

## **ANALYSIS OF ADOPTION OF NERICA 1 RICE TECHNOLOGIES AMONG FARMERS IN GOMBE STATE, NIGERIA**

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### **ABSTRACT**

The study examines level of adoption of NERICA 1 rice among farmers in Gombe State. Multi-stage sampling technique was used to determine the sample for the study. Primary data was collected through the use of structured questionnaire. Descriptive statistics such as percentage, minimum, maximum, means, standard deviation and adoption index was used to achieve objectives of this study. The mean age, years of schooling and farming experiences of respondents were 37.8 years, 11.9 years and 14.5 years respectively. Sex shows that 90.2% are males' farmers and 81.1% are membership of cooperative with average household size of 8 persons and farm size of 1.5 ha. The respondents access minimum of ₦10,000 credits and have maximum household income of ₦500,000 with a mean output of 2189.8 Kg/ha. It is concluded that majority of the respondents are male, literate, married with moderate household size and young. The level of adoption of NERICA 1 rice technologies in the study areas was found to be low hence it is recommended that Government at all levels, private sectors and NGOs should motivate youth to sustain

the cooperative spirit and create awareness to the farmers through seminars and workshop on the importance of women involvement in farming activities, also, private investors, NGOs and Governments should collaborates and supply farm inputs such as certified NERICA 1 seeds, fertilizer, pesticides, herbicides, planters, weeders and harvesters fabricated by research institutes to reduce drudgery which mostly deter farmers from full adoption of promoted technologies (NERICA 1 rice).

**Keywords:** Analysis, Adoption, NERICA, Rice and Technologies

## INTRODUCTION

Agriculture is the mainstay of Nigerian economy and has continued to play significant role in the national economy since then. Ukeji (2003) reported that in the 1960s agriculture contributed up to 64% to the total Growth Domestic Product (GDP) but gradually declined in the 1970s to 48%, this was as a result of oil surplus of the 1980s. Oji-Okoro (2011) stated that agricultural sector is the largest sector in the Nigerian economy with its dominant share to the GDP, employment of more than 70% of the active labour force and the generation of about 88% of non-oil foreign exchange earnings. Rice is also a major staple in Africa; this makes demand of the crop in the continent to go far beyond the production level. As an important crop in Africa; its consumption has sustainably increased over the years. Rice is the most rapidly growing food commodity in Africa (Saidu, 2017). As a result, it becomes highly strategic and priority commodity for food security in the continent and it's consumption is growing faster than that of any other agricultural commodity because of high population growth, rapid urbanization, and changes in

eating habits and it is the single most important crop for Africa as a whole (Seck; Famohe; Nakelse and Diagne, 2013). Presently in Nigeria rice is one of the fastest growing agricultural sub-sectors and has moved from ceremonial to a staple food in many Nigerian homes within the last two decades, such that some families cannot do without rice in a day (Oikehet *et al.*, 2008). It ranks fourth in output among cereals grown in Nigeria, representing 12.7% of total cereals output after maize, sorghum and millet (Food Fortification Initiative [FFI], 2016). Rice as a predominant staple crop in Nigeria produced in over 18 States of 36 States (Olushola, 2018); he further stated that, the production has increased at an annual average of 3.7% over the past decade, reaching 3.7 million tons in 2017.

Over 200,000 hectares (ha) are reported under NERICA cultivation in Sub-Sahara African countries and the leading countries are Guinea, Nigeria, Côte d'Ivoire and Uganda (Inoussa, 2007). The NERICA rice varieties are group of rice varieties resulting from inter-specific crosses between the *Oryza sativa* rice species from Asia and the locally adapted and multiple-stress resistant *Oryza glaberrima* African rice species. They are the outputs of the inter-specific hybridization breeding programme started in 1991 by the Africa Rice Center (WARDA). NERICA is an inter-specific hybrid between the local African rice (*Oryza glaberrima*) and the Asian rice (*Oryza sativa*) offers new opportunities for upland rice farmers. NERICAs have unique characteristics such as shorter duration (mature between 30 and 50 days earlier than traditional varieties), higher yield, and tolerance to major stresses, higher protein and good taste compared with the traditional rice varieties (Wopereiset *et al.*, 2008).

Diffusion is defined as the stage in which the innovation extends for use by people in a given community. "Interaction" connotes a sense of acceptance and perhaps transparency within the user environment (Ekong, 2010). There are a number of factors interacting to influence the diffusion of a new agricultural technology (innovation). The four major factors are the innovation itself, method of dissemination (how information about the innovation is communicated), time, and the nature of the social system into which the innovation is being introduced (Rogers, 1982). Adoption refers to "the stage in which a technology is selected for use by an individual or an organization" (Rajesh and Rajhans 2014).

As a staple food in the diet of most Nigerians, there is a high demand for rice which has cumulated in a large gap between the supply and demand for rice. In the last decade rice consumption has increased at an annual mean of 10.3% (Maji, Bashir, Odoaba, Gbagba and Audu, 2015). Similarly, the annual consumption per capita of 32kg of rice was the highest of any staple in Nigeria (Olusola, 2018) and is expected to rise due to growth in population and urbanization. Rice demand in Nigeria is high and meeting this demand is among the food security priorities (National Rice Development Strategy [NRDS], 2009). In 2017 the rice consumption was 6.4 Million Tons (MT) (United State Department of Agriculture [USDA], 2017) while domestic production was about 3.7 MT of milled rice (Bayo, 2018). Hence, there is a shortage of 2.7 MT. As a result, there has been a growing gap between the demand for rice and its supply arising from low productivity. The stronger the force of demand for rice in relation to supply the higher the frequent rise in the price of rice and therefore has great implication for the food security status and economic

development of the Nigerian economy. Monty Jones, a breeder of NERICA, argues that NERICA's yield is as high as 2.5 tons per ha under low inputs, and 5 tons or more with practical fertilizer use under research station conditions (Kijima and Sserunkuuma, 2009).

Adamu (2014), reported that Gombe State produce an average record of 3.5 tons/ha of paddy rice. The area under rice production in Gombe State increases from 57.060 ha to 60.019 ha from 2015 to 2017 (Gombe State Agricultural Development Project [GSADP], 2018). Despite the production of the NERICA 1 rice in Gombe State, the level of its adoption have not been documented hence, the need for this study to establish the level of adoption of NERICA 1 rice among farmers in Gombe State. The specific objectives of this study are: to describe the socioeconomic characteristics of farmers, examine the level of adoption of NERICA 1 rice among farmers.

## **MATERIALS AND METHODS**

### **Study Area**

Gombe State was created on 1<sup>st</sup> October, 1996 by the military Government headed by General Sani Abacha, the Commander-in-chief of Armed Forces of the Federation. It was formally under Bauchi State. The State has eleven local government councils with its administrative headquarters in Gombe. The State shares common boundary with Adamawa, Bauchi, Borno and Yobe State to the south, west, east and north respectively. It is located in the northern guinea savannah| agro-ecological zone of Nigeria (GSADP, 2018). The State lies on latitude 10<sup>o</sup>15' N and longitude 11<sup>o</sup> E (Omorogbe *et al.*, 2017). It has a total population of 2,365,040 out of which

1,244,228 are males and 1,120,812 were females (National Population Commission (NPC), 2010); this is projected to be 3,216,454 which constitute 1,692,232 males and 1,524,304 females at 3.0% growth rate in 2018. About 60% of the population in Gombe engages in agriculture and the State covers land mass of about 20, 266 square kilometre (Km<sup>2</sup>) (Gombe, 2017). The crops grown in the State are, cereals (Maize, Millet, Sorghum, Rice and Wheat), legumes (Cowpea, Groundnut, Soya beans and Bambara nut), Fruits (Mango, Guava, Pawpaw, Orange, Lemon and Grapes), vegetables (Tomatoes, Onion, Pepper, Okro, Pumpkin and Melon), Tree crops (Gum Arabic, Moringa) and livestock such as cattle, sheep, goats, poultry, rabbits, pigs and fishes (Gombe, 2017).

### **Sampling and Sampling Procedure**

Multi-stage sampling technique was used to determine the sample for the study. First stage, Balanga and Yamaltu-Deba LGAs were randomly selected. The Second stage involved a random selection of ten (10) rice producing communities from the two LGAs. Third stage is random selection of 164 NERICA 1 rice farmers from Balanga and Yamaltu-Deba. Primary data was collected through the use of structured questionnaire. Descriptive statistics such as percentage, minimum, maximum, means and standard deviation and adoption index was used to achieve objectives of this study.

## **RESULT AND DISCUSSION**

### **Socioeconomic characteristics of respondents**

Table 1 shows the socioeconomic characteristics of respondents. The mean age of respondents was 37.8 years with minimum of 18 and maximum of 65 years and standard deviation of 10.5. This result implies that farmers are in the

study areas are young, energetic and can actively perform well in Agricultural activities more especially in rice production. The findings of this study is similar to the study of Ahmed and Philip (2012), who stated in their study in Dadin-kowa community of Yamaltu-Deba Local Government of Gombe State, 90% of the farmers were under the ages of 60 years. The result of the sex respondents revealed that 90.2% are males' farmers. The implication of this result is that NERICA 1 production is male dominated. This result corroborate with the findings of Omorogbe *et al.* (2017) who reported that majority 98.3% of the sweet melon producers in Balanga local government area were males. The result shows an average of 11.9 years of schooling and standard deviation of 3.5 with minimum and maximum of 5 and 20 years respectively for the respondents hence, the finding indicates that majority of the respondents in the study areas are literate thus; they can read, write and interpret information regarding new technologies which help in making a wise decision with respect to adoption of improved variety (NERICA 1 rice). This concurs with Omorogbe *et al.* (2017), who reported that the literacy level among the sweet melon farmers in Balanga was relatively high. They further said that level of education in a particular community determines the level of exposure and sophistication in production as well as their perception of new innovations.

The average farming experiences was 14.5 years with minimum and maximum of 2 and 40 correspondingly and a standard deviation of 8.2. This result shows that the respondents have not spent many years in farming therefore; they have the ability to accept and adopt new technology (NERICA 1 rice) considering the brighter future expectation they have in rice

farming. This result differs with Abdulazeez *et al.* (2018), stated that the farming experience of the respondents had a mean of 8 years, minimum and maximum of 5 and 15 years respectively. The household size result revealed minimum of 1 and maximum of 25 with average of 8 persons and standard deviation of 5.8. This result implies that farmers in the study areas have available family labour which can greatly reduce their cost of production and this could be attributed to polygamous (extended family) nature of study areas which are mostly Muslims, in addition to the presence of single young men and women in the families. This result is dissimilar with Omorogbe *et al.* (2017), who reported that, the average households' size of the sweet melon farmers in Balanga was found to be 13 persons and this is most likely attributed to polygamous nature in Northern Nigeria.

The average farm size is 1.5 ha and standard deviation of 0.8 with minimum and maximum of 0.3 ha and 4 ha cultivated by the respondents. This result implies that majority of the respondents are smallholder farmers. The findings of this study disagree with Adenuga *et al.* (2016), who found that the average farm size for the adopters of improved rice varieties was 2.82 ha. The result of credit access revealed that respondents received minimum of ₦10, 000 and maximum of ₦150, 000 with standard deviation of 29915.1 and an average of ₦42, 868.4. This result indicates that majority of the respondents' access credit for their NERICA 1 rice production based on the farm size and nature of farming intended. This result is contrary to Adenuga *et al.* (2016), who revealed in his study that none of the non-adopters of improved rice varieties had access to credit while only 11% of the adopters had access to credit and more than 60% of



those that had access to credit obtained it from informal sources.

Household income revealed that NERICA 1 farmers have an average income of ₦189, 121.9 and minimum and maximum of ₦50, 000 and ₦500, 000 with standard deviation of ₦110607.7. This implies that NERICA 1 gives high revenue to farmers. The result shows that NERICA 1 rice farmers have an average output of 2189.8 Kg/ha with minimum and maximum of 160 Kg/ha and 8240 Kg/ha with a standard deviation of 1419.2 Kg/ha. This implies that NERICA 1 rice has high yield compare to local varieties. This result agrees with Kinkingnihoun-Medagbe *et al.* (2014), who reported that farmers obtained an additional yield of 678 kg per hectare by adopting NERICA rice varieties. Membership of cooperative societies result shows that most 81.1% of the respondents are members of cooperative. This result implies that most of the NERICA 1 respondents are members of cooperative; hence they have great chance of getting credit, inputs and useful information related to NERICA 1 rice. The finding of this study contract with Chekene and Chancellor (2015), who found that majority 65% of the respondents, was members of association and the bulk of fast adopters.

### **Level of Adoption of NERICA 1 Rice Technologies**

Level of adoption result presented in table 2 below shows that 11.6% and 10.9% of the respondents are high and medium adopters of NERICA 1 rice technologies in the study areas. Similarly, majority 77.4% of the NERICA 1 respondents are low adopters of the production technologies. This result implies that adoption of NERICA 1 rice technologies is low in the study areas; this could be attributed to high cost and

complexity of the technology coupled with smaller holder nature of the farmers which produce the crop mainly for family consumption. This finding corroborate with Bzugu *et al.* (2010), who reported that the level of adoption of NERICA 1 rice variety was low in Jalingo, which could be as a result of either low level of accessibility of the technology to farmers or as a result of economic factors which some farmers could not afford. Also confirms the result Wiredu *et al.* (2010), who reported that the rate of adoption of the NERICA varieties in Ghana was very low, less than 10%.

## **CONCLUSION**

Based on the findings of this study, it is concluded that Based on the findings of this study, it is concluded that majority of the respondents are male, literate, married with moderate household size, young, energetic and can actively perform well in Agricultural activities more especially in rice production with low rice farming experienced therefore; they have the ability to accept and adopt NERICA 1 rice. The level of adoption of NERICA 1 rice technologies in the study areas was found to be low.

## **RECOMMENDATION**

Based on the findings of this study, the following recommendations were made; Government at all levels (Federal, State and Local), private sectors and Non-Governmental Organizations (NGOs) should motivate youth to sustain the cooperative spirit and create awareness to the farmers through seminars and workshop on the importance of women participation in farming activities. It is also recommended that private investors, NGOs and Government at all levels should collaborates and invest in supplying farm

inputs such as certified NERICA 1 seeds, fertilizer, pesticides, herbicides, planters, weeders and harvesters fabricated by research institutes to reduce drudgery which mostly deter farmers from full adoption of promoted technologies (NERICA 1 rice).

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**Table 1: Socioeconomic characteristics of respondents**

Variable	NERICA 1 Rice Farmers			
	Min	Max	Mean	Std.d
Age	18	65	37.8	10.5
Education level	5	20	11.9	3.5
Household size	1	25	7.9	5.8
Farm size	0.3	4.0	1.50	0.8
Farming experience	2	40	14.5	8.2
Credit access	10000	150000	42868.4	29915.1
Household Income	50000	500000	189121.9	110607.7
Output	160	8240	2189.8	1419.2
Number of cooperatives	0	4	0.5	0.8

Source: Field survey, 2018

**Table 2: Level of adoption of NERICA 1 rice technologies**

Adoption Index	NERICA 1 Rice Farmers	
	Frequency	Percentage (%)
High (0.7-1)	19	11.6
Medium (0.4-0.6)	18	10.9
Low (0.1-0.3)	127	77.4
<b>Total</b>	<b>164</b>	<b>100</b>

Source: Field survey, 2018

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among Farmers in Gombe State, Nigeria

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