Determining Nutritional Status of the Rice Farmers Participating in IFAD-VCD Programme in Niger State of Nigeria

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Abstract

Most of the research on the impact of agricultural programmes on food security of farming households in Nigeria has been centered on the expenditure without having a critical investigation of the diet composition of the farmers. It is in this context that this research was conceptualized to study the nutritional status of the rice farmers participating in IFAD-VCD programme in Niger State of Nigeria. A representative sample size of 111 active participating farmers was selected and data was collected from the chosen farmers through a structured questionnaire, complemented with an interview schedule. The collected data were analyzed using both descriptive and inferential statistics. The results showed that the programme had an impact on the nutritional status of the participants, as their calorie intake per-head/day, after participating in the programme exceeded the recommended benchmark of 2250kcal/head/day for sub-Saharan Africa by 60.82 per cent. However, the recommended calorie consumption of the farmers was observed to be affected due to large household size, high dependency ratio, fear of default and delinquency owing to credit, non-effective extension service delivery owing to poor motivation of change agent and fear of managerial inefficiency in resource allocation owing to farming experience. Therefore, the study recommends that both public and private organizations with an agricultural mandate should make provision of consumption credit so as to enhance availability, utilization and stability of farm family food security in the studied area.

Keywords: Balanced diet, Calorie, Rice farmers, IFAD-VCD, Niger State, Nigeria

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Introduction

The continent of Africa with 52 countries is one with incredible opportunities in the face of many challenges. Johns (2002) reported that the continent is distinct owing to its diverse land topography, various agro-ecological climates and food diversity of over 150 food crops, of which 115 are indigenous. The population at an estimated 800 million and with the youngest population bulge, has quadrupled in the last 50 years with a low life expectancy of below 50 years of age in many countries and unacceptable rates of maternal and child mortality. Furthermore, income disparity in the continent has been on the increase in the last decades which directly affected those who are food insecure and hungry.

According to Behrman et al. (2001), sub-Saharan Africa is known to be the home to some of the most nutritionally insecure people in the world, owing to poor infrastructure and limited resources, compounded with conflict, HIV and poor access to health services, thus contributing to the staggering levels of malnutrition and food insecurity in the continent. Despite these enormous challenges, some countries in Africa are making progress towards food and nutrition security, and there has never been a better time to work towards improved human development that has nutrition as a goal (Watson and Andersen, 2010).

For many years, food security was simply equated with enhancing the availability of food, and was linked to innovations in agricultural production. While food availability is clearly important to achieving food security, having the means to effectively access and utilize quality food remains central to good nutrition (Negin et al., 2009). The issue of access to high quality nutritious foods has become a major challenge for many individuals living in Africa. Most diets, in the sub-Saharan Africa consist mainly of cereals or root staple crops, and very little of animal source proteins, micronutrient rich vegetables and fruits, and quality diversity of the food basket. These foods are either not accessible because of high cost, are locally unavailable, unequally distributed within households or are not considered household priorities when incomes are not sufficient to meet the needs of a high quality diet (Chastre et al., 2007).

Most of the empirical research conducted on the impact and effects of agricultural programmes in the study area in particular and the country in general with a focus on rural

households' food security, dwell on the expenditure in determining the wellbeing of farmers without looking inward on their nutritional status, which have significant effect on the quality of their lives. Therefore, it becomes imperative to look critically into the food and nutrition of the farm family in order to have a healthy farming population, which is a precursor for productive agriculture as "good health is wealth".

Poor nutrition arises from multi-faceted and interrelated circumstances and determinants. An individual's nutritional status can be affected by circumstances within the household and the community as well. The other intermediate causes include household food insecurity through agricultural production and income, inadequate care for children and women, unhealthy household environment and lack of accessible health and education services. The immediate causes e.g. inadequate dietary intake, water and sanitation and related diseases, lack of necessary knowledge, directly affects an individual, with disease perpetuating nutrient loss and poor nutritional status. Even without the disease burden, children with inadequate nutrient intake will not grow sufficiently and are at risk of irreversible stunting (Golden, 2009; Victora et al. 2008). To meaningfully incorporate the nutrition elements into the concept of food security, it is quintessential to ensure "adequate protein, energy, vitamins and minerals for all household members at all times".

Research Methodology

Niger State is located at latitudes 8°20'N and 11°30'N of the equator and longitudes 3°30'E and 7°20'E of the GMT. The agro-ecological zone of the State is northern guinea savannah with a fringe of southern guinea savannah in Mokwa LGA. The major occupation of the inhabitants is farming and it is complemented with civil service jobs, artisanal, craftwork, Ayurveda medicines and petty trade. By using a structured questionnaire complemented with an interview schedule, field survey data of 2018 cropping season was elicited from a total of 111 rice farmers sampled through multi-stage sampling design. In the State, only five (5) Local Government Areas were chosen as the pilot phase for the programme with Agricultural Zone A (Bida) and C (Kontagora) having two LGAs each namely Bida and Katcha; and, Wushishi and Kontagora respectively, while Zone B has one participating LGA viz. Shiroro.

In the first stage, for Agricultural Zone A, one LGA viz. Katcha LGA was randomly selected; for Zone B the only participating LGA i.e Shiroro LGA was automatically selected;

while for Zone C, Wushishi LGA was purposively selected based on its comparative advantage, as rice is produced throughout the year owing to the presence of Tungan-Kawo irrigation dam. In the second stage, two villages were randomly selected from each of the participating LGAs. Thereafter, two active co-operative associations from each of the selected villages were randomly selected. It is worth to note that Microsoft excel in-built random sampling mechanism was used for the random selection of the villages and the co-operative associations. In the last stage, using the sampling frame obtained from the IFAD/VCD office (Table 1), Cochran's formula was used to determine the representative sample size. Thus, a total of 111 active rice farmers formed the sample size for the study. The collected data were analyzed using descriptive statistics, t-test and Tobit regression model. The Cochran's formula used is shown below:

$$n_a = \frac{n_r}{1 + \frac{(n_r - 1)}{N}} \quad \text{..... (1)}$$

$$n_r = \frac{(1.96)^2 \, pq}{e^2} \quad \text{..... (2)}$$

Where:

n_a = adjusted sample size for finite population

n_r = sample size for infinite population

N = population size

p = proportion of the population having a particular characteristic

q = 1 - p

e^2 = error gap (0.07)

Thus, p = 0.40 and q = 1 - 0.40 = 0.60

Table 1. Sampling Frame of Participating Farmers

LGAs	Villages	Co-operative Associations	SF	SS
Katcha	Baddegi	Managi Badeggi Farmers CMPS	24	10
		Aminci Ebanti Twaki CMPS Ltd	25	10
	Edostu	Edotsu Co-Operative Credit & Marketing CMPS	25	10
		Edotsu Jinjin WugakunYema CMPS	25	10
Shiroro	Baha	Baha Abmajezhin Cooperative Multi-Purpose Society Ltd	15	7
		Abwanubo Najeyi Development Association	18	8
	Paigado	Paigado Achajebwa Development Farmers Soc.	25	10
		Paigado Farmers Cooperative Society Ltd	25	10
Wushishi	Bankogi	Bankogi Alheri Farmers Coop. Multipurpose Soc Ltd	22	9
		Bankogi GwariNasara CMPS	16	7
	Kanko	Kanko Arewa Farmers	25	10
		Kanko Unguwar Ndakogi Cooperative Multipurpose Society Ltd	25	10
Total			270	111

Source: IFAD-VCDP farmers' database, 2018
Note: SF and SS mean sampling frame and sample size respectively.

Food Consumption Score (FCS)

In order to measure food security, the food consumption score (FCS) developed by WFP, (2009) and adopted by Rahman and Noman (2019) was used (Table 2).

Table 2. Food Groups and their Weights

Food Items	Definitive	Weight
Maize, maize porridge, rice, sorghum, millet pasta, bread and other cereals; Cassava, potatoes and sweet potatoes, other tubers and plantains.	Main staple	2
Beans, Peas, groundnuts and cashew nuts	Pulse	3
Vegetables, relish and leaves	Vegetables	1

Fruits	Fruit	1
Beef, goat, poultry, pork, eggs and fish	Meat & Fish	4
Milk yogurt and other dairy	Milk	4
Sugar and sugar products	Sugar	0.5
Oils, fats and butter	Oil	0.5
Spices, salt, fish powder, small amounts of milk for tea	Condiments	0

Source: WFP, 2009; Rahman and Noman (2019)

Specific FCS Threshold

* Poor consumption(≤ 28)
* Borderline consumption(≤ 42)
* Acceptable consumption(>42)

However, Rahman and Noman (2019) decomposed the Acceptable household threshold intoacceptable low (≤ 52) and acceptable high (> 52)

Model Specification

Tobit regression model

The Tobit model assumes:

$$Y_i^* = \alpha + X\beta + \varepsilon_i \quad \text{..... (3)}$$

$$Y_i^* = \alpha + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + X_5\beta_5 + ... + X_n\beta_n + \varepsilon_i \quad \text{..... (4)}$$

Where:

Y_i* = calorie intake of i^{th} household; X_1= Yield (kg); X_2= Marital status (married =1, otherwise = 0); X_3= Education (years); X_4= Sickness of household member (yes =1, otherwise =0); X_5= Extension visit (number); X_6= Access to credit (yes = 1, otherwise =

0); X_7= Seed variety (improved = 1, local =0); X_8= Gender (male =1, otherwise = 0); X_9= Age (year); X_{10}= Household size (number); X_{11} = farm size (hectare); X_{12}= Annual income (₦); X_{13} = Farming Experience (year); X_{14} = Non-farm income (yes =1, otherwise = 0); X_{15} = Security threat (yes = 1, no = 0); β_0 = Intercept; β_{1-n} = vector of parameters to be estimated; and, ε_i = Error term.

Results and Discussion

Impact of IFAD on the Calorie Intake of the participating farmers

A perusal of Table 3c showed that the programme had an impact on the recommended daily dietary calorie intake of the farmers after participating in the programme, as indicated by the significance of the t-statistics at 1% probability level. It was evidently seen that the recommended daily dietary calorie intake per head/day of a farm family increased by 1675.97 kcal after participating in the programme. Before the programme, the average calorie intake per person was 1942.42 kcal, which was 13.67 per cent less than the recommended benchmark of 2250 kcal/head/day. However, after participation in the programme the calorie consumption per head/day surged to 3618.38 kcal, which was 60.82 per cent higher than the daily recommended kcal intake for sub-Saharan Africa (Table 3c).

The decomposition analysis showed a sharp decline in the percentage of those who were poor (18.02%) after participation in the programme as against 73.87 per cent observed before participation in the programme. Thereafter, there was a sharp rise in the percentage (81.98%) of those who were non-poor after participation in the programme as against the percentage of 26.13 per cent recorded before participation in the programme (Table 3a). Also, from the consumption score point of view, majority (95.50%) of the farmers fell within the poor consumption category before participation in the programme with a few percentage (4.5%) within the borderline consumption category. But after participation in the programme the percentage of the farmers in the latter category increased to 83.78 per cent while that of the former category drastically dropped to 16.22 per cent (Table 3b). Therefore, it can be inferred that the programme made a landmark by not only making the smallholding farmers food secure but also nutritionally balanced.

Table 3a. Calorie Intake of the Participating Farmers

Category	Before	After	Average kcal/ head/day
Ultra poor(<1600 kcal)	46 (41.44)	8 (7.21)	1127
Hard core poor (<1805 kcal)	15 (13.51)	3 (2.70)	1737.12
Absolute poor (<2250 kcal	21 (18.92)	9 (8.11)	1994.73
Non-poor ($\geq$2250 kcal)	29 (26.13)	91 (81.98)	3297.07
Total	**111 (100)**	**111 (100)**	

Source: Field survey, 2018

Note: Values in parenthesis are percentages

Table 3b. Percentage of Food Consumption Score of the Participating Farmers

Profile	Before	After
Poor consumption ($\leq$28)	106 (95.50)	18 (16.22)
Borderline consumption ($\leq$42)	5 (4.50)	93 (83.78)
Acceptable consumption low ($\leq$52)	-	-
Acceptable consumption high(>52)	-	-
Total	**111 (100)**	**111 (100)**

Source: Field survey, 2018

Note: Values in parenthesis are percentage

Table 3c. Impact of the Programme on Calorie Intake of the Farmers

Items	Mean	t-stat
Before	1942.41	
After	3618.38	
Before - After	-1675.97	-16.423***

Source: *Field survey, 2018*

Note: **** means significant at 1%*

Factors influencing Calorie Intake among the Participating Farmers

The results showed Tobit regression to be the best fit for the specified equation as indicated by the Chi2 statistic which is different from zero at 10 per cent degree of freedom. In addition, it also implied that the estimated parameters included in the model were different from zero, thus had significant influence on the nutritional status of the participating farmers (Table 4). Furthermore, the diagnostic test results showed that the residual term is normally distributed, as was evident by the non-significance of the Chi2 statistic at 10 per cent degree of freedom. Also, it was observed that there was an absence of multi-collinearity test between the explanatory variables, as indicated by their respective VIF values, which were less than the benchmark variance inflation factor (VIF) value of 10.00. Therefore, all the above evidence justifies the validity of the chosen model and the reliability of the estimated coefficients for prediction.

The results showed that the nutritional status of the farmers is being influenced by educational level, extension contact, access to credit, age of the farmers, household size, income, farming experience and security status as indicated by the significance of their respective estimated coefficients at less than or equal to 10 per cent probability level. The positive significance of the education estimated coefficient showed that farmers with high level of education were conscious of their nutritional status by maintaining a healthy status so as not to dispose their households to the consequences of malnutrition. Therefore, the probability of an increase in the educational level of a farmer will lead to an increase in his dietary intake (recommended kcal intake) by 0.0055, while the elasticity implication will be 0.006%. The negative significance of the extension contact estimated coefficient showed the consequences of political matters discussed by the extension agents with the farmers such as how to bequeath fortune in the feature, sense of power and independence which are outside the mandate/scope of the change agent viz. research information outreach on farm production and rural home management makes the farmers develop misery instincts, thus affecting their household food consumption (balanced diet intake).This outcome did not come as a surprise as extension agents in the study area are in the habit of discussing political issues with farmers at the expense of their core mandates owing to poor incentives and unqualified personnel. Therefore, the marginal and elasticity implications of a unit increase in the number of extension visits received by a farmer will lead to a decrease in his household kcal intake by 0.0066 and 0.0061% respectively. The positive significance

of the sickness of household member coefficient showed how precautionary measures against ill-health among the farm families make farmers conscious in avoiding malnutrition. Therefore, the probability of a farmer with a challenge of a sick household member will make him increase his recommended dietary intake by 0.034 and the elasticity implication will be 0.0097 per cent.

Fear of default and delinquency which will lead to loss of capital and farm investment insolvency makes the farmers to be dietary deficient in kcal intake as indicated by the negative significance of access to credit coefficient. The probability of a farmer having access to credit will lead to a decrease in his recommended dietary intake by 0.045 and the elasticity implication will be 0.0027 per cent. Due to strong correlation between age and health status, the fear of deteriorating health status with ageing makes a farmer health conscious i.e. apprehensive of malnutrition, by taking the recommended dietary kcal as is evident by the positive significance of the age coefficient. Therefore, the marginal and elasticity implications of an additional increase in the age of a farmer will lead to an increase in his/her recommended dietary kcal intake by 0.014 and 0.072 per cent respectively. Malnutrition among the farmers with large household size, having high dependency ratio owing to poor farm income affected their recommended dietary intake as is indicated by the negative significance of the household coefficient. Therefore, the marginal and elasticity implications of a unit increase in a farmer's household size will lead to a decrease in his/her recommended dietary intake by 0.079 and 0.0789 per cent respectively. The positive significance of the income coefficient implied that the Marginal Propensity to Consume (MPC) of the farmers increased as their income increased. This outcome did not come as a surprise given that Keynes consumption theory stipulated that the MPC of poor people is high while that of the rich people is low as income increases. Therefore, the marginal and elasticity implications of a unit increase in a farmer's income will increase his recommended dietary intake by 0.0127 and 0.022 per cent respectively.

In order not to have their farm investment affected due to allocative inefficiency, owing to their resource-poor status i.e. paucity of capital, the experienced farmers were reserved in meeting with the recommended dietary kcal intake as is evident by the negative significance of the farming experience coefficient. The marginal and elasticity implications of a unit increase in the farming experience of a farmer will lead to a decrease in his/her daily dietary recommended kcal intake by 0.0185 and 0.047 per cent respectively. The

positive significance of the security threat coefficient implies that the farmers with little or no security threat challenges have their recommended dietary nutrient intake unaffected as compared to their counterparts with security challenges, which has consequences on their economic, social, health and psychological status. The probability of a farmer not having security challenge will make him increase his dietary recommended kcal intake by 0.246 and 0.0014 per cent respectively.

Table 4. Factors Determining Calorie Consumption of IFAD Rice Farmers

Variables	Coefficients	t-stat	Elasticity	VIF
Constant	6.8080(1.6331)	4.169***	-	-
Yield	0.1487(0.1662)	0.894NS	0.15315	1.569
Marital status	0.1059(0.1502)	0.705NS	0.01293	1.657
Educational level	0.0055(0.0032)	1.718*	0.00634	1.194
Sickness	0.0342(0.0201)	1.710*	0.00965	1.921
Extension visit	- 0.0065(0.00142)	4.570***	-0.00607	1.439
Access to credit	- 0.04543(0.008615)	5.273***	-0.00266	1.360
Seed variety	- 0.04909(0.13107)	0.374NS	-0.00636	1.095
Gender	0.15419(0.1946)	0.792NS	0.01829	1.444
Age	0.0140(0.0063)	2.237**	0.07214	3.209
Household size	- 0.0789(0.0163)	4.852***	-0.07888	2.285
Annual income (₦)	0.01269(0.006708)	1.892*	0.02169	1.623
Farm size	0.03558(0.09845)	0.361NS	0.00538	1.862
Farming experience	- 0.01849(0.00725)	2.551**	-0.04679	3.891
Non-farm income	0.00840(0.08489)	0.099NS	0.00041	1.194
Security threat	0.2464(0.1268)	1.942	0.00139	1.247
Chi2 test	95.425***			
Normality test	2.864 [0.238]***			

Source: Field survey, 2018

*Note: *** ** * & NS means significant at 1%, 5%, 10% and non-significant respectively.*

The values in ( ) and [] are standard error and probability value respectively.

Conclusion and Recommendations

The empirical evidence showed that the programme had an impact on the recommended calorie consumption of the participating farmers, as their kcal/head/day was 60.82 per cent higher than the recommended benchmark of 2250kcal/head/day for sub-Saharan Africa. However, factors viz. extension visit, access to credit, household size and farming experience were identified to be the factors affecting the intake of the recommended calorie among the participating households. Therefore, the study recommends that both the public and the private organizations with an agricultural mandate should sensitize the farmers on the importance of keeping a sustainable household size so as to enable them meet the recommended balanced diet. In addition, apart from the production credit, consumption credit should be given to the farmers in order to dissuade them from fear of loss of farm capital due to default, which has a negative consequence on the calorie consumption. Well trained extension personnel coupled with proper incentives should be put in place so as to make research-extension-farmers linkages viable and efficient in the studied area.

References

Behrman, J.R. and Rosenzweig, M.R. (2001).The returns to increasing body weight, W.P.-. Penn Institute for Economic Research: Philadelphia

Chastre, D., Duffield, A., Kindness, H., LeJeune, S. and Taylor, A. (2007).The minimum cost of a healthy diet: findings from piloting a new methodology in four study locations. Save the Children: London UK.

Golden, M. (2009).Proposed nutrient requirements of moderately malnourished populations of children. Food and Nutrition Bulletin, 30(3):267-343.

Johns, T. (2002).Plant genetic diversity and malnutrition. African Journal of Food and Nutrition Sciences, 2(2).

Negin, J., et al. (2009).Integrating a broader notion of food security and gender empowerment into the African Green Revolution. Food Security, 1(3):351-360.

Rahman, M.A and Noman, S.M.M.H.(2019).Poverty and food security analysis of handloom weaver households in a selected area of Bangladesh. Journal of Bangladesh Agricultural University, 17(1): 80-85

Victora, C., Adair, L., Fall, C., Hallal, P.C., Martorell, R., Richter, L. and Sachdev,H.S.(2008).Maternal and child under-nutrition: consequences for adult health and human capital. The Lancet, 371(9609): 340-357.

Watson, D. and Andersen, P.P.(2010).Nutrition situation in sub-Saharan Africa. In Andersen, P. (ed.):The African food system and its interaction in human health and nutrition, Cornell University Press: New York. Pp. 14-33.

World Food Programme (WFP)(2009).World Food Programme, Food Security in Bangladesh: Papers presented in the National Workshop. Ministry of food and disaster management, Government of the People's Republic of Bangladesh and World Food Programme (WFP), Bangladesh.

List of calories of different food items:

Food items	Gram equivalent	Calorie equivalent
Rice	100 gm (uncooked)	372
Flour	100 gm	340
Potatoes	100 gm	77
Pulse	100 gm	14
Tomato	100 gm	18
Leafy vegetables	100 gm	49
Bitter gourd	100 gm	17
Garden egg	100 gm	25
Apple	100 gm	52
Orange	100 gm	47
Banana	1 pic medium	105
Pineapple	100 gm	50
Guava	100 gm	68
Grape	100 gm	67
Beef, mutton and chevron	100 gm	187
Chicken	100 gm	110
Egg	1 pic medium	78
Milk	100 ml	44
Fish	100 gm	100

Source: FAO, 2008 (http://www.fao.org/docrep/006/Y5022E/y5022e04.htm)