

# Analysis of Food Consumption Pattern among Rural Fishery Households: A Panacea to Poverty Alleviation in North Central Nigeria

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## Authors' contributions

*This work was carried out in collaboration between all authors. Author YUO designed the study, performed the statistical analysis, wrote protocol and first draft of the manuscript and managed literature review. Authors ZA, MAD and DFO managed the analysis of the study and further literature searches, review of the manuscript. All authors read and approved the final manuscript.*

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## ABSTRACT

A study was conducted to determine the food and non- food pattern among rural artisanal fishery households in North Central Nigeria. Data used for this study was collected from a total of three hundred and twenty rural fishery households using a multi-stage random sampling technique. The main tools of analysis include descriptive statistics, budget share index and ordinary least square regression model. The study shows that about four-fifth, 77% of total monthly expenditure of fishery households were expended on both stapled and non-stapled food. The left over, 23% comprises of payments for energy, clothing, health, education and others. The results revealed that the average age was 43 years, mean education index of 2.1 years, household size of 8 and adjusted size of 6 and average monthly income of ₦11,350. The empirical results also revealed that adjusted household size (0.138), net fishery income (0.516) and years of schooling (1.53e-05) were factors influencing food consumption among rural fishery households. The study recommends the need to

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assist fishermen households to improve their fishery practices and diversify their sources of income in order to be able to meet their minimum food requirement especially during the off fishing season.

*Keywords: Household expenditure; per adult equivalent; poverty; total monthly income.*

## 1. INTRODUCTION

Globally, there are over half a billion small farms and artisanal fishing, and they produce much of the world's food by working 2 ha or less, including much of the food they consumed [1]. However, in a developing country like Nigeria, small scale farmers who constitute the bulks, produce about 85% of Nigeria's total food production. The rural households constitute more than 70% of the country's population, mostly in rural areas, earns their living from these small farms and artisanal fishery. But, ironically the level and incidence of poverty is very pronounced in those areas [2]. As a result of inherent poverty in most of the rural areas, particularly in developing countries, the Millennium Development Goals (MDGs) were established by the United Nations in year 2000 to combats poverty, hunger, disease, illiteracy, gender inequality, environmental degradation and biodiversity.

Investing in fishery is one of the most effective strategies for achieving the goal of halves the proportion of people in poverty and hunger, and achieving critical post-2015 sustainable agricultural development and food production goals related to poverty and hunger, nutrition and health, education, economic and growth, peace and security, and preserving the world's environment [1,3]. This is because food security, nutrition and health status of fishermen are of great concern in the contemporary world. The fishery households has multiple roles of contributing about 3.5% to the Nigerian country's annual Gross Domestic Product (GDP), employ about 4.3% of Nigeria population and is an important contributor to the population's nutritional requirements, constituting about 50% of animal protein intake [4]. Therefore, fishery households are indispensable towards sustaining agricultural development and feeding an estimated 160 million Nigerians who needed to have an adequate calories and balance nutrients.

Given the sheer size of fishermen and farmers in general in food production, expenditure pattern of fishermen have important implications for nation food self sufficiency and the sustainable increases in food production and raw material for

the agro-food industries not only for Nigeria but also for exports to other countries' food industries. [2] posited that consumption of a household depicts the aggregate demand of goods and services, and the level of welfare and poverty that a household is experiencing.

The expenditure pattern of rural households in developing countries has been largely skewed towards food consumption [2], yet rural households that provide the bulks of agricultural products still suffers from caloric and nutrition insufficiencies. It suffices to note that the bulk of rural fishery households need to have an adequate amount of food to eat to surmount minimum of 2100 kcalories needed per caput per day as recommended by Food and Agriculture Organization and eradicate hunger [3]. For example, the daily calorie per capita intake of an average Nigerian was estimated to be lower than 1700 kcalories as against the recommended minimum requirement of 2100 kcal for moderate activity [3]. Then, after they have had enough to eat, they may want to have better and more nutritious food to eat to eradicate nutrition insufficiency and meet the minimum 75 g protein requirement to maintain a balance diet [5,1].

Both caloric and nutrition insufficiencies leads to various health problems, which ultimately affects the economic growth and prosperity of a country. [6,1] observed that the rural households experienced cycle of seasonal food shortage yearly and that 1996 World Food Summit (WFS) brought to centre stage in the development debate the issue of hunger and food insecurity as both cause and effect of poverty and slow growth. Therefore, this paper provide a micro view of poverty and food security studies with a view to understanding the expenditure pattern of rural artisanal fishery households and its determinants.

## 2. METHODOLOGY

### 2.1 Study Area

The study was conducted in North Central, Nigeria. The region has six States and FCT Abuja (Fig. 1) with River Niger flowing along Kwara, Kogi and Niger States and River Benue

in Benue State. Kwara State has a land mass covering about 32,500 square kilometres. The State's population and farm families were projected in 2014 to be about 3, 043, 221 and 306, 582 respectively representing 3.2% annual growth rate and an average density of 91 persons/km<sup>2</sup>. However, Niger State has a land mass covering about 76, 000 km<sup>2</sup> with the State's population and average density/km<sup>2</sup> projected in 2014 to be about 5, 014, 358 and 66 per persons respectively [7].

Artisanal fisheries production is much favoured in this North Central part of Nigeria as a result of numerous tentacles of inland water and streams as well as flood plains of the River Niger that stretches from Niger State (Borgu LGA) through Kwara State (Edu LGA) to Lokoja/Idah in Kogi State. River Benue also cut across Benue State with prominence in Markudi and adjacent towns in the State. The fishing activities are usually carried out by traditional fishing methods such as canoes with paddlers, gill nets, cast nets, long lines, hook and line sets, traps and outboard engine canoes. The main fish species found in the study area are *clarias anguillaris*, *barilius niloticus*, *hemichromis fasciatus*, *Synodontis filamentosa* and *Gymnachus niloticus*.

## 2.2 Method of Data Collection

The study was conducted between December 2012 and July 2013 in 8 fishing settlements in both Kwara and Niger States, Nigeria. Primary data were collected through interview and structure questionnaire which was subjected to a pre-survey. This was administered to the fishery households randomly selected to generate information on socio-economic and demographic characteristics of households. Information on weekly/monthly household's consumption expenditure on food and non-food items were also collected. Descriptive statistics, budget share and multiple regression models were employed to analyse the data to achieve the objectives of the study.

The sampling procedure was multi-stage random sampling technique. Kwara and Niger States were randomly selected from the list of 6 States in North Central Nigeria. Then, 4 fishing settlements each were randomly selected in chosen States. Finally, with combined efforts of Project staff and 'Sarkin Ruwa' or village heads, 40 fishery households were randomly selected from each of the fishing settlements making a total of 320 fishery households for the study. The

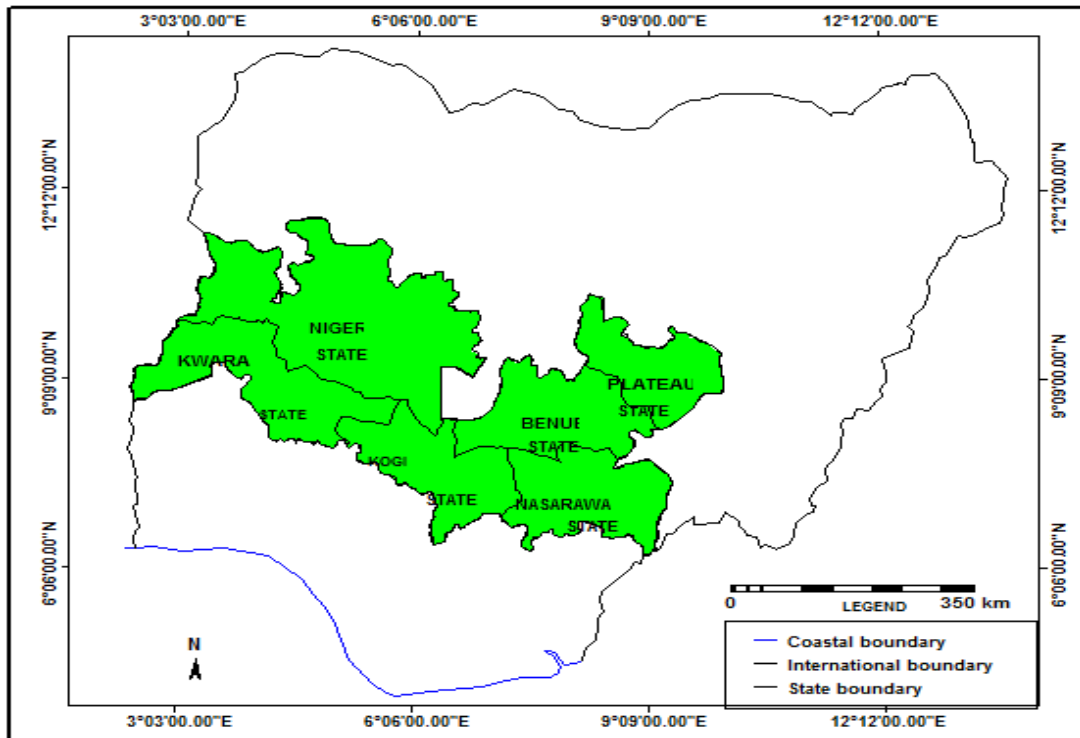


FIGURE 1 : THE NORTH CENTRAL STATE S OF NIGERIA

Source : Adapted and Modified from Administrative Map of Nigeria.

selected fishing settlements were: Yimagi, Tsonga, Ellah, Sunkuso (Kwara State); and Kaya, Garafini kodo, Kokoli, Mago (Niger State).

For this study, expenditure refers to all goods and services for use of fishery households. The components of total expenditure for the rural fishery households were food and non-food items. The major food components for the fishery households reported followed that of Nigerian Bureau of Statistics [2] classification which was assumed to be on seven major groups as follow: Cereals; Root and Tubers; Legumes; Fruits and Vegetables; Animal protein sources; Fats and Oil and other food items. It should be noted that household food consumption covers purchased food and subsistence production by the household itself. The non-food component consists mainly of expenditure on basic household needs such as fuel for cooking, clothing and health. Others include transportation, information technology and communication, and education.

### 2.3 Analytical Tools

Budget share on the seven classes of food adopted by [8] was verified using equation 1 below:

$$w_i = \text{Exp}_i / \text{THE}_a * 100 \quad (1)$$

$w_i$  = budget share of each seven classes of food, and other goods and services;  $\text{Exp}_i$  = expenditure on each component and  $\text{THE}_a$  = total adjusted household expenditure.

Adult equivalent was generated from Organization for Economic Corporation and Development (OECD) Scale adopted by [9] as follows:

$$\text{AE} = 1 + 0.7(N_{1\text{adult}} - 1) + 0.5N_{2\text{children}} \quad (2)$$

Where, AE represents adult equivalent,  $N_1$  represents the number of adult aged 15 and above and  $N_2$  is the number of children aged less than 15.

Further, following [10] and adopted by [11] an ordinary least square regression specified in equation 3 was employed to find out the factors influencing food pattern of the artisanal fishery households in North Central Nigeria:

$$\text{LogHc}_i = \beta_0 + \beta_1 \text{LogY}_{fi} + \beta_2 \text{LogHs} + \beta_3 \text{LogE}_d + \beta_4 \text{LogY}_{nfi} + e_i \quad (3)$$

Where:  $H_c$  = household expenditure on food items;  $Y_{fi}$  = per capita net income;  $H_s$  = adjusted household size;  $E_d$  = education level of household heads;  $Y_{nfi}$  = proportion of non-fishing income  $\beta_0$  is a constant;  $\beta_1$ -  $\beta_4$  are regression parameters that were estimated and  $e_i$  = the error term. Note: ₦, Nigeria currency Naira and 1USD (\$) = ₦158 during field survey

## 3. RESULTS AND DISCUSSION

### 3.1 Socio-economic Characteristics

The results in Table 1 revealed that fishing household heads in the study area were males dominated (90.3%); average age of 43 years and married (94.7%) with mean household size of 8 and adjusted size of 7. The presence of female-headed households in actual fishing was due to death of male heads, migration, divorce or economic reasons. The estimated mean years of schooling of fishery heads were 2 years, largely skewed towards the informal education and fell below 2011 UNDP mean education index of 5 years for Nigeria (Table 1). This reflects a low level of education by fishermen, although an important component of household feature to improve the quality of life.

The average monthly income from fishing summed up to ₦11350 (\$71.84) ranging from ₦2900 (\$18.35) to ₦32500 (\$205.70) per month which show positive contribution to fishery household's welfare. Majority of the pooled fishermen (95.7%) had subsidiary occupations with average yearly off-farm income of ₦8050.50 (\$50.95) ranging from ₦2500 (\$15.82) to ₦49000.80 (\$310.13) per year. This shows that the rural artisanal fishermen have developed capacity to cope with increasing vulnerability associated with fishing such as occupational diversification and migration

### 3.2 Expenditure Patterns

The rural artisanal fishery households' food and non-food expenditure by deciles is presented in Fig. 2. Throughout the ten deciles, the fishermen households recorded higher values for food expenditure than the non-food expenditure items. The food poverty line was ₦5900.6 (\$37.35) which account for about 77% of total expenditure of fishermen's household, while the non-food poverty line equal ₦1766.6 (\$11.18) and this account for only about 23% of total expenditure.

It can be concluded that the bulk of rural households' expenditure was on food.

### 3.3 Component of Households' Expenditure

The result of the analysis of expenditure pattern of respondents indicates the mean per adult equivalent household expenditure for all household was ₦11500.80 (\$72.79) with standard deviation of ₦3700.20 (\$23.42). This gives a two third of ₦7667.20 (\$48.53) per adult equivalent per month which was relative poverty line for rural fishery households. The relative poverty line which was 2/3 per capital expenditure translates to ₦92006.4 (\$582.32) per year and about ₦253 (\$1.60) per day respectively. More than half, (56%) of sampled fishermen fell below poverty line of ₦7667.2 (\$48.53).

The total expenditure value was disaggregated into food, about 77 %) and non-food, about 23% as in Fig. 3. More than half, 53.4% of the total expenditure was captured by staple food items such as cereals, root and tubers, legumes, vegetables and animal sources while non staple food items such as groundnut oil, salt / potash / seasonings, fruits and beverages consumed about one quarter (23.6%) of the item of expenditure of the fishermen. Energy in form of fuels for lightening and cooking gulped only 10.1%. Other items of expenditure include clothing (5.0%); health (4.3%) and others including education (3.6%). It can be concluded that more than half, 56% of rural households' expenditure were below the poverty line, which implies that all fishery households whose expenditure is less than the poverty line were impoverished.

The implication of analysis of expenditure pattern of fishery household shows that in terms of food and non food consumption per adult equivalent, the rural fishery households in Kwara State also had a low level of welfare. This gave an indication that despite their engagement in both secondary and off farm activities; fishery households in the study area were still unable to meet basic food and non-food needs. [6] also posited that hunger and food insecurity as both cause and manifestation of poverty and slow growth.

The rural artisanal fishery households' mean per adult equivalent expenditure disaggregation is presented in Table 2. The result shows that expenditure value had a range of ₦3650.55 (\$23.10) to ₦36900 (\$233.54) per adult equivalent per month with a mean of ₦11500.80 (\$72.79). Fishery households could be classified into different categories suggested by [12]. For example, category with subscript a and expenditure range ₦3000-₦5000 (\$18.99-\$31.65) could be classified as extremely poor, b as very poor, c where poverty line falls as transient poor while expenditure range denote by subscripts d and e as non-poor.

Alternatively, the expenditure pattern with a poverty threshold of ₦7667.2 (\$48.53) drew a demarcation between poor and non poor. While the poor fishery households were indicated by those below poverty line (about 56%), the non poor could be describe as fishery households above the poverty bench mark (44%). This result established the view of [12,5] who posited that analysis of poverty status identifies and groups those who experience poverty most intensely, deepen the understanding of poverty and ensure that key groups are not neglected in analysis and action.

**Table 1. Dominance indicator of some socio-economic variables of artisanal fishermen**

| Variables                  | Dominance indicators         | Mean  | Std dev | CV(%) |
|----------------------------|------------------------------|-------|---------|-------|
| Gender (sex)               | About 93% were male          | -     | -       | -     |
| Age (yrs)                  | 67% below 51 years           | 43    | 9.5     | 22.1  |
| MMM Marital status         | 95% were married             | -     | -       | -     |
| Level of Education (years) | 66%, no formal schooling     | 2.1   | 1.2     | 57.1  |
| Fishing experience (years) | About 65% had up to 23 years | 19.2  | 11.5    | 59.9  |
| Household size (persons)   | 69% had adjusted size of 6-9 | 7     | 3.1     | 38.8  |
| Average income/month (₦)   | 72% earned <₦15,000 (\$94.9) | 11350 | 7850.8  | 69.2  |
| Off-fish income/year (₦)   | 51% had < ₦20,000 (\$126.58) | 8050  | 1050.5  | 13.0  |
| Subsidiary occupations     | 83% engage in farming        | -     | -       | -     |
| Expenditure (₦)            | 56% below 2/3 monthly        | -     | -       | -     |

Source: field survey, 2013

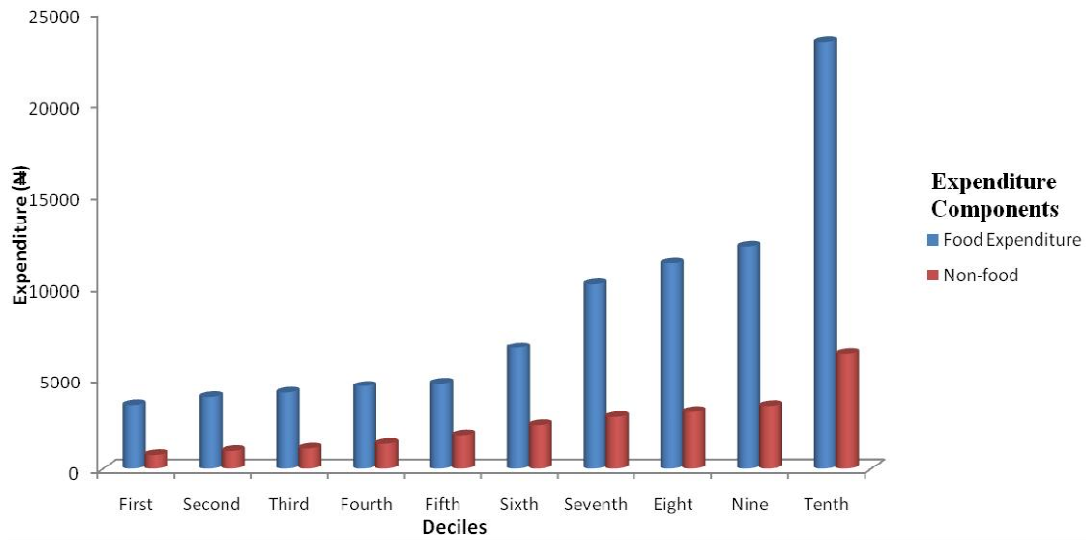


Fig. 2. Per adult equivalent of food and non- food expenditure pattern by deciles

### % Expenditure

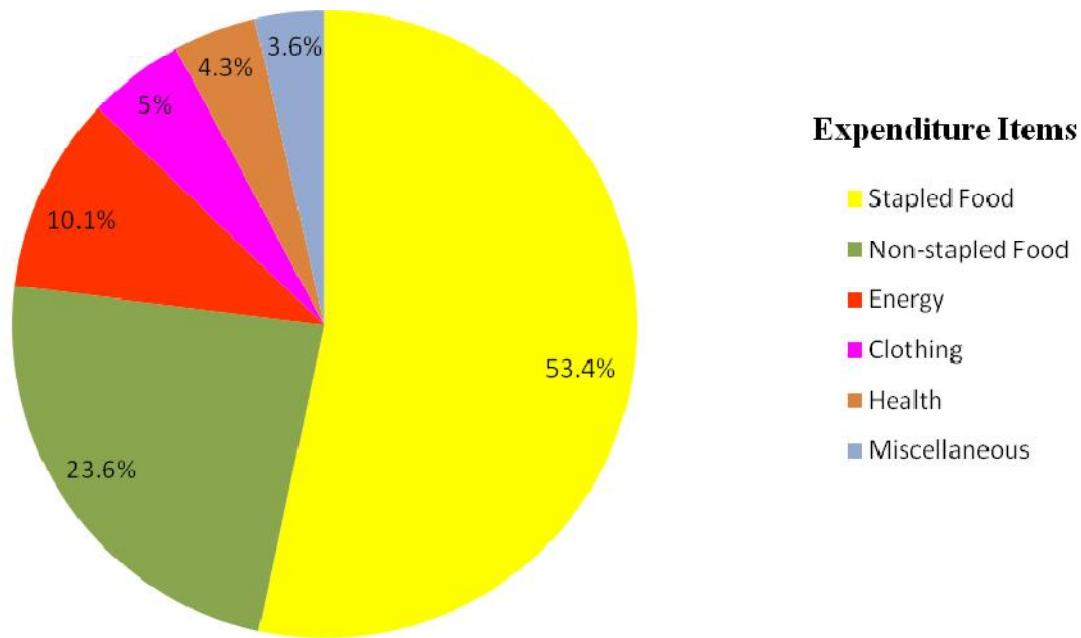


Fig. 3. Distribution of household expenditure in the study area

### 3.4 Food Consumption Pattern

From Table 3, suffice to note that cereals and tubers were responsible for the largest proportion of household expenditure representing 62.1% of food components and 41.3% of total household

expenditure. The result corroborates [1] who assert that the developing countries including Nigeria suffers from caloric and nutrient insufficiencies because the bulk of foods consumed were mainly carbohydrates which are obtained mostly in the form of starch.

**Table 2. Distribution of households by mean/ adult equivalent consumption expenditure**

| Expenditure range (₦)     | Expenditure range (\$) | Frequency | Percentage (%) |
|---------------------------|------------------------|-----------|----------------|
| 3001 –5000 <sup>a</sup>   | 18.99-31.65            | 22        | 6.9            |
| 5001 – 7000 <sup>b</sup>  | 31.65-44.30            | 62        | 19.4           |
| 7001-9000 <sup>c*</sup>   | 44.30-56.96            | 126       | 39.4           |
| 9001-11000 <sup>d</sup>   | 56.96-69.62            | 42        | 13.1           |
| 11001 –13000 <sup>e</sup> | 69.62-82.28            | 37        | 11.5           |
| Above 13000 <sup>e</sup>  | Above 82.28            | 31        | 9.7            |
| Total                     |                        | 320       | 100            |

Source: field survey, 2013; Note: poverty line= N7667.2 (\$48.53); \* =Poverty class interval

Further analysis revealed that total protein sources, mainly from legumes and animals in form of fresh and dried fish, beef, mutton, pork and eggs accounted for about 15.1% and 11.7% of food and total fishery households' expenditure respectively. However, the bulks, 79% of the respondents preferred and consumed fish to any other animal protein sources. With an average of 7 members per household, an adult equivalent consumes ₦5,499 (\$34.80) worth of carbohydrate food, ₦1,335.7 (\$8.45) of protein food and ₦708.4 (\$4.48) worth of vitamins. This amounts to an average of ₦8855 (\$56.04) worth of food per household member per month in Table 3. It also amounts to an intake of 80.2% carbohydrate, 11.8% protein and 6% vitamin per household per month.

This harmonized [13,5] observation that Nigerian average protein consumption from both plant and animal of 36.6 g per caput consumption per day is less than UN/FAO'S estimated minimum of 75 g of daily per caput intake. In addition, the contribution of 13.3 g/day from animal source of which fish products captured 6 g/head/day (about 42%), is below the recommended 35 g/day by the FAO to be the minimum protein requirement that should be obtained from animal products for the growth and development of the body.

The general livelihood pattern also indicates that fishermen who produce more of the food protein consumed in the study area sold the bulk of fish harvest in exchange for money to cater for life's basic needs. This implies that as this trend continues, the fishermen consumed more of the unbalanced diets which retard growth and productivity, and generally remaining in the ultimate vicious cycle of poverty.

### 3.5 Regression Results

Results showed that the hypothesized socio-economic variables in equation 5 explained

about 62% in the variations of food commodities consumed by fishery households (Table 4). The result revealed that food consumption was positively correlated with adjusted household size as hypothesized and statistically significant at 1% level of probability. This implies that food consumption increase with increase in household size. These results are in line with findings of [14,11] that reported that the rate of increase in food consumption was depended on household size.

The net fishery income affected significantly ( $p < 0.001$ ) the consumption of food expenditure positively. In other words, food consumption of fishery households increases with increase in net income of rural fishery households, *ceteris paribus*. This implies that a unit increase in fish income would increase rate of food consumption by 0.51602. This is however expected due to the fact that the more the fish caught, the higher the income. An increase in income will increase the propensity of fishermen to increase the expenditure pattern including food consumption. Nevertheless, following Engel's law the rate of food consumption is mostly likely to increase but at a lesser rate with rise in income. Thus, higher income tends to bring about welfare improvement hence reduction in poverty levels. These findings corroborates the findings of [11,13,14] in a similar study on food consumption pattern in Bangladesh and Pakistan respectively, who found that per capita consumption of food commodities increased with changes in income.

Nevertheless, years of formal schooling of household heads had a regression coefficient of 1.53e-05 and statistically significant at ( $p < 0.1$ ) implying that level of education affected household consumption though marginally in the study area.

**Table 3. Classifications of food and non food components of fishery households**

| <b>Commodities</b>    | <b>Average monthly expenditure (₦)</b> | <b>% Food component</b> | <b>% as total expenditure</b> |
|-----------------------|--|-------------------------|-------------------------------|
| Cereals               | 3409.2(\$21.58)                        | 38.5                    | 29.6                          |
| Root and Tubers       | 2631.3(\$16.65)                        | 29.7                    | 22.9                          |
| Legumes               | 512.2(\$3.24)                          | 5.8                     | 4.5                           |
| Fruits and Vegetables | 531.3(\$3.36)                          | 6.0                     | 4.6                           |
| Animal sources        | 533.5(\$3.38)                          | 6.0                     | 7.2                           |
| Fats and Oils         | 1060.4(\$6.71)                         | 12.0                    | 9.2                           |
| Other food items      | 177.1(\$1.12)                          | 2.0                     | 1.5                           |
| Sub-total             | 8855.0(\$56.04)                        | 100                     |                               |
| <b>Non-food</b>       |  |                         |                               |
| <b>Commodities</b>    | <b>Average monthly expenditure (₦)</b> | <b>% Non-food</b>       | <b>% as total expenditure</b> |
| Clothing              | 574.1(\$3.63)                          | 21.7                    | 5.0                           |
| Energy                | 1166.8(\$7.38)                         | 44.1                    | 10.1                          |
| Health                | 489.5(\$3.10)                          | 18.5                    | 4.3                           |
| Education             | 190.5(\$1.20)                          | 7.2                     | 1.7                           |
| Transport             | 105.8(\$0.67)                          | 4.0                     | 0.9                           |
| Others                | 119.1(\$0.75)                          | 4.5                     | 1.0                           |
| <b>Sub-total</b>      | <b>2645.8 (\$16.75)</b>                | <b>100</b>              |                               |
| <b>Total</b>          | <b>11500.8(\$72.79)</b>                |                         |                               |

Source: Field survey, 2013

**Table 4. Factors influencing food consumption among rural fishery households**

| <b>Variables</b>        | <b>Coefficient (β)</b> | <b>Standard Error</b> | <b>t-ratio</b> |
|-------------------------|------------------------|-----------------------|----------------|
| Intercept               | 0.555 **               | 0.264                 | 2.1            |
| Adjusted household size | 0.138 ***              | 0.020                 | 6.9            |
| Net fishery income      | 0.51602 ***            | 0.09208               | 5.6            |
| Education level         | 1.53 e-05*             | 8.1 e-06              | 1.9            |
| Non-fish income         | 14.694 <sup>NS</sup>   | 112.32                | 0.13           |
| R <sup>2</sup> value    | 0.628                  |                       |                |

Source: field survey, 2013; \* \* \* and \* were statistically significant at 1% and 10% probability level respectively. R<sup>2</sup> indicates coefficient of multiple determination

## 4. CONCLUSION

It can be concluded that the general livelihood pattern indicates that bulk of rural households' operate subsistence agriculture. In addition, fishery households' who produce more of the food protein consumed in the study area sold the bulk of fish harvest in exchange for money to cater for other life's basic needs. This implies that as this trend continues, the fishermen consumed more of the unbalanced diets which retard growth and productivity, and generally remaining in the ultimate vicious cycle of poverty. It can also be concluded that more than half, 56% of rural households' expenditure were below the poverty line, which implies that all fishery households whose expenditure is less than the poverty line were impoverished.

## 4.1 Policy Recommendations

Nigeria fishery resources are grossly under-utilized, thus there is an enormous potential to increase the output of this sector to raise the income of the fishermen, calorie and nutrition requirements, and improved their welfare. Further, since food demand analysis showed that the fishery households' expenditure were largely on carbohydrate, mostly cereals and tubers, it is imperative to encouraged bulk of the artisanal fishery who engaged in arable farming as subsidiary operation to cultivate these crops.

In addition, there is need for an appropriate policy mix that will promote the increased production of legumes and animal protein foods in the study area. An increase in net fishery income will increase the propensity of fishermen to increase the expenditure pattern including



food consumption. Nevertheless, following Engel's law the rate of food consumption is mostly likely to increase but at a lesser rate with rise in income. The remnant income could be converted to durable assets which could easily fall back on, in times of need either by outright sales of these assets or by leasing them. Therefore, policies that would enhance the income generating activities of the rural households in the study area is desirable so as to enhance their food purchasing power, reduce food insecurity and reduce poverty relative to food. Finally, there should be an appropriate policy that would take care of the anticipated changes in the structure of food demand as poor households tends to become non-poor, when their income increase.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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