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ADOPTION OF IMPROVED RICE PRODUCTION TECHNOLOGIES IN IRRIGABLE LOWLAND AREAS OF JERE, BORNO STATE, NIGERIA

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ABSTRACT

This study assessed the adoption of improved rice production technologies in irrigable lowland areas of Jere Local Government Area, Borno State, Nigeria. A multi-stage sampling technique was employed to select 200 respondents, who were administrated with questionnaires. Data were analyze using descriptive and inferential statistics. The findings of the study showed that majority (98.0%) of the respondents were male, most (33.5%) of the rice farmers were within the age range of 41-50 years, majority (90.0%) of the respondents were married, majority (82.5%) of the respondents went through informal education, about (56.0%) of the farmers had 6-10 household size, most (43.0%) of the respondents had 20 years and above farming experience, majority (69.5%) were not a member of cooperative in the study area, also majority (93.5) had extension contact through informal means. The findings of the study show that, six out of the nine recommended rice production technologies were classified as high practice, one of the rice technologies was considered as medium practice, while the remaining two of the recommended technologies considered as low practice. This implies that respondents' compliance was high in terms of technology transfer. The findings further shows that the age was positively significant at 0.05 while education, farming experience, cooperative membership and extension contact were positively significant at 0.01.

Keywords: Adoption; Improved; Rice; Technology; Irrigable; Lowland

INTRODUCTION

Agriculture is one of the key sectors in the Nigerian economy, engaging nothing short of 80% of the total population with a meaningful contribution to the Gross Domestic Product (GDP), providing significant foreign exchange, and supplying raw materials for local industries. Nevertheless, agriculture has not been exploited to its fullest to make a meaningful

economic growth and food availability (FMARD, 2011). According to NBS (2010) and FMARD (2011) agriculture is a major driver of economic growth in Nigeria with the involvement of more than 70% of the rural population in one form of production or the other and a contribution of about 40% to the Gross Domestic Product. Small scale farmers living in rural areas are principally engaged in agriculture who produce bulk of the food in Nigeria (Okunlola, 2005; World Bank, 2013). However, Vincent (2019) stated that low productivity, underutilization of the available improved technologies, lack of agricultural support services as well as low incomes are the key features of agriculture in Nigeria, especially in relation to rice production. According to Williams *et al*. (2005) and Tiamiyu *et al.* (2009) inefficient communication and dissemination strategies have to a large extent contributed to the inaccessibility of agricultural knowledge amongst rice farmers in most rural areas. Adesina (2015) opined that inaccessibility of useful agricultural knowledge and information has been limiting for rice productivity.

Amidst living in this period of rapid scientific and technological development, farmers still engaging traditional system of rice production in most communities (Gerald, 2015). According to FMARD (2012) most rice farmers rely on traditional rice farming characterized by low productivity due to inadequate modern agricultural knowledge. However, rice has long been dominant part of a population's diet for about half of the human race (Ojehomon *et al*., 2009). According to Erenstein *et al.* (2004) improved rice production technologies have potential to improve nutrition, boost food affluence, promote community development and reduce poverty. Hence, rice productivity could be increased amongst rural farmers when improved rice technologies are fully adopted. Thus, it was found to be extremely important to investigate the adoption of rice production technologies in Jere Local Government Area of Borno State, Nigeria. The main objective of this study was to investigate the adoption of improved rice technologies amongst rice farmers in Jere lowland areas of Borno State, Nigeria.

METHODOLOGY

Study Area

The study was carried out in Jere Local Government Area, Borno State, Nigeria. It is one of the twenty-seven (27) local government areas of the State. The Local Government Area was carved out of Maiduguri Metropolitan Council (MMC) in 1996 (BSG, 2007). It lies within latitude 11^0 40' and 12^0 05N and longitudes 13^0 50 and 12^0 20E. It occupies a total landmass of 160 square meters, shares boundaries with Mafa Local Government Area to the east, Maiduguri and Konduga Local Government Area to the South. Two hundred and ninety-three thousand eight hundred (293,800) is the population of the area at growth rate of 3.4% (NBS, 2019). The Major inhabitants of the area are farmers. The major ethnic groups in the area include Kanuri, Hausa, Zarma, and Shuwa (BOSADP, 2008).

Sources of Data

The data for this study were collected from both primary and secondary sources. The primary data were collected through the use of interview schedule. The secondary information was obtained from journals, proceedings of conferences, textbooks, and other relevant documents.

Sampling Procedure and Sample Size

A multi-stage sampling technique was used for this study. In the first stage, Alau, Dusman, Lawanti, Gongolon and Zabbarmari wards were purposively selected because of the presence of high number of rice farmers. In the second stage, three wards namely, Gongolon, Alau, and Dusuman were randomly selected through raffle method. In the third stage, three (3) villages were selected from each of the randomly selected wards. These villages were Karwinari, Modu-Ajiri and Monduri from Gongolon, Moduyari, Ngawu-Bulamari and Koreri from Alau, while Shuwari, Arizarmari and Kazallari from Dusman. Finally, 20 rice farmers was obtained from each of the selected villages. Thus, a total of 200 respondents were used for the study as sample size.

Data Analysis

Data for the study were analyzed using descriptive (frequencies and percentages) and inferential statistics (multiple regression). The regression analysis was used to determine the relationship between socioeconomic factors influencing the level of adoption of improved rice production technologies. The model in its explicit model presented below:

β_0 = constant
β_i = Parameters to be estimated
X_i = independent variables that predict the outcome of Y the dependent variable
X_1 = Age (years)
X_2 = Sex (Male or Female)
X_3 = Education status (0 = informal, 1= primary, 2= secondary, and 3= Tertiary)
X_4 = Membership of Cooperative Organization (1= if member and 0 = if not member)
X_5 = Farming experience (years)
X_6 = Household size (number)
X_7 = Extension contact (1= if formal contact and 0 = if otherwise); and
e_i= error terms.
Y= (pooled index scale of respondent's decision on adoption practice was measured using score scale of 0= non adoption, 1= total adoption).

Adoption practice is the degree of use of number recommended innovations practice by farmers and was measured by using adoption index. This study adopted the procedure by Tiruneh *et al.* (2007). The procedure categorized adopters in low, medium and high practice of adoption depending on the score scale obtained between 0-1. The index scale was presented as follows: score of 0 implies non adoption, score of 1 implies total adoption. The score scale between 0.1-0.33 implies low adoption practice, the score scale between 0.34-0.66 implies medium adoption practice and the score scale between 0.67-1 implies high adoption practice. The low indices explain complete adoption of the package by the farmers that is 1-33% compliance with the technology. The medium indices explain complete adoption of the package by the farmers that is 34-66% compliance with the technology. The high indices explain complete adoption of the package by the farmers that is 67-100% compliance with the recommended practice.

RESULTS AND DISCUSSION

The results in Table 1 indicate that majority (98.0%) of the respondents were male. This show that there are more male farmers than their female counterparts in rice farming in the study area. Wakil (2018) found similar results in Oyo State Nigeria. Also, the results show that most (33.5%) of the rice farmers were within the age range of 41-50 years. This showed that majority of the farmers are capable of doing rigorous farm work, since they are in their active and productive age to engage in rice farming. The results agree with Gerald (2015) who reported that productive farmers are generally young. The result shows that majority (90.0%) of the respondents were married and this confirms the finding of Tiamiyu *et al.* (2009) that the married accounts for the majority of rice farmers. The findings also showed that majority (82.5%) of the respondents went through informal education. This implies that the formal literacy level was below average, and this high level of illiteracy may reduce adoption rate of improved rice production technologies disseminated through various flat forms.

Table 1: Socio-economic characteristics of rice farmers in Jere (n= 90)

Socio-economic characteristics	Frequency	Percent
Gender		
Male	196	98.0%
Female	04	2.0%
Age		
20 years	25	12.5%
21-30 years	30	15.0%
31-40 years	43	21.5%
41-50 years	67	33.5%
Above 50 years	35	17.5%
Marital status		
Married	180	90.0%
Single	20	10.0%
Educational Level		
Informal	165	82.5%
Primary	15	7.5%
Secondary	11	5.5%
Tertiary	9.0	4.5%
Household Size		
1-5 persons	53	26.5%
6-10 persons	112	56.0%
11 and Above	35	17.5%
Years of farming experience		
1-5 years	09	4.5%
6-10 years	16	8.0%
11-15 years	37	18.5%
16-20 years	52	26.0%
Above 20 years	86	43.0%
Cooperative membership		
Member	139	69.5%
Not member	61	30.5%
Extension contacts		
Informal	187	93.5%
Formal	13	6.5%

Table 1 also showed that 56.0% of the farmers had 6-10 household size. This implies that rice farmers have a fair household size that could supply the needed farm labour. Also, the results show that most (43.0%) of the respondents had 20 years and above farming experience. This implies that most of the respondents have been into rice farming for a long time. According to Oguegbuchlam *et al.* (2012) many years of farming experience will help farmers make sound decisions as regards resource allocation and management of their farms. In terms of cooperative membership, a majority (69.5%) were not members of cooperative in the study area. Also, the result indicates that nearly all (93.5) had extension contact (informal) which could be due to inadequate administration of extension organization to ensure formal wider coverage.

Table 2 indicates that majority (90.5%) of the respondents adopted fertilizer application with the adoption index of 0.91, majority (89.5%) adopted irrigation system with the adoption index of 0.90, majority (86.5%) adopted land preparation with the adoption index of 0.86, majority (80%) adopted improved seed variety with the adoption index of 0.80, majority (74%) adopted pesticides application with adoption index of 0.74, majority (73%) adopted herbicides application with the adoption index of 0.73. This means those with majority percentage of adopters are classified high adopters. This could be as a result of extension contact either through formal or informal means. About (49%) of the respondent adopted planting depth with the adoption index of 0.49 and were considered as medium adopters. Those respondents (30.5) who adopted use of milling machine with the adoption index of 0.31. This implies that the respondents who adopted use of milling machine were classified as low adopters. About (0.29) adopted water management with the adoption index of 0.29 who are classified as low adopters.

The findings indicates that six out of the nine recommended rice production technologies were classified under high adopters while one of the rice technologies were considered as medium adopters. The remaining two of the recommended technologies considered as low adopters. This implies that respondents' compliance was high in terms of technology transfer.

Table 2: Adoption practice of improved rice production technologies (n=200)

Technologies	Frequency	Percentage	Adoption index	Adoption Practice
Fertilizer application	181	90.5	0.91	High
Irrigation system	179	89.5	0.90	High
Tillage/land preparation	173	86.5	0.86	High
Improved seed variety	160	80.0	0.80	High
Pesticide application	148	74.0	0.74	High
Herbicide application	146	73.0	0.73	High
Planting depth/spacing	98	49.0	0.49	Medium
Use of milling machine	61	30.5	0.31	Low
Water management	58	29.0	0.29	Low
Total score scale			6.87	
Mean score value			0.53	

*Multiple responses exist

Table 3 presents the results of regression analysis which show that age, educational status, years of farming experience, cooperative membership and extension contact significantly influenced farmers' adoption of improved rice technologies. The age was

positively significant at (P<0.05). This implies that a unit increase in age of the farmers leads to 7% increase in adoption of rice production technologies. This means that the older the farmers become, the high they are likely to adopt improve rice technologies. Educational status was positively significant (t= 8.547, P<0.01). This implies that a unit increase in educational status of the farmers leads to 15% increase in adoption of improve rice technologies. This finding implies that the more educated the farmers, the more likely they are to adopt an innovation. This confirms the findings of Alhassan *et al.* (2017) who asserted that highly educated farmers tend to adopt new technology faster than those with less education. This deduce that education can play an important role in making adoption faster.

Farming experience was positively significant at 1% (t= 3.903, P≤0.01). This implies that a unit increase in farming experience leads to 8% increase in adoption of improve rice technologies. This implies that the more experience the farmer, the more rational they are in decision making that may affect their farming activities. This is in conformity with the findings of Ojehomon *et al.* (2012) who reported that the more experience the farmer, the more likely they are to adopt new innovations. Cooperative membership was positively significant at 1% (t= 4.347, P≤0.01). This implies that a unit increase in cooperative participation leads to 14% increase in adoption of improve rice technologies. This means the more farmers actively participate in cooperative activities, the more likely they are to adopt improve rice technologies. Extension contact (informal) was also found be positively significant at 1% (t=6.119, P≤0.01). This implies that a unit increase in extension contact leads to 13% increase in adoption of improve rice technology. This implies that informal extension contacts play a vital role in motivating and encouraging adoption of an improve rice technologies.

Table 3: Some selected Socio-economic factors influencing adoption practice of rice production technologies

Variables	Std. Error	Coefficient	t-value	P-value
Constant	-26.615	6.793	-3.918***	0.0001
Age	7.865	0.855	2.181**	0.0400
Education status	15.527	1.232	8.547***	0.0011
Farming experience	8.601	0.667	3.903**	0.0072
Cooperative membership	14.559	2.659	4.347***	0.0061
Extension contacts	13.321	2.832	6.119***	0.0041
R^2		0.609		

***P≤0.01 is Significant at 1%, ** P≤0.05 is Significant at 5%

CONCLUSION

It is concluded that there was very weak formal extension service. Because majority of the rice farmers had extension contact through informal means. It is also, deduced that there are no cooperative offices in the area where farmers can conveniently join. Based on the findings of the study, it is recommended that government should ensure effective administration of extension organization to provide formal wider coverage. Government and non-governmental organizations should foster cooperative registration membership and make cooperative branches available in the area. Government should provide an enabling environment for rice farmers to further their education.

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