positive influence on the adoption of NERICA-1 rice. It implies that the more the farmers are educated the less the adoption of NERICA-1 rice. This could be related to the fact that educated people tend to leave farming in rural areas in exchange for a white-collar job in urban centers. This was in line with findings of Solomon (2024) who found that educational level was negative and significantly associated with the adoption of the SRI practices. However, varies with Malabe *et al.* (2021), Iwuchukwu *et al.* (2022), and Ogunkunle *et al.* (2023) who established that number of years spent in school were positive and significantly influenced farmers' adoption of improved rice technologies. The result established that marital status had positive coefficient (0.507) and significant influence on the adoption level of NERICA-1 rice at 1% probability level which is different from the *a priori* expectation in which the adoption of NERICA-1 rice was expected to have negative relationship with marital status of the respondents. The model explains that marital status increases the NERICA-1 rice adoption by 50.7% in the study area. This could be because married households' have access to available and cheap labour for farming activities. This motivates NERICA-1 rice farmers to adopt NERICA-1 rice which may translate in to high yield, income as well as improved in their level of living. This agrees with the findings of Solomon (2024) discovered that there is significant association between marital status and adoption of SRI practices.

The perceived compatibility revealed negative coefficient (-0.244) and significant influence on the adoption of NERICA-1 rice at 5% probability level in the study area. This means compatibility reduce adoption of NERICA-1 rice by about 24.4%. This implies that NERICA-1 rice was negatively perceived by the respondents in terms of amount of money to be sent in its production. This could be due to inadequate credit availability to farmers. Inadequate credit limits farmers' ability to purchase farm inputs and payment of labour. The introduced technology must be compatible in terms of climatic condition, market, tradition and culture of the people which it will be used. The result is contradicted with the a priori expectation which is expected to have a positive relationship with the adoption of NERICA-1 rice. This was similar to Abdulmumini *et al.* (2019) who discovered that compatibility of technology was negative and significantly influenced the adoption of RLRPTs in Jigawa State.

Table 2: Factors Influencing Level of Adoption of Nerica-1 Rice

Variable	Coefficient	Standard Error	T-value
Age	0.002	0.006	0.33
Sex	-0.088	0.136	-0.65
Educational. Level	-0.058	0.035	-1.66*
Farm size	0.027	0.053	0.51
Marital status	0.507	0.156	3.26***
Household size	-0.011	0.014	-0.77
Farming experience	0.224	0.129	1.74*
Membership coop	0.775	0.153	5.08***
Credit access	0.008	0.153	0.06
Extension contact	0.134	0.158	0.85
Relative advantage	0.213	0.124	1.72*
Affordability	0.109	0.114	0.96
Compatibility	-0.244	0.114	-2.13**
Simplicity	0.724	0.124	5.84***
Constant	-0.641	0.325	-1.98*
Variance of std. err	1.165	0.169	
Diagnostic statistics			
Number of observations	605		
Chi square value	172.81***		
Log likelihood	-491.68484		

Source: Field survey (2024) *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level

CONCLUSION AND RECOMMENDATIONS

It is concluded that NERICA-1 rice farmers in the northeast were smallholder, young and active with less involvement in cooperative societies and low access to credit. Educational level, marital status, membership of cooperative, farming experience, relative advantage, compatibility and simplicity had significant influence on the level of adoption of NERICA-1 rice. It is recommended that Government at all levels (federal, state and local), NGOs, private and public extension workers should encourage farmers to have more involvement in the cooperative societies to assess more inputs and share information among them. This could be done through sensitisation of farmers on the benefits of participation in cooperative societies. Also, it is recommended that Government at all levels (federal, state and local), NGOs, private and public extension workers should encourage farmers to maintain the zeal and interaction of cooperation among themselves to be able to share relevant and useful information on new farming techniques, assess inputs at low cost and at the time required as well as credit to finance farming activities.



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