



Food Security and Coping Strategies of Selected Villages along River Rima Affected by Flood in Sokoto State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author HS designed the study, wrote the protocol and supervised the work. Author MB carried out all field work and performed the statistical analysis. Author HS wrote the first draft of the manuscript. Authors MB and HS managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

The study evaluated the food security and coping strategies of selected villages along River Rima affected by flood in Sokoto State, Nigeria. Eighty respondents were randomly selected across three out of nine local governments affected. Data were collected by the use of interview schedule. Descriptive Statistic, food Security Index and Coping Strategy Index (CSI) were used to analyse data collected. In total sample households, the incidence of food security, average food insecurity gap (depth) and square of food insecurity gap (severity) are 59%, 0.33 and 0.007 respectively. Results further revealed that among the coping strategies adopted by households due to flood,

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relying on less preferred and less expensive foods was the most common adopted while the least adopted by households was skipping whole days without meals. The study concludes that food insecurity in the study area is high and pronounced thus, a special intervention needs to be put in place either by Government or other donor agencies.

Keywords: Food security; River Rima; coping strategies; Sokoto; climate change.

1. INTRODUCTION

Nigeria is one of the food insufficient countries in sub-Saharan Africa (SSA) although, it is arguably better, in terms of food production than the others [1]. Food insufficiency and importation are prevalent in Nigeria, despite the country having the highest food production in SSA [2]. The fact is that food deficit production has consistently increased over the years, yet deficit and importation are on the increase. Food insecurity in Nigeria is concentrated in rural areas, where about 64 percent live below the poverty line compared to 35 percent in urban areas. While a greater proportion of poor households are found in the north than in the south, the highest incidence of poverty is observed in households engaged in agriculture, that is about 90 percent poor households in Nigeria are engaged in agriculture. Agricultural growth, therefore, is important for the eradication of extreme poverty and hunger in Nigeria.

Populations have developed a number of coping mechanisms in order to live with climate variation and uncertainty. Coping mechanisms are the actual responses to crisis on livelihood systems in the face of unwelcome situations, and are considered as short-term responses [3]. Indigenous strategies to cope with climatic variability vary among different geographical locations and between social-religious-cultural settings, as well as between livelihood cores (e.g. between agro-pastoral communities depending on livestock raising compared to sedentary farming communities depending primarily on crop production). It is thus impossible to give a generic overview of indigenous coping mechanisms. Suffice it to state that coping with climatic variability forms an inherent and fundamental part of societies hosted in arid, semi-arid and dry sub-humid temperate and tropical landscapes [4]. Most individuals and households employ a combination of responses to the impacts of climate on their livelihoods [5]. This suggests that actions constantly change with different situations.

In Nigeria, Sokoto State in particular is highly prone to food insecurity due to a number of factors: climatic, social, economic, erratic weather patterns and low fertile soils. This situation has worsened in recent times due to the climatic change experienced in the world today. In September, 2010, River Rima over flooded due to high volume of rainfall experienced that year. Before then, the river used to be filled to the brim and slightly over flowed its banks. But in 2010, precisely in late August 2010, rainstorms caused the dam upstream of River Rima to fill to dangerous levels. In an attempt to reduce the risk of failure, the gates were opened on 1 September 2010, causing major flooding in the downstream village of Kagara. On 8 September the spillway from the dam completely failed, causing much more widespread flooding. As a result, villages along the River were greatly affected with devastating effect on lives and properties of the inhabitants of those areas and part of the state. Thus, it is critical at this stage to assess the food security situation of the affected area because this is likely to worsen in time to come. Also, knowledge of the coping strategies adopted by households during the crises is important. In view of the above, the study had the following objectives;

1. Assess the household food security status of the respondents.
2. Identify the coping strategies adopted by the respondents as a result of the flood in the study area.

2. METHODOLOGY

Sokoto is a city located in the upper northwest of Nigeria, near to the confluence of the Sokoto River and the Rima River. It is geographically located between longitude 4°8' and 4°45' E and latitude 12°0' and 13°58' N [6]. For the purpose of sampling, a list of Local Government Areas affected by the flood together with their corresponding villages was obtained from the Ecological Disaster Unit of Ministry of Environment, Sokoto State. A multi-stage sampling technique was employed. Out of nine Local Governments that were affected by the

flood, three Local Government Areas were selected. For the local government selected, the first (Gada) had nineteen villages, the second (Goronyo) had eleven villages and the third (Kware) had seven villages. Accordingly sampling with proportion was used to select five villages from Gada, three villages from Goronyo and two villages from Kware. In each village, eight household heads were selected. This gave a total of (80) eighty respondents. All selections above were done using simple random sampling technique.

Interview schedule was used to collect data. For the calorie intake, the household head's wife assisted him in providing the information needed and the analytical tools that were used in data analyses include:

1. Food Security Index to analyze objective 1,
2. Coping Strategy Index (CSI) to analyze objective 2,

2.1 Description of Analytical Tools

2.1.1 Food security index

Two objective methods of food security measurement have been widely used in most food security studies [7]. First, is to estimate gross household production and purchases over time, estimate the growth or depletion of food stocks held over that period, and presume that the food that has come into the households' possession and "disappeared" has been consumed. The other method is to undertake food consumption recall for individual members of a household or for the household as a whole and analyze each type of food mentioned for calorie content. In this study, a 7-day recall method was used. The food security line was the recommended daily per capita calorie intake of 2260 kcal. The households' calorie intake was obtained through the households' consumption. From the data the quantity of every food items consumed by the households in the 7 days period was estimated. The quantities were converted to kilogram and the calorie content was estimated by using the nutrient composition table of commonly eaten foods in Nigeria (Appendix I). Per capita calorie intake was calculated by dividing estimated total household calorie intake by the family size.

To get the household's daily per capita calorie intake, the household's per capita calorie intake was divided by seven. Households whose daily

per capita calorie intake were up to 2260 kcal were regarded as food secure and those below 2260 kcal were regarded as food insecure households. The food security status is dichotomous (i.e. 1 = food secure households and 0 = food insecure households).

The model as used by [8] is expressed as follows:

$$Z_i = Y_i/R \quad (1)$$

Where;

Z_i = Food security status of i^{th} households which take values 1 for food secure households or 0 for food insecure households.

Y_i = Daily per capital daily calorie of i^{th} household.

R = Recommended per capital daily calorie intake (2260 kcal).

Z_i = 1 for Y_i greater than or equal to R

Z_i = 0 for Y_i less than R

Other indices;

Head count method was used to measure food security status of the entire area under study and is expressed as:

$$FII = (FIH/TH) \times 100 \quad (2)$$

Where;

FII = Food Insecurity Index

FIH = Number of Food Insecure Households

TH = Total Households under study

Food Insecurity Gap measures the depth of food insecurity and is expressed as:

$$FIG_i = (TCR_i - TCC_i)/TCR_i \times 100/1 \quad (3)$$

Where;

FIG_i = Food Insecurity Gap of i^{th} food insecure household

TCR_i = Total Calorie Requirement for i^{th} food insecure household

TCC_i = Total Calorie Consumption by i^{th} food insecure household

Hence, the total food insecurity gap is expressed as:

$$TFIG = \sum \{(TCR_i - TCC_i)/TCR_i\}/FIH \quad (4)$$

Squared Food Insecurity Gap, which indicates severity of food insecurity among the food insecure house hold is given as:

$$SFIG = \sum (FIG_i)^2 / FIH \quad (5)$$

2.1.2 Coping strategy index (CSI)

Coping strategy was employed to access the extent of use of coping strategies of the households. The knowledge of this allows a better understanding of the possible areas of intervention (formal and informal strategies) either by government or other stakeholders in the area. In analyzing the extent of use of the coping strategy, a coping strategy index (CSI) was developed by ranking. The CSI gives a quantitative score for each household and is a cumulative measure of the level of coping [9]. The extent of use of the CSI was expressed using a five-point scale with the scoring order 4, 3, 2, 1 and 0 for every day, 3-6 times a week, 1-2 times a week, less than 1 time a week and never used respectively. The formula used to obtain the CSI score was adapted from [10] as follows:

$$CSI = N_4 X_4 + N_3 X_3 + N_2 X_2 + N_1 X_1 + N_0 X_0$$

Where:

CSI = Coping strategies use index

N_4 = Number of households using a particular coping strategy everyday

N_3 = Number of households using a particular coping strategy 3-6 times a week

N_2 = Number of households using a particular coping strategy 1-2 times a week

N_1 = Number of households using a particular coping strategy less than 1 time a week

N_0 = Number of households not using any of the coping strategies.

X_4 = Scoring order for everyday

X_3 = Scoring order for 3-6times a week

X_2 = Scoring order for 1-2 times a week

X_1 = Scoring order for less than 1time a week

X_0 = Scoring order for not using any

The CSI was used in rank order to reflect the relative position of each of the coping strategy in terms of their use.

3. RESULTS AND DISCUSSION

3.1 Food Insecurity Profile among Households in the Study Area

Adequacy of food consumption is the ultimate index of food security. This adequacy is directly reflected in the adequacy of food nutrient intake. This is because the calorie consumed in a region is a reflection of the food security situation of an area. Furthermore, knowing the number of calories missing from the diets of undernourished people helps run out the picture of food deprivation in an area [11]. It can be observed from the findings in Table 1 that the average calorie intake was found to be 1514.2 kcal per capita per day. This is far below the FAO minimum recommended intake of 2260kcal per capita per day and could indicate food insecurity problem in the area. For further analysis, three food insecurity measures (incidence, depth and severity) were used to assess the degree of food insecurity among sampled households using the household per capita daily calorie intake as presented in Table 1. On the average the head count ratio was 0.59 implying that 59% of the households in the study area were food insecure based on the household per capita daily calorie intake. This is similar to the findings of 8 who found that 64% of households in north central Nigeria were food insecure. Therefore, the incidence of food insecurity can be said to be high in the study area as more than half of the population are food insecure. In terms of level of food insecurity (indicated by depth and severity), the results showed that for the depth, daily calorie intake increases of about 33% are required to fill the food insecurity gap by households to meet the minimum Recommended Daily Allowance (RDA). Babatunde et al. [8] similarly found that households require about 32% daily calorie intake to fill the food insecurity gap in order to meet the minimum RDA. The severity observed was surprisingly low (0.007) and is contrary to expectation. With the present global food crises due to effect of climate change and increase in fuel prices in the country which has resulted to high cost of food stuffs, the situation of food insecurity in the area is expected to worsen.

3.2 Coping Strategies of the Respondents

Households actively try to protect their livelihood, adopting several action and mechanism when faced with shock and stress that affect their

livelihood or livelihood outcomes one of which is food security which is an important aspect [12]. The prevailing strategies for dealing with food insufficiencies in households are presented in Table 2 using rank scores. The result from the Table shows that “eating less preferred and less expensive food” was the most prevalent coping strategy among households during periods of food insufficiency which ranked first with a score of 280. This is similar to findings of several authors [7,9,13,14,15] and implies that the first thing that comes to mind in a household in the event of insufficient food is to consider the purchase of food that is less expensive and usually less preferred relative to what should have been consumed if food is sufficiently available. However, the essence of eating food is not only to quench hunger but also to derive satisfaction from the foods being consumed. Hence, if one is compelled by necessities to eat foods which are not preferred, that satisfaction might not be attained. Also, consuming cheap foods means consuming less meat and fewer dairy products, smaller amounts of oils and fats, and fewer fruits and vegetables. These foods are usually the most expensive, but they are also the most concentrated sources of many nutrients. Thus, the poor in developing countries usually suffer disproportionately from malnutrition in part because diverse, nutritionally well-balanced diets are unaffordable [16].

The second strategy adopted by households was “limit meal consumed by adults”. This allows children to have relatively enough food to eat but

could results to reduction in the health and productivity of the adults in the households on whom the responsibility of providing food for the family is bestowed [17,18,19]. These might further aggravate the food insecurity situation as the ability to work and earn income is hampered. The third strategy adopted was “borrow food or borrow money to buy food”. This is similar to finding of [15,20]. Although adoption of this strategy might results in satisfying the present food need, it might also result in future food insecurity as it can lead to permanent indebtedness.

Table 1. Summary statistics of food security indices for the study area

Food security indices	Mean value
Per capita daily calorie intake	1514.20kcal
Food insecurity incidence	58.75%
Depth	0.33
Severity	0.007

Other strategies adopted in descending order were ‘limit portions at meal times’, ‘purchase food on credit’, reduce number of meal eaten in a day’, ‘ration little money available to members to buy street food’, rely on help from relative or friends outside household’, and the least adopted was ‘skipping whole day without eating. The strategies are similar to what [9,14] found in their studies in Nigeria and Ghana respectively. This may be because of traditional and cultural similarities between the study areas.

Table 2. Coping strategies adopted by households

S/N	Strategy	Every day (4)	3-6 times a week (3)	1-2 times a week (2)	<1 times a week (1)	Never (0)	Total score	Rank
1	Rely on less preferred and less expensive food	58	10	8	2	2	280	1
2	Borrow food or borrow money to buy food	11	45	15	1	8	210	3
3	Purchase food on credit	6	39	20	6	9	187	5
4	Rely on help from relatives or friend outside household	4	6	11	12	47	68	8
5	Limit portions at meal time	10	29	28	8	5	191	4
6	Ration little money available to members to buy street food	3	9	11	8	49	69	7
7	Limit meal consumed by adult	29	19	16	13	3	218	2
8	Reduce number of meal eaten in a day	16	21	16	24	2	183	6
9	Skip whole day without eating	2	4	7	10	58	44	9

4. CONCLUSION

Based on the findings of the study, it could be concluded that households in the study area are food insecure and they actively adopt various strategies to improve their situation. Households in the study area need about 33% of daily calorie intake increase to fill the food insecurity gap though the severity of food insecurity observed is low among households. Victims and other individuals living in places liable to flood are advised to vacate those areas so that they will not be affected by possible future occurrence of the flood.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Appendix 1. Calorie content of some commonly eaten food items in Nigeria

Food items	Kcal/kg	Food items	Kcal/kg
Staple foods		Beef	2370
Cassava flour	3870	Sheep meat	2370
Garri	3840	Goat meat	2370
Yam	1100	Chicken	2380
Sweet potato Tuber	1100	Tomato	880
Irish potato	1200	Pepper	3930
Maize grain	4120	Onions	440
Sorghum grain	3500	Carrot	440
Millet	3500	Spinach	220
Rice	1230	Salt	180
Wheat	3400	Maggi	220
Beans	5950	Palm oil	8920
Soybeans	4050	Groundnut oil	9000
Ground nut	5950	Soft drink	620
Fish	2230		
Egg(pieces)	1400		
Milk	4900		
Sugar	3340		

Source: Adapted from Babatunde et al. [8]

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