Available online: www.ncribjare.org
 ISSN: 2695-2122, e-ISSN: 2695-2114
 DOI: <https://doi.org/10.35849/BJARE202104005>
 Journal homepage: www.ncribjare.org

Research Article

Assessment of Food Security and Livelihood Status of Rural Households Adopting Improved Rice Varieties in Kwara and Niger States of Nigeria

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Abstract

The study assessed the food security and livelihood status of rural households adopting improved rice varieties in Kwara and Niger States of Nigeria. Sample sizes of three hundred and ninety four rice farmers were selected using multi-stage sampling method. Structured questionnaire complimented with interview were used for data collection. Data were analyzed using descriptive statistics, food security index, livelihood status index and Simpson index of diversity. The findings revealed 83.3% and 82.7% of rice farmers adopted FARO 44 and FARO 54 respectively. Also, 92.1% were food secured while 65.5% were of moderate livelihood status. The Simpson Diversification Index of rice farmers in the study area was 0.219, indicating low degree. Thus, it is recommended that rice farmers should diversify into other income generating activities in order to enhance their livelihood status and food security status. Also, research institutes should ensure farmers' access improved rice varieties with affordable prices and right time in order to enhance their livelihood and food security status.

Keywords: Food Security, Livelihood Status, Rural, Households, Improved Rice, Varieties, Farmers' adoption

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Introduction

Rice (*Oryza sativa*) is one of the most cultivated crops in the world. It is third most important cereal grown and consumed globally after wheat and maize (Agro Nigeria, 2018). In Nigeria, rice is cultivated in almost all ecological belt of the country as they all provide favourable environments to support the crop cultivation (Agro Nigeria, 2018). This has made rice a staple food crop in Nigeria as it is consumed by almost every tribe in different forms, example, tuwo rice, jellof, white rice, fried rice e.t.c. "Rice is life" was adopted to implement the International Year of Rice (IYR), declared by the United Nations, general Assembly during its 57th session ((WARDA, 2011). One the major objective of IYR was to focus attentions on the role that rice could play in providing the population with food security

and addressing poverty alleviation (Mohammed *et al.*, 2018). Rice is a staple food for many Africans and constitutes a major part of the diet for many others. During the past three decades, the demand for rice has been increasing steadily, playing a major role in the strategic food security planning policies of many countries in sub-Saharan Africa (WARDA, 2011).

Many improved rice varieties have been released in Nigeria by the National Cereal Research Institute (NCRI) Baddegi to improve cultivation suitable to different agro-climatic condition in the country. The released varieties are classified into four main groups; Early maturing varieties, these includes FARO 27 and FARO 44, Medium maturing varieties, these includes, FARO 29, FARO 35, FARO 37, FARO 50, FARO 51, FARO 52 and

FARO 57. While, late maturing varieties include FARO 7, FARO 8, FARO 12, FARO 14 and FARO 15 and deep water (floating) areas, FARO 7, FARO 14 and FARO 15 respectively (NCRI, 2009). FARO 44 is one of the rice varieties that have been widely distributed and highly adopted compared to other varieties (Tsado *et al.*, 2018). Evidently, food security and rural livelihood will not be thoroughly achieved without rapid agricultural growth (Usman *et al.*, 2019). However, assisting the rural poor farmers to enhance their livelihood and food security in a sustainable manner is therefore a great challenge. Household food security is a term used to be described as an access, at all times, to adequate food for an active and healthy life, which includes access to nutritionally safe foods and assured ability to acquire foods in socially satisfactory ways (FAO, 2011). The concept of food security is defined in terms of availability, accessibility, utilization and suitability over time (Fawole and Oladele, 2010). Another author views food security as the state of having reliable access to a sufficient affordable and nutritious diet at all time (FAO, 2011). Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2014). It entails ensuring sustainable access, availability and affordability of adequate quantity and quality food to all citizens to meet up with their physiological requirements (Okuneye, 2014). The main goal of food security is for individuals to be able to obtain adequate food needed at all times, and to be able to utilise the food to meet the body's needs. FAO (2010) refers to food insecurity as the consequences of inadequate consumption of nutritious food bearing in mind that the physiological use of food is within the domain of nutrition and health. Food insecurity may occur for rural households' populations because they do not produce adequate food and they do not have enough purchasing power to take care of their food needs. Singh and Hiremath (2010) posits that the concept of sustainable rural livelihoods has a wide generic meaning, encompassing the protection and assurance of the means of livelihood for people and society, and the current concerns and policy requirements pertaining to sustainable development. Amadi, and Anokwuru (2017)

proposed the concept of sustainable rural livelihood to include capability, equity, and sustainability. The term livelihood refers to a means of earning a living by an individual or household that is a combination of the individual or household's assets, including activities and resources and access to these, mediated by institutions and social relations. This is a typical situation among resource-poor farmers in Nigeria (Eme *et al.*, 2014; FAO, 2021). The production, provision and consumption of good nutritional food in households depicts food security, physical access of food relates to issue of food supply or food availability, economic access to food is concerned with capacity to acquire or purchase food while sustainability of access to food deals with food supply and demands issues determines the ability of a nation or household to enjoy stable sustained physical and economic access to food over time (Alade and Eniola, 2012). Adesina (2012) opined that Nigerian 50 percent food problems would be solved if farmers paid attention to the types of varieties utilized and adoption of developed rice varieties could ensure family food security and betterment of rural livelihood. In this respect, there is the need to assess the food security and livelihood status of farmers in the major rice producing areas of Nigeria, including Niger and Kwara States. In 2011, Nguetze *et al.* (2011) assessed the impact of improved rice technology (NERICA varieties) on income and poverty among rice farming households in Nigeria and observed that increased investment in rice varieties dissemination, with complementary measures, is a reasonable policy instrument to raise incomes and reduce poverty among rice farmers in Nigeria. The objectives of the present study were to; identify the improved rice varieties adopted in the study area, determine the food security status of adopters of improved rice varieties; examine the livelihood status of adopters of improved rice varieties and determine the income distribution of adopters of improved rice varieties.

Materials and Methods

Kwara State is one of the States where the research was undertaken. The State is located in the North Central Nigeria. The State lies between latitudes 8°-10°N and longitude 2°45'-6°4'E of the Greenwich meridian. It covers an estimated land area of about 36,825 square kilometers or 8% of

the total area of Nigeria. According to National Population Census (NPC) (2006), the state has a population of 2,591,555 peoples, spread across the sixteen Local Government Areas, which was projected to be 3,005,409 as at 2017 using an annual population growth rate of 2.5% (World Bank, 2013). The major Food crops produced in the state are mostly cereal crops namely rice, maize, sorghum, millet, cow pea, melon and they constitute the main staple food aside root and tuber crops (Ajadi *et al.*, 2011). Niger State is other State where this research was conducted. The State can be found in the Guinea Savannah ecological zone of Nigeria. In terms of land mass, it is the largest State in Nigeria. It covers a total land area of 74,224km² thus accounting for about eight percent of Nigeria's land area. About 85% of its land area is good for arable crop production. It is located within longitude 3° 30' and 7° 20' East & latitude 8° 20' and 11° 30' North, with a population of about 3,950,249 (NPC, 2006) and with a growth rate of 3.2%, the State an estimated population of 5,586,000 in 2017 (Niger State Geographical Information System, 2015). Some of the crops grown in the area are yam, cotton, Shea-butter, maize, sorghum millet, cowpea, soybean, beans, rice and groundnut. Some of the tree crops are Mango, citrus, coconut, cashew, banana, pawpaw. The inhabitants of the State also rear some livestock like goats, sheep, cattle and chicken among others. The Other non-agricultural activities engaged in by men include blacksmithing, leatherwork, mat and basket making, trading while women also engage in technical handicraft and trading. Multistage sampling technique was employed in this study to select the sample size. This involved four stages of selection. The first stage involved random selection of Kwara and Niger states from the North central Zone. The second stage involved random selection of six (6) Local Government Areas (LGAs) from Niger and two (2) LGAs from Kwara bringing the total to eight (8) LGAs. In the third stage, three (3) villages involved were randomly selected from each LGA in the selected State making a total of twenty-four (24) villages. The fourth stage involved the use of proportional sampling to select 10% of the respondents from the sampling frame. Primary data were used for this study. Data were collected by researchers assisted by trained enumerators using structured questionnaire and interview schedules.

Descriptive statistics which comprises percentages and frequency counts was use to identity the improved rice varieties adopted in the study area.

Food security Index

Food security index adopted from Iorlamen *et al.* (2014) was used to determine the food security status of adopters of improved rice varieties. The food security index is based on whether the rural households adopting improved rice varieties are food secure or insecure ($F_i \geq 1$ =food secure household and $F_i < 1$ =food insecure household).

Food security model:

$F_i =$

$$\frac{\text{per capita food expenditure of } i^{\text{th}} \text{ household}}{\frac{2}{3} \text{ mean per capita food expenditure of all household}}$$

Where:

F_i = food security index

Decision Rule:

When $F_i \geq 1$, it implies that i^{th} household is food secure, but when $F_i < 1$, it implies that the i^{th} household is food insecure

Livelihood status index

Livelihood index was used to determine the livelihood status of improved rice adopters adopted from (Mohammed *et al.*, 2020). The livelihood benefitted by each respondents (such as procurement of food item, expenditure from non-food item, household assets, procurement of farm inputs, expenditure on non-farm activities, expenditure on off-farm activities, livestock assets, livelihood expenditure, expenditure on cultural festival/ceremonies, settlement of hospital bills and sponsoring ward or pupils to school) were considered. The index is expressed as;

$$LSI = \frac{\text{Number of livelihood factors benefitted by } i^{\text{th}} \text{ respondent}}{\text{Total number of livelihood benefits}}$$

LSI = Livelihood Status Index

The researcher thereby categorized the livelihood status of respondents as follows:

≤ 0.25 =very low livelihood status

$0.26 - 0.49$ = low livelihood status

$0.50 - 0.75$ = high livelihood status

≥ 0.76 =very high livelihood status

Simpson index of diversity

The Simpsons Index of Diversity (SID) adopted from Afodu *et al.* (2020) was used in this study to estimate the degree of income diversification among rice farmers. The SID takes into consideration both the number of income sources as well how evenly the distributions of the income between the different sources. The SID ranges between Zero (0) and One (1). Thus, 0 denotes specialization and 1 the extremity of diversification. The more the SID value is closer to one, the more diversified the household is.

The SID general formula is given as:

$$SID = 1 - \sum_{i=1}^8 P_i^2$$

SID=Simpsons Index of Diversity, n=number of income sources, P_i =Proportion of income coming from the source i , the value of SID ranges from Zero (0) to One (1), however, if there is only one Source of Income, $P_i=1$, then $SID=0$.

$$SID = 1 - \sum_{i=1}^8 \left(\frac{Li}{thi} \right)^2 + \left(\frac{Osi}{thi} \right)^2 + \left(\frac{Wof}{thi} \right)^2 + \left(\frac{Hu}{thi} \right)^2 + \left(\frac{Cs}{thi} \right)^2 + \left(\frac{A}{thi} \right)^2 + \left(\frac{Cc}{thi} \right)^2 + \left(\frac{Fc}{thi} \right)^2$$

Where: Li =livestock, Osi = Other sources of income, Wof = Working for other farmers, Hu=Hunting, Cs=Civil servants, A=Artisan, Cc=Cash crops, Fc=Food crop.

Results and Discussions

Improved varieties adopted by the respondents

Table 2 shows that majority (87.7%) and (71.5%) of rice farmers in Niger and Kwara States respectively adopted FARO 44. This shows improved high proportion of FARO 44 adopters in Niger states. This may be connected to the fact that majority of farmers in Niger state produced rice. The pooled results showed that 83.3% of the rice farmers adopted FARO 44. This study revealed that FARO 44 is the major improved rice varieties adopted by the respondents in the study area. This might be owing to some favourable qualities exhibited by FARO 44 such as high yield, early maturity, high resistance to pest and diseases and market acceptability. This finding agrees with Tsado *et al.* (2018), who reported that majority of the rice farmers in Niger State adopted FARO 44. Also, 85.9% and 74.3% of rice farmers in Niger

and Kwara states respectively adopted FARO 54 while the pooled results showed that 82.7% of the respondents adopted FARO 54. This may not be unconnected with high yielding and early maturity experienced with FARO 54 (Tsado *et al.*, 2018). Further findings showed that 80.4% and 75.2% in Niger and Kwara States adopted FARO 57 while the pooled results showed that 78.9% adopted FARO 57. The least adopted improved rice varieties in the study area was FARO 62. This might be due to relatively new seeds varieties that the farmers shy away from or lack of familiarity, as farmers tend to find yet compatible with their existing practices or lack of awareness about it.

Food security

Table 3 showed that majority of rice farmers (96.3%) and (90.5%) in Kwara and Niger State respectively were food secured. This shows high food security among improved rice varieties adopters in both states. The pooled results showed that 92.1% of the rice farmers were food secured. This is an indication that majority of rice producers in the study were food secured and this is expected to improve their livelihood status and standard of living of rice farmers in the study area. Olawale *et al.* (2020) stated that majority of rice farmers in Kacha and BDA LGAs in Niger State of Nigeria were food secured as result of participation in Value Chain Developmental Programme (VCDP).

Livelihood status

Table 4 revealed the distribution of respondents according to livelihood status in the study areas. Table shows that 80.7% of rice farmers in Kwara State had low livelihood status while 84.7% of rice farmers in Niger had moderate livelihood status. The pooled result also showed that 65.5% of rice farmers in the study area had moderate livelihood status, implying adoption of improved rice varieties had little impacted rice farmers livelihood in the study area. This finding concurs with that of Mohammed *et al.* (2018) who reported that most of the farming populace in Niger and Kogi States, Nigeria had moderate livelihood on the utilization of forest resources. Ofodu *et al.* (2020) reported high livelihood status among rice producers in Ogun State of Nigeria.

Simpson diversification index

Table 5 revealed the results of Simpson

Diversification Index. The finding in Kwara State showed a SDI of 0.23 while that of Niger State was 0.218. The pooled results indicated SDI of 0.219. This implies that the stream of income of rice farmers as a result of diversification was found to be generally low and in some cases, some activities might yield low income leading to low degree of diversification. This low degree of SDI could also imply that rice farmers are less diversified in relation to the income generating activities they engaged in. Thus rice farmers tend to rely their source of income in few activities that are farm related. This finding is in consonance with Babatunde and Quaim (2009) who reported low income diversification among farming household in Nigeria.

Conclusion and Recommendations

It can be concluded that majority of the rice farmers adopted FARO 44 and FARO 54. Also, majority of the farming populace in the study area were food secure and also have moderate livelihood. The Simpson diversification index of rice farmers in the study area was 0.219. The Simpson diversification index of rice farmers was low, it is therefore recommended that rice farmers should diversify into other income generating activities in order to enhance their livelihood status and food security status. It is advice that research institutes should ensure farmers access improved rice varieties with affordable prices and right time in order to enhance their livelihood and food security status.

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Table 1: Sampling design for rural household adopting improved rice varieties in the selected LGAs in Niger and Kwara States

State	Zone	LGAs	Villages	Sample frame of rice farmers	Sampling size of farmers (10%)
Niger	A	Lavun	Manbe	202	20
			Masaga-Lati	151	15
			Kashi Koko	178	18
		Gbako	Essan	143	14
			Evungi	161	16
			Edozhigi	206	21
	B	Munya	Sarkin pawa	160	16
			Guni	174	17
			Zazzaga	159	16
		Rafi	Tegina	107	11
			Kwona	164	16
			Yakila	162	16
	C	Wushishi	Tunga kawo	150	15
			Wushishi	161	16
			Makunsidi	138	14
		Agwara	Rofia	127	13
			Zumu	163	16
			Swashi	150	15
	Sub-total	6	18	2856	285
Kwara	B	Edu	Putu	200	20
			Edogidukun	156	16
			Tsonga	173	17
		Patigi	Rogun	150	15
			Kusogi	222	22
			Kpada	193	19
	Sub-total	2	6	1094	109
	Total	8	24	3950	394

Source: Niger and Kwara State, Agricultural Developments Projects, (ADPs) 2018.

Table 2: Distribution of respondents according to improve varieties adopted

Variables*	Kwara State (n=109) Freq (%)	Niger State (n=285) Freq (%)	Pooled (n=394) Freq (%)
FARO 44	78 (71.5)	250 (87.7)	328 (83.3)
FARO 54	81 (74.3)	245 (85.9)	326 (82.7%)
FARO 57	82 (75.2)	229 (80.4)	311 (78.9%)
FARO 60	76 (69.7)	220 (77.1)	296 (75.1%)
FARO 62	68 (62.4)	214 (75.1)	282 (71.6)

Sources: Field survey, (2019)

Multiple responses

Table 3: Distribution of rice farmers according to food security

Food security	Kwara State (n=109) Freq (%)	Niger State (n=285) Freq (%)	Pooled (n=394) Freq (%)
Secure	105 (96.3)	258 (90.5)	363 (92.1)
Not secure	4 (3.7)	27 (9.4)	31 (7.9)

Sources: Field survey, (2019)

Table 4: Distribution of rice farmers according to livelihood status

Livelihood status	Livelihood class	Kwara State (n=109) Freq (%)	Niger State (n=285) Freq (%)	Pooled (n=394) Freq (%)
High	≥ 0.76	4 (3.7)	4 (1.4)	8 (2.0)
Moderate	0.50-0.75	16 (14.7)	242 (84.9)	258 (65.5)
Low	0.26-0.49	88 (80.7)	22 (7.7)	110 (27.9)
Very Low	≤ 25	1 (0.9)	17 (5.9)	18 (4.6)

Sources: Field survey, (2019) 0.50-0.75

Table 5: Simpson index of diversification

Variables	Kwara State (n=109)	Niger State (n=285)	Pooled (n=394)
n-1	7518992	23187692	30706692
n(n-1)	1.31E+13	1.1703E+14	2.07E+14
SID index	0.231568	0.217665	0.219943

Sources: Field survey, 2019