



ANALYSIS OF THE FACTORS AFFECTING ADOPTION OF IMPROVED RICE TECHNOLOGY IN NIGER STATE, NIGERIA

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ABSTRACT

The study was carried out in Niger State, Nigeria to analyze factors affecting adoption of improved rice technology. Multi-stage sampling technique was used to select 180 respondents. Both descriptive and inferential statistics were used for the data analysis. The result disclosed that 55% of the respondents were still in their active and productive age. 95% of the respondents were married and majority 77% had moderate house hold size of 1-10 people. Majority (91.1%) had no formal education and 96.7% were small holder rice farmers. On farm adoption research and town criers ranked the 1st as rice farmer major sources of information. The major improved rice technologies adopted by the farmers were weed control (67.2%) and recommended land preparation practices (59.45%). The major factors affecting the adoption of improved rice technologies were marital status and extension contact at $P \leq 0.01$ probability level; other factors include cooperative membership and age of the respondents at $P \leq 0.1$ probability level, though age was inversely related to adoption of improved rice technologies. It was recommended that institutional credit organizations should provide credit facilities at a low interest rate to the rice farmers to enable them adopt the improved rice technologies.

Keywords: Adoption, Factors, Improved, Rice, Technology.

INTRODUCTION

Rice is one of the major food crops cultivated in all agro-ecological zones of Nigeria and it is consumed daily by a large proportion of the population. An average of 25kg of rice is consumed annually per person (Hussein, 2004). There is increasing demand for rice in Nigeria; annual consumption growth rate is 10% (Akande, 2001) compared to the population growth rate of 3.5%. demand is met both by locally produced and imported rice of the total demand of 5 million tons in 2006, imports account for 1.6 million tons the country ranks first among the major rice importing countries in Africa and second after Philippines in the world (Africa Rice Centre, 2008).

The recognition of the importance of rice in national food security and the need to reduce the amount of foreign exchange spent on rice importation has made increased rice production a major priority of the Nigeria food policy programmed. A disturbing situation about the issue of self-sufficiency is the increasing rate of consumers' preference for imported rice (Erenstain, *et al.*, 2004).

In 2017, the quantity of local rice production in Nigeria was estimated at 9.86 million tons (Food and Agriculture Organization [FAO], 2017. This further conforms to the assertion of Ogunsumi *et al.* (2013) on the gap between local demand and supply of rice in Nigeria that the level of rice consumption in Nigeria increases with about 10% per annum as a result of changing consumer preferences amidst other factors. The low productivity of rice farmers is occasioned by the use of low technologically empowered agricultural equipment which does



not support large scale production. For instance, Fasoyiro and Yaiwo (2012) observed that in Nigeria, rice is mainly produced by small-scale farmers whose production is characterized by low output resulting from production inefficiency.

The broad objective of to: determine the socio-economic the study was to analyze the factors affecting adoption of improved rice technology in Niger State, Nigeria. The specific objectives were characteristics of rice farmers; determine the sources of information; ascertain the type of rice technologies adopted by the rice farmers; and examine the factors affecting the adoption of improved rice technologies.

MATERIALS AND METHODS

The Study Area

The study was carried out in Niger State, Nigeria. The State is located between latitude $3^{\circ} 20'$ east and longitude $11^{\circ} 30'$ north and is bounded in the North East by Kaduna State, Zamfara State in the north, in the North west by Kebbi State, in South East by Kogi State, in the East by Federal Capital, Abuja while in the South West by Kwara State. Niger State Agricultural Development Project is divided into three (3) zones, namely 1, 2 and 3. The study was conducted in Agricultural zone 1 (Niger State Geographic Information System [NIGIS], 2019).

Zone 1 is made up of Agaie, Bida ,Edati, Gbako, Katcha, Lapai, Lavun and Mokwa local government areas (LGAs) with the headquarter at Bida. The zone is suited for major cereal crops like rice and guinea corn, etc. The inhabitants of the study area are subsistence farmers the major crops produced are maize, millets, rice, guinea corn etc. Animal reared includes cattle, goat, and sheep. The average annual rain fall in the State is 1219 mm, the wet is from March to September and the dry season is from September to March temperature is about 26.1°C (June to February) to 30.3°C (March to April) the tribes living in the area are Nupe, Hausa, Yoruba and Ibo (NIGIS, 2019).

Sampling Procedure and Sample Size

Multi-stage sampling technique was adopted for the study. The zone is made up of eight (8) extension blocks out of which four (4) extension block were purposively chosen/selected for the study due to large production of rice in these extension blocks. The second stage was the random selection of three (3) extension cells from each of the four extension blocks. The third stage was the random selection of three (3) villages from each cell; and fourth stage was the random selection of 15 rice farmers from each village, giving a total of 180 respondents as presented in Table 1.

Table 1: Sampling Frame and Size Selection Plan of the Study

ADP Zone	LGAs	Communities	Sample Size
Zone 1	Lavun	Doko, Jimma, Mambe	45 farmers
	Gbako	Lemu,Somazhinko, Tiwugi	45 farmers
	Katcha	Katcha, Logunma, Baro	45 farmers
	Mokwa	Raba, Tatabu, Muwo	45 farmers
Total			180

Method of Data Collection

The study data collected was through the use of a questionnaire/interview schedule. Data that were collected include, socio-economic characteristics of the rice farmers, sources of



information on improved rice technologies by the respondents, factors affecting farmers adoption of improved rice technologies in the study area.

Analytical Techniques

Descriptive statistical tools (frequencies, variables counts, percentages means, and ranking) and inferential statistics (multiple regression model) were used to analyze the data. The multiple regression models are implicitly specified as:

$$Y = F(X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 X_9) \quad \dots(1)$$

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + b_9 X_9 + e \quad \dots(2)$$

where;

Y = Adoption (number of technologies adopted)

The independent variables are defined as:

X₁ = Age of respondent (in years)

X₂ = Marital status of respondent (1 if married and 0 otherwise)

X₃ = Family size (number)

X₄ = Education of the respondent (years spent in formal education)

X₅ = Farming experience (Years)

X₆ = Farm size (hectares)

X₇ = Extension contact (Number of times visited)

X₈ = Access to credit (Yes/No)

X₉ = Output after adoption (kg)

X₁₀ = Land ownership (yes = 1; no = 0)

X₁₀ = Cooperative membership (yes = 1; no = 0)

a = Constant

b₁ – b₂ = Coefficients

e = Error term

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

Table 2 reveals that 53.9% of the respondents were within the age range of 21 – 40 years; about 34% were within the age range of 41 – 60 years. Also, 11.1% were above 40 years and only 1.1% was below 21 years. This implies that majority of the respondents were still in their active age and it is assumed that this age groups are more active and responsive to changes in innovations and as such can diversify in to non-agricultural activities for economic enhancement and improved livelihood. This result is in agreement with those of Okwache and Daudu (2010) who pointed out that most of their respondents in the study area were still in their active and productive age.

Table 2 further shows that majority (95.0%) of the respondents were married and only 5.0% were single, this implies that majority of the respondents were married and are likely to be more responsive to new technologies to enable them meet up with their additional responsibilities. Majority (96.1%) of the respondents were males while only (3.9%) were females, this implies that males are more into rice farming than the female. This may not be unconnected with the intensive labour required for carrying out rice estimated women were however more active in post-harvest activities. This finding is in agreement with that of Tologbonse (2004) who pointed that females were more active in post-harvest activities like processing and marketing of rice. Also, 38.3% of the respondents had house hold size of 1 – 5 people, while 38.9% had between 6 – 10 people; 1.7% had between 16 – 20 people and only 0.6% had above 20 people. This implies that majority of the respondents had moderate house hold size.



Table 2: Socio-economic Characteristics of the Respondents

Variables	Frequency	Percentage
Age		
Less than 21 years	2	1.1
21 – 40 years	97	53.9
41 – 60 years	61	33.9
Above 60	20	11.1
Marital status		
Married	171	95.0
Single	9	5.0
Sex		
Female	7	3.9
Male	173	96.1
Household size		
1 – 5	69	38.3
6 – 10	70	38.9
11 – 15	25	13.9
16 – 20	3	1.7
Above 20	1	0.6
Major occupation		
Trading	7	3.9
Farming	149	82.8
Civil servant	23	12.8
Others	1	0.6
Education		
Literate	164	91.1
Illiterate	16	8.9
Cooperative membership		
Yes	111	61.7
No	69	38.3
Source of land		
Lease/hired	115	63.9
Purchased	22	12.2
Inherited	43	23.9
Farm size		
Less than 1(ha)	5	2.7
1 – 3 (ha)	174	96.7
Above 6	1	0.6

Source: Field survey, 2019

Table 2 also revealed that majority of the respondents (82.8%) were full time farmers while 12.8% and 3.9%, respectively, were civil servant and traders, this implies that majority of the respondents were full time farmers and the tendency to accept and adopt improved rice technologies is likely to be high so as to boost their income generation capacity. Majority (91.1%) of the respondents were literate and only 8.9% were illiterate. Education is said to be a major determinant of adoption. This implies that the tendency of the respondents to accept and adopt improved technologies is high. This finding is in agreement with that of Hornik (1999) who stated that basic education whether obtained in school or out of school makes a lot of contribution to adoption and farmers productivity, because according to him better educated farmers are easier to deal with and have greater access to external information sources and easily adopted innovations.

In Table 2 results, about 62% of the respondents belong to one cooperative society or the other and only 38.3% indicated that they do not belong to any cooperative society. This



implies that majority of the respondents stands a better chance of benefiting from government organizations, nongovernmental organizations and Donor Agencies, for cooperative societies are presently the avenues through which assistance are rendered by the above mentioned organization or agencies. Furthermore, majority (63.9%) of the respondents obtained their land for rice cultivation through leasing while 12.2% and 23.9% respectively purchase and inherited their farm land. This implies that majority of the respondents had to pay for the land they are using for rice cultivation which usually add to the cost of production. Table 2 also indicated that majority of respondents (96.7%) had between 1-3 hectares of land while 2.7% had less than 1 hectare and only 0.6% had above 6 hectares. This implies that majority of the rice farmers in the study area are small scale farmers.

Sources of Information of the Respondents

Table 3 shows that farm adaptive research and town crier Ranked 1st as the major sources of information. Training and visit and method demonstration ranked 3rd and 4th, respectively. This finding is in agreement with that of Agbamu (2006) who pointed out farmers use several sources to obtained information about improved technologies.

Table 3: Distribution of Respondents according to Source of Information (n = 180)

Source of information	Frequency*	Percentage	Rank
Method demonstration	170	94.4	4th
Training and visit	21	11.6	6th
Contact farmers	168	93.3	5th
On farm adaptive research	180	100	1st
Town crier	180	100	1st
Others	179	99.4	3rd

*Multiple responses exists

Source: Field survey, 2019

Rice Production Technologies Adopted by the Respondents

Table 4 reveals that planting of disease resistant varieties was the most (93.3%) adopted by the respondents; followed by recommended spacing (92.8%), and improved threshing floor (92.2%), bird control (91%) and disease control (86.7%). This implies that the farmers were selective in adopting the recommended improved rice technologies. This may be the main reason why farmers do not obtain optimum yield from their plots; for according to Pretty (1996), optimum yield can only be obtained when farmers use improved technologies in combination rather than in isolation.

Table 4: Improved Rice Production Technologies Adopted in the Study Area

Rice technologies	Adopted	Not adopted
Disease resistant variety	168 (93.3)	12 (6.7)
Selection of health seeds	139 (77.2)	41 (22.8)
Recommended land preparation	73 (40.6)	107 (59.4)
Spacing	167 (92.8)	13 (7.2)
Use of herbicide	115 (63.9)	65 (36.1)
Fertilizer use	99 (55.0)	81 (45.0)
Weed control	59 (32.8)	121 (67.2)
Disease control	158 (86.7)	24 (13.3)
Iron toxicity control	162 (90)	18 (10)
Bird control	172 (91)	15 (8.3)
Timely harvesting	165 (91.7)	15 (8.3)
Improved threshing floor	166 (92.2)	14 (7.8)

Source: Field survey, 2019



Factors affecting Adoption of Improve Rice Production Technologies

Table 5 reveals that age is significant at 10% level of probability however, it is inversely related to adoption (-2.03), as such the tendency of the farmer to adopt new innovations at a giving time reduces by (2.03%) which implies that as the farmer increases in age the probability of adoption new innovations decreases. For other significant variables like marital status (3.99), cooperative membership (1.98) and extension contact (8.37), the probability of the farmer's adoption of improved rice technologies will increase by the percentages against each of the significant variables, that is, 3.99%, 1.98%, and 8.37% for marital status, cooperative membership and extension contact, respectively.

Table 5: Factors affecting Adoption of Improve Rice Production Technologies

Variables	Coefficient	z-value
Constant term	-2.430665	0.111
Age (X ₁)	-0.59744	0.051*
Marital status (X ₂)	1.914154	0.000***
Household size (X ₃)	-0.0524993	0.668
Education (X ₄)	0.759064	0.172
Farming experience (X ₅)	-0.0550706	0.242
Farm size (X ₆)	0.1765145	0.548
Extension contact (X ₇)	1.546296	0.000***
Access to credit (X ₈)	-0.3844869	0.387
Yield after adoption (X ₉)	0.0019106	0.171
Land ownership (X ₁₀)	-0.7222445	0.120
Cooperative membership (X ₁₁)	0.9671221	0.056*
LR chi ² (II)	68.51	
Prob. > chi ²	0.0000	
Pseudo R ²	0.2828	

Note: ***significant at 1%; and *significant at 10%

Source: Field survey, 2019

Table 6 reveals that as the age of the farmers increases at -2.03% the tendency of the farmer to adopt new innovations at a giving time reduces by 2.03% which implies that as the farmer increases in age the probability for adoption new innovations decreases. For other significance variables like marital status (3.99), cooperative membership (1.98) and extension contact (8.37), the probabilities of the farmer's adoption of improved rice technologies will increase by the percentages against each of the significant variables, that is 3.99%, 1.98%, and 8.37% for marital status, cooperative membership and extension contact, respectively.

Table 6: Average Marginal Effect of the Significant Factors affecting Adoption of Improve Rice Production Technologies

Variables	Marginal effect	z-value
Age	-0.0094716	-2.03
Marital status	0.3034645	3.99
Cooperative membership	0.1533248	1.98
Extension contact	0.2451453	8.37

Source: Field survey, 2019

CONCLUSION AND RECOMMENDATIONS

The study showed that the major sources of information of rice farmers in the study area were on farm adaptive research and town crier. Also a number of factors affect adoption of improved rice technologies as the age, marital status, extension contact and membership of



cooperative societies. All these variables accounted for the level of adoption of improved rice technologies in the study area. Based on the finding of the study, the following recommendations were made:

- i. The need to organize more training for the purpose of improving local farmer's technical skills for adopting improved rice technologies is to organize for the farmers.
- ii. Farmers should organize themselves into cooperative societies so that they can access the assistance usually rendered by government and non-governmental organizations.
- iii. Timely provision of credit facilities at a low interest rate to farmers.

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