



Food Security Situations among Smallholder Farmers under Kogi Accelerated Rice Production Programme: A USDA Approach

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ABSTRACT

The study analysed food security status of smallholder farmers under Kogi accelerated rice production program: a USDA approach. Primary data collected through multistage sampling procedure were obtained from 216 irrigated rice farmers randomly selected using the card method. Descriptive statistics and United State Development Agency (USDA) approach were employed. The results showed the mean age of household heads was 42 years, average household size of 4, and mean farming experience of 8 years. The USDA method categorizes households using a constructed food security scale. The result also revealed that the marginal effect of 0.477 shows that one extra year of education increases the probability of being food secured by 47.7%. Household size and household's dependency ratio were found to be negative and statistically significant at $p < 0.1$ and $p < 0.05$ level of probability which signified an inverse relationship with household food security. Furthermore, an additional increase in the number of non-working member of household increases the food requirement of households thereby reducing the probability of food security. Income had positive influence on food security status and significant at $p < 0.10$ level. The most widely used coping strategies by the farmers under Kogi Accelerated Rice Production Programme in the state are purchased food on credit, restricted consumption of adults to allow more for children, reduced numbers of meal per day, sold household assets, begging and borrowing.

Keywords: Extension, participation, rice, USDA Approach

INTRODUCTION

It is a widely accepted fact that food is a basic necessity of life. Its vital role at the household level is obvious since it is a basic means of livelihood. Adequate intake of quality food is a key requirement for healthy and productive life (Abdulrahman *et al.*, 2017). Rice has become a highly strategic and priority commodity for food security in Africa. Consumption is growing faster than that of any other major staple on the continent because of high population growth, rapid urbanization and changes in eating habits (Seck *et al.*, 2013). It is the single most important source of dietary energy in West Africa and the third most important for Africa as a whole. Although local rice production increased rapidly after the 2007-2008 food crisis, a key problem facing the rice sector in Africa is that local production has never caught up with demand.

In spite of the various poverty - reduction interventions in Nigeria (by the government) which has been initiated and targeted at the agricultural sector with the aim of increasing the productivity and attaining self-sufficiency in food production, rice production in Nigeria has still not been sufficient to meet consumption demand; a situation that has resulted in massive importation with serious consequences on the foreign reserves (Oladimeji and Abdulsalam, 2013; Oladimeji, 2017). In its quest of boosting the agricultural sector and ensure food security, the Nigerian government started an Agricultural Transformation Agenda (ATA) in 2011 with rice as one of the five priority commodity value chains. The objective was to close the prevailing gap between demand-supply for rice in Nigeria, make Nigeria self-sufficient in rice and the development of a vibrant rice value chain that will attract

investments in local rice production in Nigeria by the year 2015. Hence, the government made plans to put more land under irrigation for rice production and rehabilitate dilapidated irrigation schemes under the ATA.

The Kogi Accelerated Rice Production Programme (KARPP) is an initiative of the Kogi State Government with its objectives tailored in line with the Agricultural Transformation Agenda of the Federal Government. The Rice Development Programme which started in December 2011 aims to make the State self-sufficient in rice production with particular emphasis on irrigated rice production and create wealth for farmers through opportunities in rice processing and export. Food (crop) production increase have not kept pace with population growth, resulting in rising food imports and declining levels of national food self-sufficiency (FMARD, 2008). The main factors undermining production include reliance on rain fed agriculture, smallholder land holding, and low productivity due to poor planting material, low fertilizer application, and a weak agricultural extension system amongst others (FAO, 2016). With the recognition by the Nigerian Government of the multi-dimensional nature of poverty, a number of coordinated programmes and policies had been formulated to combat poverty among the rural poor in developing countries including Nigeria (Oladimeji *et al.*, 2015). An example of such programme is the Accelerated Rice Production Programme an initiative of the Kogi State Government with objectives tailored in line with the (ATA) of the Federal Government which is an integrated and rural development Project designed to contribute to the Country's food security efforts, increase access to rural infrastructure facilities in the Project areas using participatory community demand driven approach.

Poverty alleviation, food self-sufficiency and food security have been the priority objectives since independence not only in Nigeria but also in other sub-Saharan African countries. However, these objectives have not been fully achieved due to a number of factors such as political and economic instability, inadequate infrastructural facilities, and inadequate credit facilities at both household and national levels, over population, unfavorable micro and macroeconomic policies, inadequate agricultural inputs, poor agricultural technologies, inappropriate agricultural knowledge, rural-urban migration and lack of employment opportunities (Kidane *et al.*, 2005) Despite good agricultural policies and strategies, the population of food insecure households in Nigeria continues to increase from 18% in 1986 (Babatunde *et al.*, 2007) to 40% in 2005 (Enete *et al.*, 2010). Therefore, the study aims to assess the food security status of KARPP farmers as well as coping strategies.

METHODOLOGY

Study Area

Kogi state has an area of 29,581.9 square kilometers with a population of 4.37 million in 2015 (Kogi Statement Government, 2007; NBS, 2006). The State has an average maximum temperature of 33.2°C and average minimum of 22.8°C. The State has two distinct seasons – dry season, which lasts from November to February and the raining season that lasts from March to October. Annual rainfall ranges from 1016mm- 1524 mm.

The State is drained by the two major rivers in Nigeria (Benue and Niger) as well as other rivers, streams and lakes/pond and holds great potential for irrigation. The alluvial soil deposited along the banks of these Rivers provides great opportunity for the cultivation of rice and other crops. In terms of rice production, reports by Horna *et al.* (2005) indicated that Kogi State produced at least 5% of the total rice production in Nigeria. According to Kogi State Ministry of Agriculture, the main rice producing areas in Kogi State are Ibaji, Idah, Lokoja and Bassa. As part of the drive to boost rice production, the State has established rice farms in Koto, Okumi, Galele and Sarkin Noma Irrigation Project sites. The State government has earmarked 6,750 hectares of land for cultivation out of which 3,000 hectares has already been cleared (by the year 2013), and 80 per cent of it had been cultivated as part of rice revolution in the State .

Sampling Procedure

This study employed a multi-stage sampling procedure in the selection of respondents for data collection. In the first stage, the two zones (Zone B & C) out of the four (4) zones in Kogi State were randomly selected through the use of card method. In the second stage, Bassa and Lokoja Local Government Areas (LGAs) was purposively selected each from Zone B and Zone C respectively based on the volume of rice cultivation and where irrigated rice production is currently taking place under the KARPP. The third stage involved listing of all the villages /communities in each of these two LGAs mentioned above based on the intensity of irrigated rice production. On the basis of volume of irrigated rice production, Koriko 1 and Koriko 2 were selected from Bassa LGA and Kabawa, Sarkin Noma, Okumi 1 and Okumi 2 were selected from Lokoja LGA. In all, a total of six communities/villages were purposively selected from the two LGAs. Information obtained from the State ADP revealed that there were 287 registered farmers' cooperative groups, each comprising of 10 farmers as participants in the KARPP.

In the fourth stage, all the farmers’ cooperative groups in the villages/communities selected were listed. From each of the communities/villages, 40 percent of the farmers’ cooperative groups were selected randomly using ballot techniques thus giving a total of 48 farmers’ cooperative groups. The last stage involves using a Slovia formula for calculating sample size based on the assumption of 5% expected margins of error, 95% confidence interval and applying the finite population correction factor. The formula was expressed as follows:

$$n_0 = \frac{N}{1+N(e^2)} \quad (1)$$

Where: n_0 is the sample size without considering the finite population correction factor; $e = 0.05$; $N =$ total number of observation. Therefore, a total of 216 irrigated rice farmers were randomly selected using the card method and interviewed as participants in the KARPP.

Analytical Technique

This study adopts the United State Development Agency (USDA) approach for the analysis of farm household food security in the study area. The USDA method categorizes households using a constructed food security scale. This scale is a number continuum in a linear scale that ranges between 0 and 10. The scale measures the degree of food insecurity/hunger experienced by a household in terms of a single numerical value. The procedure that determines a household scale fundamentally depends on the household responses to some structured survey questions (These questions are presented in Table 1). For instance, a household with a scale value of 6, has responded affirmatively to more questions that are indicators of food insecurity than for a household with a scale value of 3. A household that has not experienced any of the conditions of food insecurity covered by the core questions will be assigned a scale value of 0, while a household that has experienced all of them will be scored scale values close to 10. In general, the set of questions works symmetrically together to provide a measurement tool for identifying, with considerable sensitivity, the level of food insecurity/hunger experienced in a household.

Food Security Scale:

Each household’s location on the food security continuum is assessed by their response to series of questions about behaviors and experiences known to characterize households having difficulty meeting their food needs. To do this, it is first necessary to code their response to each of questions 1-16 in Table 2 as either affirmative or negative. Questions 1-16 in Table 1 have three response categories often true, sometimes true and never true. For these questions both often true and sometimes true are considered as affirmative responses because they indicate that the condition occurred at some time during the year of the study. The distinction between the often true and sometimes true is therefore not used in the scale. In determining the household food security status on the food security scale, the food security scale is first simplified into a small set of categories as in Fig. 1. Four categories can be defined for this purpose:

Food secure households: These are households that show zero or minimal evidence of food insecurity. The group’s value ranges between 0- 2.32 on the food security scale.

Food insecure without hunger households: These groups show concern about the adequacy of the household food supply. They therefore show adjustments in their daily food management. This group’s value ranges from 2.33-4.56 on the food security scale

Food insecure with hunger (moderate) households: These groups of households have their food intake reduced such that the household adults have repeatedly experienced the physical sensation of hunger. The group’s value ranges from 4.57-6.53 on the scale.

Food insecure with hunger (severe) household: Households in this group have their children’s food intake reduced to an extent that the children have experienced hunger. The group’s value on the food security scale ranges between 6.54 and 10.0.

Table: Household food security status, USDA Approach, 2000

	0-2.32	2.33-4.56	4.57-6.53	6.54-10.0
Food security	Food insecurity			
	Food insecure without hunger		food insecure with hunger	
			“moderate”	“severe”

RESULT AND DISCUSSION

Socio-Economic Characteristics of Respondents

The results in Table 2 depict socio-economic characteristics of participating rice farmers in KARPP programme. The mean age of household heads was 42 years with a minimum and maximum of 20 and 58 years respectively. This shows that farmers are active, and could stand the demands for rice production. The coefficient of variation (CV) was 19.1% which implies low level of variation in age among the farmers in the study area. This implies that irrigated rice farming in the study area was predominantly by the middle-aged farmers. According to Abdulrahman (2015), the low coefficient of variation within the permissible upper fiducial limit (33%) of coefficient of variation is a reflection of reliability (precision) of the result. The finding is in line with Oladimeji and Abdulsalam (2013) that found the mean age of rice farmers in Kwara State to be 42 years and opined that age of farmers significantly influence the decision making process of farmers with respect to production-related decisions.

The result also revealed that large proportion (72.2%) of the farmers in KARPP irrigated programme had average household size of 4 with minimum and maximum household size of 1 and 7 respectively. The estimated coefficient of variation was 29.7% which implies that there was low level of variation in the household size among participated farmers in the study area. In a study of irrigated vegetable farming in Kwara State by Oladimeji and Abdulsalam, (2014), the average family size of farmers' household head was found to be 7. Size of the household may enhance labour availability that can be used for different agricultural activities (Oyewole, 2012). The significance of household size in agriculture hinges on the fact that the availability of labour for farm production, the total area cultivated to different crop enterprises, the amount of farm produce retained for domestic consumption, and the marketable surplus are all determined by the size of the farm household.

Table 2: Socio-economic characteristics of rural farming household heads

Variables	Mean	Minimum	Maximum	Std. dev.	Covariance
Age (Years)	42	20	58	8.4	19.1
Household size (number)	4	1	7	1.4	29.7
Farming experience (years)	8	5	15	2.5	32.6
Level of Education (years)	10.25	0	18	6.7	
Distance covered to farm (Km)	2.5	0.3	6	3.5	
Extension contact	2.5	1	7	1.3	

The farming experience of the respondents presented in Table 2 had a mean of 8 years, minimum and maximum of 5 and 15 years respectively. The coefficient of variation (CV) for participated farmers was 32.6 percent, which implies that there is low level of variation in the farming experience among participants. Experienced farmers have the ability to use modern farming techniques and the agricultural environment as to when to plant and to market their produce. This finding is similar with Oladimeji and Abdulsalam (2014), who found average farming experience of irrigated vegetable farming household heads to be 15 years.

The distance covered to the farm as well as proximity to source of water may affect farmers' choice of participation in irrigated rice production, cost of transportation and efficiency. Results indicated that the mean distance covered to farm across the participants is 2.5 km with minimum and maximum of 0.3 and 6.0 Km respectively. This implies that farmers who live very close to the source of water are more likely to participate in irrigated rice farming than their counterparts who live far off. The study is at variance with findings of Oladimeji et al. (2016) who estimated that rural farmers in North Central Nigeria travelled average of 1.8 km to obtain fuels from their farms. The extension agents serve as a link between the research institutes and farmers. The study revealed that the Kogi accelerated rice production programme participants (100%) had access to extension services while about 17.6% of the non-participants reported they had access to extension services. In many rural settings, access to adequate knowledge, improved technology, financial services and other relevant social services (e.g. drinking water, education and health services) remain a critical issue. There are still significant challenges in providing extension and advisory services (EAS) in these areas. These range from insufficient funds for supporting public extension, poor resourcing, high extension to farmer ratio, limited involvement of rural farmers and populations in extension processes to the lack of appropriate strategies for effective research and adequate extension methods (IFPRI, 2010). The Kogi accelerated rice production programme used the extension agents from the KADP to facilitate it activities to improve the productivity of the participating farmers.

Food Security Status of Participants' Farmers in KARPP

The methodology adopted in estimating food security status of KARPP participant was based on the core food security module of United State Development Agency (USDA, 2000) which is composed of a set of 16 questions with negative answer referring to better food security status while an affirmative answer refers to worse food security status. Thus any negative influence on the food security level would imply an increase in food security

level while a positive influence will mean decrease in food security level. The food security level was scaled. This scale is a number continuum in a linear scale that ranges between 0 and 10. The scale measures the degree of food insecurity/hunger experienced by a household in terms of a single numerical value. The result revealed that more than two-third (65%) participants were food secure while one-third (35%) are food insecure at different level of food insecurity (figure 2). There were more respondents with food insecurity without hunger than the farmers with food insecurity with moderate hunger and food insecurity with severe hunger. As a whole majority of the respondents were food secured. This result is in line with Abdulrahman *et al.* (2017) which indicated that 51% of farmers were food secured, while 49% of the farmers are food insecure

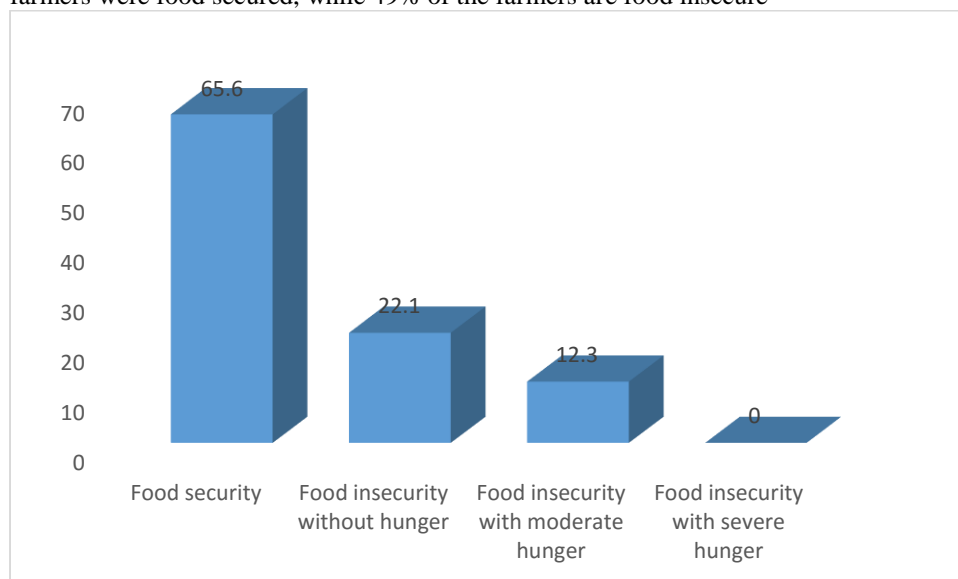


Fig. 2: food security status of the farmers

Determinants of Food Security Status of Rural Farm Households

The Logit model was used in estimating factors that influence food security status of Kogi accelerated rice production programme participant. The likelihood ratio test was -162.555 with 8 degree of freedom was significant at ($p \leq 0.01$). This implies that all the variables included in the Logit model jointly influenced Kogi accelerated rice production programme participants’ food security. The marginal effects from the model, which measure the expected change in probability of a particular choice being made with respect to a unit change in an independent variable, were reported in Table 3.

Table 3: Logistic estimate of determinants of food security Status of rural farm households

Variable	Coefficient	Standard error	T-value	Marginal effect
Constant	-14.981	11.370	-1.119	
Age	-1.867	1.611	-1.611	0.071
Education	0.121	0.059	1.749*	0.477
Credit	0.650	0.372	1.485	0.690
Gender	0.416	0.555	0.636	0.083
Household size	-0.825	0.358	-1.960*	0.548
Dependency ratio	-0.466	0.182	-2.176**	0.026
Marital status	0.218	0.455	0.407	0.018
Income	0.412	0.209	1.676*	0.050
Numbers of observation		216		
Log likelihood ratio test		-162.555		
F-distribution		0.397		
McFadden R-square		0.537		

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.10$

The coefficient of education had a direct relationship with level of food security and statistically significant at $p < 0.01$ level, thus suggesting that the higher the educational level of the household, the more they are food

secured. This is as expected, since the level of education should positively affect the level of efficiency in managing the household's food resources. This result implies that households who have household heads with relatively better education are more likely to be food secure than those headed by uneducated household heads. The marginal effect of 0.477 shows that one extra year of education increases the probability of being food secured by 47.7%. This result is in line with Abdulrahman *et al.* (2016) who opined that educational improvement could lead to awareness of the possible advantages of modernizing agriculture and improve the quality of labor. Household size and household's dependency ratio were found to be negative and statistically significant at $p < 0.1$ and $p < 0.05$ level of probability which signified an inverse relationship with household food security. This result is expected because increase in the household size implies that more people are eating from the same resources, hence, the household members may have less food to go round when compared with a smaller household size. Furthermore, an additional increase in the number of non-working member of household increases the food requirement of households thereby reducing the probability of food security. Income had positive influence on food security status and significant at $p < 0.10$ level. This indicates the higher the income of the farmers, the greater the probability of being food secure. This could be expected because increase in income, all things being equal, means increase access to food. This result is consistent with Babatunde *et al.* (2007) who revealed positive and significant relationship between household income and food security.

Coping Strategies Adopted by Rural Farm Households

The food insecurity coping strategies adopted by farming households to mitigate effects of food insecurity were presented in figure 3. Based on the result, the most widely used strategies by the farmers under KARPP are purchased food on credit, restricted consumption of adults to allow more for children, reduced the numbers of meal per day, sold household assets i.e. land, begged and borrowing. This implies when households are faced with food shortage, the immediate strategy they adopt is to go for credit or loan. The finding is at variance Orewa and Iyangbe (2010), Demi and Kuwormu (2013) and John *et al.* (2013) who revealed that eating less preferred food, limiting size of food consume (rationing) and skipping meal within a day were the most preferred strategies households adopted to minimize the impact of food insecurity.

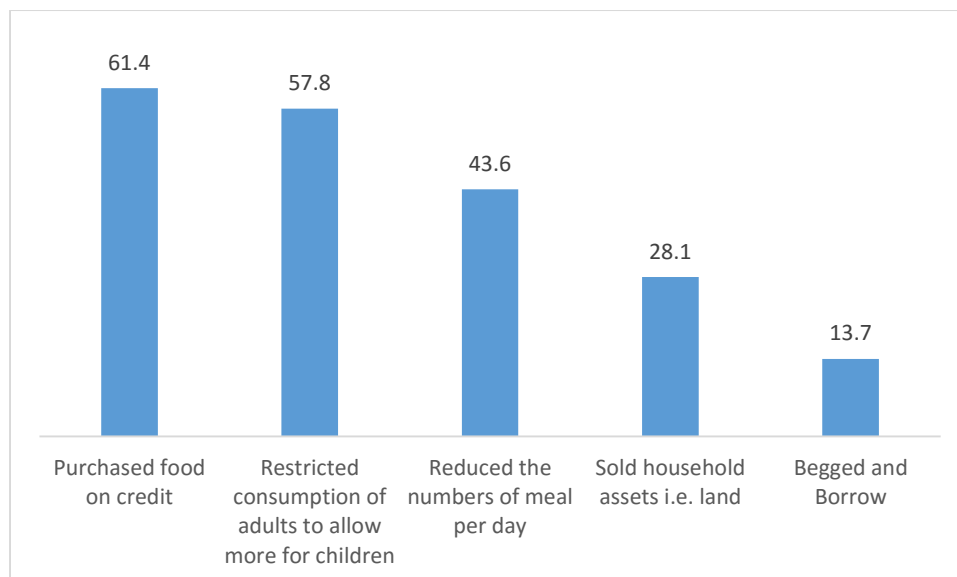


Fig. 2. Distribution of household according to coping strategies adopted

As the food insecurity continues other strategies which were more severe are used such as restrict consumption of adults to allow more for children, reduced the numbers of meal per day and usually the parents forgo their food to enable children have enough. It might be argued that food intake and expenditures cannot be reduced, because households are already at subsistence level, and further reductions in consumption will present potentially severe consequences for lives. This finding is in line with Idrissa *et al.*, (2008) who revealed allowing children to eat first, buying of food on credit and eating once a day as preferred strategies among the farming households to cope with food insecurity. Furthermore, the result also revealed that 28.1% of the farmers employed sales of asset to reduce the effect of food insecurity. However, the least strategy used were begging and borrowing food and money to cushion the effect of food insecurity. This strategy was seen by households as loss of pride and dignity in the community. This finding conforms to John *et al.* (2013).

CONCLUSION AND RECOMMENDATIONS

This study examined the determinants of food security status of irrigated rice farmers under the Kogi accelerated rice production programme and the coping strategies adopted against food insecure. The results revealed that education, household size, dependency ratio and income were statistically significant variables determining food security status of KARPP irrigated rice farmers. The most widely used coping strategies by the farmers under KARPP are purchased food on credit, restricted consumption of adults to allow more for children, reduced the numbers of meal per day, sold household assets, begging and borrowing.

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APPENDIX

Table 1: USDA template questions lists on food security status

Questions	Often true	Sometime true	Never true
Do you worry if your food stock will run out before you get another to eat?			
Do you have enough resource to acquire enough food?			
Could you afford to eat balanced meals?			
Do you supplement your children's feed with low cost foods?			
Can you afford to feed your children balance meals?			
Were your children not eating enough because you couldn't afford enough food?			
Do adults in your household skip meals or cut the size of their usual meals?			
Do you eat less than you feel you should?			
Were you ever hungry but didn't eat?			
Did you loose weight because there wasn't enough food to eat?			
Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?			
How often did this happen?			
Did you ever cut the size of any of your children's meal because there wasn't enough money for food?			
Did any of the children ever skip meals because there wasn't enough food to eat?			
Did any of the children ever not eat for a whole day?			
Were the children ever hungry but you just couldn't afford more food?			

All questions (1-16) covered the last 12 months' period. May 2016- April, 2017;
Source: Adapted from USDA