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Food Demand Projection and Consumption Patterns of Urban Households in Nigeria's Kano State

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ABSTRACT

Changes in population and income are essential components for altering the pattern of food demand. In light of the importance of food demand analysis, this study set out to ascertain urban household consumption trends in Nigeria's Kano State in order to forecast future demand levels for certain food items. A households' cross sectional survey data elicited through a well-structured questionnaire complemented with interview schedule from a total of 144 households chosen via a multi-stage sampling procedure were used for the study. The survey was conducted in the year 2022 and the collected data were analyzed using both Linear Approximate/ Almost Ideal Demand System (LA/AIDS) and factor analysis models. Based on the empirical evidence, households' poor purchasing power that owes to high food inflation makes them to have low dietary diversity. Besides, the necessary and luxury goods respectively were rice, beans, spaghetti and meat; and, millet, yam, Irish potatoes, semovita, fish and groundnut. Whereas, maize, garri and palm oil were established to be inferior commodities. Besides rice and semovita being everyday goods, they are demand high price sensitive commodities. Further, the challenges that inhibited households' food consumption in the study area were inflation, households' population explosion, occupational hazards, debt and economic meltdown. Moreso, the projected per capita food demand for local rice, Irish potatoes and indomie noodles will be steep. Consequently, to maintain status quo in the households' welfare, onus lies on policy makers to compensate consumers if there is rise in the prices of local rice, indomie and groundnut oil. Besides, the study advice policymakers to increase the productivity of those food items projected to witness steep-to-gentle rise in demand; and government should endeavor to adopt macro-economic policies with human-face so as to cushion/soften households' economic hardship in the study area.

INTRODUCTION

In most industrialized nations, household spending contributes greater than half of GDP, making it a key factor in economic growth (Sadiq *et al*., 2020a). Households have a tendency to quickly alter their purchasing habits as their wealth grows, and a wide range of new products enter the consumption basket. According to the United Nations Industrial Development Organization (UNIDO)(2018), this phenomena is seen as a welfare-improving aspect of contemporary economic development. The changing nature of purchasing habits has significant repercussions for the expansion of industries and the overall economy. The ability of industries to achieve growing returns on scale has the greatest immediate impact. In addition, changes in household spending due to income present both opportunities and difficulties for both developed businesses facing a slowdown in demand growth and for emerging sectors of the economy providing luxury products (UNIDO, 2018). The ability of mature sectors to reach economies of scale may be hampered by a decline in demand, which could further spur inventive activity as business owners try to prolong a slowdown in economic growth by introducing new products (Sadiq *et al*., 2021). Demand expansion for emerging businesses may result in rising profits, allowing for further investment in R&D (Research and Development) operations (UNIDO, 2018). The variability in demand that increases at high levels of income hinders the achievement of scale economies, and this is a problem that new industries must concurrently deal with. According to recent research, income-induced changes in household consumption have an effect on trade patterns, labor supply, and wage disparities between skilled and unskilled employees in the larger economy (UNIDO, 2018).

The analysis of how people utilize their money to meet their needs and wants in accordance with their choices and the resources available could be referred to as the study of consuming behavior (Katsaiti *et al*., 2017). A key element of economic health and, thus, a key indication of living standards is the utilization of goods and services. Both today and in the future, wealth and income are available to sustain consumption (by means of the savings that creates income). According to the Organization for Economic Co-operation and Development (OECD) (2013), "Income, consumption, and wealth are three elements of the broader idea of economic well-being, and it is crucial to understand the links

between them" (Sadiq *et al*., 2020b). The most common methods for determining living standards are income and consumption. According to the Nigeria Bureau of Statistics (NBS) (2019), income is defined as revenues from current transfer and productive activities. Given that it has a continuous flow, or is steady, evaluating expenditure over one week or a month might give an idea of a household's consumption patterns throughout a year. But the amount of income varies significantly from month to month vice versa between weeks.

The country's overall demand for products and services is reflected in its consumption patterns. According to the NBS (2019), it accounts for around 60% of Nigeria's entire Gross Domestic Product (GDP). The mix of characteristics, quantities, activities, and trends that define how a society or human group uses resources for sustenance, comfort, and enjoyment is known as a consumption pattern. Consumption habits typically have a significant role in the nation's social and economic policies. In contrast to affluent nations, where food expenditures make up a smaller percentage of total spending, Nigeria's consumption pattern is tilted towards food (NBS, 2019). A culture spends more on non-food products and less on food the more advanced it becomes.

The overall household spending on food and non-food at the national level in 2019 was ₦40, 207,388,459,367, a significant increase from ₦21,620,601,543,613.90 in 2009/10. Approximately 43.35% (39.8% in 2009/10) of the total household expenditure in 2019 was spent on non-food products, leaving the remaining 56.65% (60.2% in 2009/10) on food. The highest amount of household spending in 2019 (a total of 24.16 percent of all family spending) was on food purchased outside the home, followed by transportation expenses and purchases of starchy roots, tubers, and plantains. In addition, total household spending in urban areas in 2019 was ₦19,113,569,558,086 compared to ₦8,412,656,254,286 in 2009/10, while in rural regions it was ₦21,093,818,901,281 relative to ₦9,364,312,669,993 in 2009/10 (NBS, 2019). In light of this, the total amount spent on food in urban areas in 2019 was ₦9,847,690,798,340, compared to ₦3,654,003,234,722 in 2009/2010, and in rural regions, it was ₦12,929,558,844,031 compared to ₦9,364,312,669,993 in 2009/2010 (NBS, 2019). Starchy foods, tubers, plantains, and rice accounted for around 37.96% of the total food expenditure in rural areas and about 42.59% in urban areas, respectively. Both sectors spent the majority of their money on meals outside the home. In the non-food category, urban families spent the most on education, transportation, services, and rent, whereas non-food household spending in 2019 was led by costs for health, transportation, education, and services (NBS, 2019).

It is imperative that economic theory address the issue of unsustainable consumption habits in a developing country like Nigeria (Ibbih and Siyan, 2018). According to this literature, current consuming habits that deplete economic resources faster than the environment can replenish them could render progress unsustainable (Sadiq *et al*., 2020c). Of course, there are other factors that affect household and children's consumption in addition to income and pricing. Choices about consumption will also be influenced by additional factors like age or parental education. The underlying empirical realities connected with the determination of expenditure shares, namely budget allocation towards diverse consumer commodity groups to incomes and prices with a focus on the income and price elasticities, had not been the focus of expenditure data analyses in the research area. To assess consumer demand for commodities, previous researches have employed single equation approaches. Consumer theory is not given much consideration in single equation specifications, which are mostly focused on estimating elasticities. In addition to being inappropriate for constrained budget sharing and having empirical findings that are more likely to be inaccurate across a larger range of data, using the parameter estimates for welfare concerns won't reveal anything about household wellbeing. Besides, demand analysis has long since moved away from simple equation estimation and toward the most complex methods. System-wide strategies guarantee that the demand systems are consistent with consumer theory.

Furthermore, consumption patterns are dynamic and not static. Despite the ongoing widespread inflation that regularly distorts consumers' spending due to income fluctuations, literature reveals little to no research efforts that apply the sophisticated methodologies utilized to solve consumer theory problem in the studied area. To forecast the future demand for agricultural goods and to food security and nutrition in the research region, it is crucial to analyze the pattern of food consumption and how it responds to changes in price and income. In order to forecast future food demand under various price and income scenarios, it is helpful to have a deeper comprehension of demand elasticities. This knowledge could be valuable to policy planners when making crucial decisions about the future of policy.

Accordingly, it was in light of the aforementioned that this research was planned in order to get insight into the food consumption patterns of the urban households in the study area. The research's conclusions will offer accurate information on budget shares of household food spending, household income, and household food

spending's price elasticity in Kano's metropolis. This information will be helpful to government parastatals, non-governmental organizations (NGO's), research institutes, etc. The broad objective of the study was to determine the food demand projection and consumption patterns of urban households in Nigeria's Kano State while the specific objectives were to assess the households' food budget share; to determine the income and price elasticities of households' food consumption; to project food demand of households in the study area; and, to determine the challenges to households' consumption pattern.

Research Methodology

Kano State, known as the commercial hub of Nigeria, is located in Nigeria (Sadiq *et al*., 2022a). It is situated in a typical tropical region between latitudes 10°30'N and 12°38'N and longitudes 7°45'E and 9°29'E (Figure 1) (Sadiq *et al*., 2022b). This place has a Koppen's Aw climate, which is a tropical continental climate with dry and wet seasons. The dry season runs from mid-October to mid-May, while the rainy season lasts from mid-May to mid-October (Sadiq *et al*., 2022a). The state's total annual precipitation is approximately 800 mm in the north and 1100 mm in the south (Sadiq *et al*., 2022a), with a mean annual temperature of about 26 °C (Sadiq *et al*., 2022c). The area has Sudan Savannah vegetation because of the rainfall quantities. Not only is Kano state the most populated state in northern Nigeria, but also in the entire nation. The predicted population as of 2022, according to the National Population Commission (NPC) and National Bureau of Statistics (NBS), was 15,462,200, premised on a 3.2% national growth rate (Anonymous, no date). Given this population and the state's 20,131 square kilometer territory, the population density in 2006 was calculated to be around 466 people per square kilometer. Because of this, it has the northern Nigerian states' greatest population density. The success of the study area's crop and animal production, both at the subsistence and commercial levels, is widely known. In the state's outlying areas, where crop production is mostly dependent on irrigation during the off season and on rainfall, these agricultural systems are most prevalent. Rain affects animal productivity as well, but somewhat indirectly. The main food crops grown for domestic consumption are maize, millet, sorghum, and rice, while groundnuts and cotton are grown for industrial and export use. Nigeria's Kano state leads the nation in the production of animal skins and hides chili peppers, gum Arabic, cotton, sesame, garlic, and soybeans.

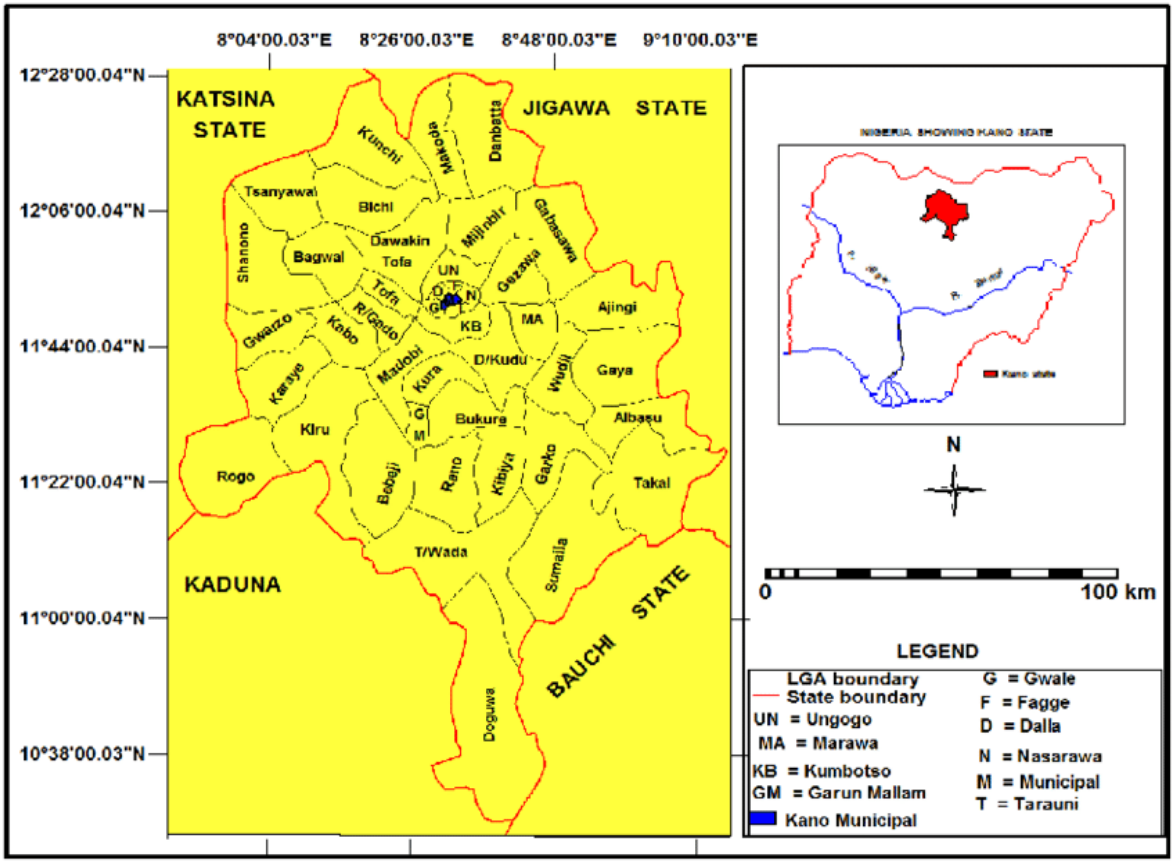

Figure 1: Map of Kano State

In drawing a representative sample size, a multi-stage sampling technique was adopted. Firstly, out of the eight local government areas (LGAs) situated in the state metropolis (NPC, 2022; NBS, 2022; Anonymous, no date), six LGAs, namely, Dala, Fagge, Gwale, Nasarawa, Tarauni and Ungoggo were randomly selected. Subsequently, using a freelance survey, from each of the selected LGAs, twenty four (24) households were randomly selected. To ensure uniformity, the composition of the twenty four households encapsulated low, medium and high incomes vis-à-vis 8 households each. Thus, a total of 144 households were randomly selected. Using an easy cost-route approach, the households cross sectional survey data were collected using a well structure questionnaire complemented with an interview schedule in the year 2022. In order of arrangement of the specific objectives, the first two objectives were achieved using a descriptive statistics and Linear Approximate / Almost Ideal Demand System (LA/AIDS) model respectively; while the third and fourth objectives respectively were achieved using food demand projection model and exploratory factor analysis.

Model specification

1. Almost Ideal Demand System (AIDS)

Due to its many advantageous characteristics, the "Almost Ideal Demand System (AIDS)" is frequently used in applied demand analysis: (a) it approximates any demand system arbitrarily well with a first-order function; (b) it complies with the choice axioms; (c) it allows non-linear Engel curves while still aggregating precisely over customers; (d) simple parameter constraints can be used to test and enforce the homogeneous and symmetry property; and, (e) if the translog price index is approximated, for example, by the Stone index, the demand equations become linear (Deaton and Muellbauer, 1980; Henningsen, 2017). The AIDS model is based on the microeconomic theory of the family and is as follows (Sadiq *et al*., 2020a):

$$\omega_i = \alpha_i + \sum_j \gamma_{ij}\, lnP_j + \beta_i ln\left[\frac{X}{P}\right] + \varepsilon_i \quad \ldots\ldots\ldots\ldots (1)$$

Where, ω_i= budget share of the ith commodity (i.e. $\omega_i = P_i Q_i / X$); P_j= is the price of the jth commodity; X = total household expenditure on all the food items considered for the study; P = price index for the group of commodities; ε_i= stochastic term, and it is assumed to be zero and has constant variance; α_i= intercept; γ_{ij} = price coefficient; and, β_i= expenditure coefficient. P is a translog price index defined as:

$$lnP = \alpha_0 + \sum_j \gamma_j\, lnP_j + \frac{1}{2}\sum_j \sum_i \gamma_{ij}\, lnP_i lnP_j \quad \ldots..(2)$$

The price index from equation (2) makes equation (1) a non-system of equations, raising estimation difficulties. To avoid non-estimation, many empirical studies used the Stone (1953) price (P^*) instead of P, as suggested by Deaton and Muellbauer (1980).

$$lnP^* = \sum_j w_j lnP_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Since the translog price index P_t is the only nonlinear component of the Marshallian demand equations, Deaton and Muellbauer (1980) recommended using the Stone index to simulate the translog price index (Henningsen, 2017). This approach makes the parameters of the demand equations linear, rendering the method of share equations considerably simpler to estimate. The term "linear approximation of the AIDS" (LA-AIDS) is used to describe this modification of the original AIDS model:

$$\omega_i = \alpha_i + \sum_{j=1}^{n=15} \gamma_{ij} lnP_j + \beta_i ln\left[\frac{X}{P^*}\right] + \varepsilon_i \quad \ldots.. (4)$$

For any anticipated demand system to be considered theoretically consistent, it must adhere to four general limits that are implied by consumer theory. The AIDS inherently satisfies the adding-up criteria, but parameter limitations can impose global homogeneity and symmetry restrictions. Yet parameter limitations typically cannot impose monotonicity and concavity characteristics. The coefficients are subject to some limitations imposed by microeconomic household theory, including the premise of utility maximization.

The "adding-up" requirement guarantees that the expenditure portions will always equal one ($\sum_i S_i = 1$). If: The following conditions are met:

$$\sum_i \alpha_i = 1\,; \sum_i \beta_i = 0;\ \sum_j \gamma_{ij} = 0\ \forall\ j \quad \ldots.. (5)$$

The "homogeneity" requirement ensures there is no "money illusion", meaning that if all prices & income fluctuate at a uniform rate, the amounts consumed remain the same. This suggests that customers are not concerned with absolute prices or levels of money or income, but just with relative prices and income. Hence, demand theory does away with the illusion of money. It is completed if:

$$\sum_j \gamma_{ij} = 0\ \forall\ i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The "symmetric", when the spending function of the AIDS is subjected to Shepard's Lemma, condition follows. Only if all prices are equal can the symmetry limitations guarantee symmetry. It is accomplished if:

$$\gamma_{ij} = \gamma_{ji}\ \forall\ i,j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Its "monotonicity", the expenditure function must increase monotonically with prices, which means that its first order derivatives with reference to prices must always be positive.

The concavity condition ensures that the utility maximization issue has a singular solution. If the expenditure function's Hessian matrix, also known as the "Slutsky substitution matrix" in this case, is concave - is a definite negative preposition

(Henningsen, 2017). The substitution matrix's i^{th} and j^{th} elements are as follows:

$$\frac{\partial e(P_t,U_t)^2}{\partial_{Pit}\partial_{Pjt}} = \frac{m_t}{P_{it}P_{jt}} C_{ijt} \quad \ldots\ldots (8)$$

Where,

$$C_{ijt} = \gamma_{ij} + \beta_i\beta_j \ln\left(\frac{m_t}{P_t}\right) + S_{it}S_{jt} - \delta_{ij}S_{it} \quad \ldots (9)$$

And δ_{ij} is Kronecker delta with $\delta_{ij} = 1$, $\forall\, i = j$ and $\delta_{ij} = 0$, $\forall\, i \neq j$.

The estimated parameters are used to calculate the demand elasticities, which have conventional ramifications.

Following are the details of the expenditure elasticity ($\in_i$), a measure of how responsively demand changes with changes in consumption expenditure:

$$\in_i = 1 + \left(\frac{\beta_i}{\omega_i}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$\in_i = \frac{MBS}{ABS} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

MBS and ABS means marginal budget share and average budget share, respectively.

Price elasticity can be calculated in two different ways: uncompensated (Marshallian) elasticity, which includes impacts on both prices and income, and compensated (Hicksian) elasticity, which only includes effects on prices (Sadiq *et al*., 2020b). When the total expenditure and other prices are maintained constant, or ceteris paribus, the uncompensated own-price elasticity ($\in_{ii}$) and the cross-price elasticity ($\in_{ij}$) measure how a change in the price of a product affects the demand for that product and that of other items, respectively.

Following Sadiq *et al*. (2020b), the Marshallian own and cross-price elasticities are presented below:

$$\in_{ii} = \left(\frac{\gamma_{ii}}{\omega_i}\right) - (\beta_i + 1) \ldots\ldots\ldots\ldots (12)$$

$$\in_{ij} = \left(\frac{\gamma_{ij}}{\omega_i}\right) - (\beta_i\omega_i/\omega_j) \ldots\ldots\ldots\ldots (13)$$

Shown below (Sadiq *et al*., 2020c), the Hicksian own & cross-price elasticities ($\in_{ii}^{*}$ *and* $\in_{ij}^{*}$) quantify the price impacts on demand under the assumption that the real expenditure ($X/_{P^*}$) is constant.

$$\in_{ii}^{*} = \left(\frac{\gamma_{ii}}{\omega_i}\right) + (\omega_i - 1) \ldots\ldots\ldots\ldots (14)$$

$$\in_{ij}^{*} = \left(\frac{\gamma_{ij}}{\omega_i}\right) + \omega_j \ldots\ldots\ldots\ldots\ldots\ldots (15)$$

Moreover, using $\in_i$, $\in_{ii}$ and $\in_{ij}$, one can estimate the compensated price elasticity, with the following permutation:

$$\in_{ij}^{*} = \in_{ij} + \in_i * \omega_i \ldots\ldots\ldots (16)$$

The sign of the estimated $\in_{ij}^{*}$ shows the substitutability or complementarity of the destinations under consideration, according to Sadiq *et al*. (2020d). If the compensated cross-price elasticity of a commodity pair is negative or positive, respectively, then that commodity pair is referred to be a complement or substitute. A food item is categorized as a Giffen or inferior commodity ($\in_i < 0$), a luxury commodity ($\in_i > 1$), or a necessity/requirement commodity ($0 < \in_i < 1$) based on the value of spending elasticity. If the elasticity value of a given product's own price is greater than unity, the demand for that commodity is considered to be price elastic (inelastic) in absolute terms (less than unity). The Hicksian elasticity describes the change in demand for a good produced by a change in price when the actual expenditure change brought on by the aforementioned price change is offset by a change in spending, keeping satisfaction or utility constant.

2. Food demand projection model

The growth formula as adopted by Goyal and Singh (2004); Mittal (2008); Kumar *et al*.(2009); Naveed *et al*.(2016); Hinna and Abbas (2021) was used to estimate the future demand for food items. Hence, the three most significant variables affecting future demand are changes in consumption patterns, per capita real income (y) & population growth (N).

$$D_{it} = d_{i0} \times N_t(1 + y \times e_i)^t \ldots\ldots\ldots (17)$$

Where D_{it} is the household demand for i^{th} commodity in period *t*; d_{i0} is the per capita consumption of the i^{th} commodity in the base year (2022); N_t is the projected population in the year *t* for the area; y is growth in per capita income (GDP – 3.06%); e_i is the expenditure/income elasticity of demand for i^{th} commodity; and t is year (1, 2, 3 ….. n): for the base year, t is 0. NPC and NBS database were used to project the future population of metropolitan Kano from 2022 to 2040 with the aid of a simple compound formula as presented below:

$$F_{pop} = P_{pop}(1 + i)^n \ldots\ldots\ldots\ldots\ldots (18)$$

Where, F_{pop} is future population; P_{pop} is present population; i is population growth rate; and, n is number of year(s).

RESULTS AND DISCUSSION

Households' Food Composition

Two factors lead researchers to consider households' consumption expenses as a stand-in for income. Firstly, according to Friedman (1957); Friedman (2018), who bases his argument on the permanent-income hypothesis, expenditures are more likely to depict permanent income and are hence a more reliable indicator of consumption patterns (Ahmed and Shams, 1994). Second, spending information is typically more trustworthy than income information. On the aggregate, a cursory review of the households' expenditure budget shares in the studied area showed cereals to account for 60.73%: coarse and non-coarse being

37.61and 23.12% respectively; protein accounts for 17.39%: animal and non-animal proteins respectively being 12.45 and 4.94%; while root and tubers, and oil (lubricants) had share budget expenditures of 9.97 and 11.92% respectively (Table 1). Besides, individual-wise, in descending order, local rice and foreign rice had the most appreciable shares in the budgetary expenditure, though didn't exceeds 20% each, then distantly followed by meat, groundnut oil (G/oil) and spaghetti whose individual shares is a single-digit but greater than 5% while the remaining ten (10) food commodities had share budget expenditures each of less than 5%. Therefore, in a nutshell, with the share contribution of carbohydrates and starchy foods in the consumers' food basket being 70.70%, it can be concluded that the dietary diversity of the households in the study area is very low. Thus, this indicates a poor balance in the dietary nutrition of the households in the study area and this might be associated with inflationary effect that erodes their purchasing power, thus forced the studied households to strike a balance of survival between the body and soul. Inspite of the cosmopolitan characterization of the study area- elites dominated, the expectation is that dietary consciousness will be the driving force/shape most of the households' budgetary expenditure but high costs of living standard that marred their purchasing powers adversely led to poor balance diet in the households' food baskets in the study area. Furthermore, the marginal propensity to consume (MPC) of the households was to some extent moderate for indomie (26.72%); low for local rice (16.75%) and groundnut oil (14.47%); and, very low for five commodities *viz*. Irish potatoes (7.48%), meat (6.62%), fish (6.24%), foreign rice (6.11%) and Semovita (5.27%). Besides, the MPC of four commodities- yam (4.64%), spaghetti (4.32%), beans (3.34%) and millet (2.45%) were marginal while the households MPC for maize, garri and palm oil commodities were negative. A positive MPC implies that as income of households' increase, their MPC for the respective commodities increases while the reverse is the case for commodities with a negative MPC. The gentle slope in the households MPC might be attributed to their purchasing power in relation to the general price level given that the MPC of poor people towards food commodities tend to be high compared to the rich people who have low MPC for food commodities. Nevertheless, the negative MPC associated with the three food commodities- maize, garri and palm oil might be connected to cultural food dietary behavior/ attitude in the study area- the north-western part of Nigeria unlike in the southern part of the country where these food commodities have strong ties/affinities to cultural dietary.

Food Expenditure Estimates

Empirically, the LA-AIDS model was found to be best fit for the households' expenditure prediction as it fulfilled its theoretical consistency of adding-up, homogeneity, symmetry conditions and 100% monotonicity fulfillment at 144 out of 144 observations. In a nutshell, the model keeps to the hypothesis of the consumer theory that underpins the fulfillment of four general restrictions that must be satisfied by any estimated demand system for theoretical consistency. Because of the use of budget shares, the adding-up condition was satisfied automatically. The condition of homogeneity implies that that the prices and income are homogenous of degree zero, i.e. only real prices and income matter to the households and not nominal prices and money-income level, thus the neglect/ discard of money illusion.

Table 1: Households' budgetary expenditure

Items	Elasticity	ABS	ABS (%)	MBS	MBS (%)
Rice (Local)	0.961999	0.174107	17.41075	0.167491	16.74912
Rice (Foreign)	0.383328	0.159468	15.94682	0.061129	6.112867
Beans	0.676102	0.04937	4.936998	0.033379	3.337915
Maize	-0.6747	0.020989	2.09895	-0.01416	-1.41616
Millet	1.141884	0.021493	2.149298	0.024542	2.45425
Yam	1.042764	0.044502	4.450249	0.046406	4.640558
Irish	2.189392	0.034171	3.41712	0.074814	7.481414
Garri	-1.11498	0.021039	2.103946	-0.02346	-2.34586
Semovita	1.339807	0.039356	3.93561	0.05273	5.272959
Spaghetti	0.667248	0.064732	6.473158	0.043192	4.319203
Indomie	2.102181	0.127113	12.7113	0.267215	26.72146
Meat	0.745405	0.088744	8.874415	0.06615	6.615037
Fish	1.746494	0.035739	3.573858	0.062417	6.241719
Palm Oil	-0.14534	0.04532	4.531995	-0.00659	-0.65866
G/Oil	1.959803	0.073855	7.385536	0.144742	14.4742

Source: Field survey, 2022

Note: ABS = Average budget share; MBS = Marginal budget share; G/Oil = Groundnut oil

The fulfillment of the symmetry condition implies that cross-price derivatives are identical. The monotonicity condition implies that the households' expenditures monotonically increases in prices, i.e. the first derivatives of the expenditures with respect to prices are non-negative.

Furthermore, for the coefficient of multiple determination (R^2), the values of the fifteen food items fitted into the equations ranged between 0.0114 for local rice to 0.308 for yam (Table 2). These R^2 values are not uncommonly low in consumption analysis when dealing with cross-sectional data as evidently pointed out by Haq *et al*.(2011). In a related research, Hina and Abbas (2021) in their study on consumption pattern in Pakistan reported low R^2 values. The positivity and significant of the intercepts of six commodities (local rice, foreign rice, yam, spaghetti, indomie and groundnut oil) at equal or less than 10% probability level, indicate an exogenous/external increase in the demand for these commodities that is independent of the changes in prices and income. Besides, for the food commodities with positive intercepts, it implies consumption of the respective commodities irrespective of prices and income changes, while negative intercepts implies di-saving to meet consumption needs of the respective commodities even if income is not generated by a household. In the LA-AIDS matrix, out of the 224 estimated slope coefficients, 69 parameter estimates were different from zero at 10 percent error gap (Table 2).

Expenditure/Income Elasticity

Except maize, garri and palm oil, empirically the expenditure elasticity showed all the remaining food commodities to be normal goods as evident from their respective elasticity estimates that were positive signed (Table 1). Further, seven commodities (millet, yam, Irish potatoes, semovita, indomie, fish and groundnut oil); five commodities (local rice, foreign rice, beans, spaghetti and meat); and, three commodities (maize, garri and palm oil) were found to be luxury, necessity and inferior commodities respectively, vis-à-vis their respective coefficients that were greater than unit, less than unity and negative. Necessities are the commodities that are common in the food baskets of households, i.e. everyday goods or goods purchased at all the times by households and easy to afford. Therefore, local rice, foreign rice, beans, spaghetti and meat are more affordable compared to millet, yam, Irish potatoes, semovita, indomie, fish and groundnut oil. Except foreign rice, all the normal goods have relative high expenditure elasticities, thus implying that most of the households, especially the poor, face tight budgetary constraints and they deemed all these food commodities to be very important as they fulfill their fundamental needs. For the commodities identified to be luxury, an increase in income will lead to an increase in their budget shares while for the necessary goods, any increase in the households' income will lead to a decrease in the budgetary expenditure of any given household in the study area. In other words, for the luxury foods, their demands will increase if the households' real income increases in tandem with the overall economic growth of the study area. However, if the households' real income depletes, in relative terms, less expenditures will be apportioned to these goods. For the necessary goods, if the relative income of households increases, less expenditure will be budgeted for these commodities while if the reverse is the case (decrease in households' real income), more expenditures will be budgeted for these commodities. Nonetheless, for the inferior commodities, neither an increase nor a decrease in income will affects the demand for these commodities. It is worth to mention that necessary/necessity goods are income inelastic while luxury goods are income elastic. It can be inferred that the growth for millet, yam, Irish potatoes, semovita, indomie, fish and groundnut oil in the study area will surpass the growth in the income. Nevertheless, given a fixed supply for millet, an upward shift of the demand curves will imply that the market equilibrium prices will increase. Since the own-price elasticity of millet is greater than unity, it is anticipated that the increase in the price due to the shift in the demand curve will lead to an increase in the demand for millet by more than the proportionate price change. Consequently, as households' expenditures increases, likewise diversifying their diets, they tend to increase their consumption of non-staple commodities rather than the staple commodities.

Price Elasticity

Own-price elasticity

Uncompensated price elasticity is the elasticity that is not adjusted for income while compensated price elasticity is adjusted for real income changes so as to maintaining consumers' utility. Besides, the former and latter respectively are composed of two effects (income and substitution effects) and one effect (substitution effect). For the own price elasticity, it shows the responsiveness of demand for a particular commodity to a change in the real prices; while for the cross price elasticity, it reflects the responsiveness of demand for a particular good to a change in the real price after real income compensation of the consumers. The uncompensated own price elasticity shows the responsiveness of a good to a change in its own price while the compensated own price elasticity shows the responsiveness of a commodity to a change in the price of other commodity(s).

Table 2: LA/AIDS food expenditure parameter estimates

Variable	Local rice		Foreign rice		Beans		Maize		Millet		Yam		Irish potatoes	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
α	0.1626	2.1416	0.24944	2.3702	-0.01102	-0.2534	-0.03532	-1.3309	0.043106	1.4826	0.066637	3.6438	-0.09419	-
β	-0.00662	-0.1629	-0.09834	-2.22	-0.01599	-1.1721	-0.03515	-4.1769	0.00305	0.3885	0.001903	0.1916	0.040643	3.6705
γ_1	-0.41761	-0.9503	0.18538	0.4323	0.12536	0.8761	-0.10297	-1.1168	-0.05449	-0.6921	0.031586	0.4137	0.20401	1.5788
γ_2	0.18538	0.4323	-0.05329	-0.0751	0.029499	0.1439	0.24407	1.8511	-0.01854	-0.1612	0.039624	0.4225	-0.17627	-0.855
γ_3	0.12536	0.8761	0.029499	0.1439	0.2744	1.9728	-0.01794	-0.2833	0.01167	0.1907	0.038459	1.1399	0.073183	0.6373
γ_4	-0.10297	-1.1168	0.24407	1.8511	-0.01794	-0.2833	0.10254	1.7855	-0.01537	-0.4093	-0.01272	-0.5938	-0.13123	-1.8431
γ_5	-0.05449	-0.6921	-0.01854	-0.1612	0.01167	0.1907	-0.01537	-0.4093	0.17933	2.8939	-0.00055	-0.0307	-0.01744	-0.1696
γ_6	0.031586	0.4137	0.039624	0.4225	0.038459	1.1399	-0.01272	-0.5938	-0.00055	-0.0307	0.16925	6.4414	0.028837	0.9749
γ_7	0.20401	1.5788	-0.17627	-0.855	0.073183	0.6373	-0.13123	-1.8431	-0.01744	-0.1696	0.028837	0.9749	1.0852	0.0002
γ_8	0.055362	0.4879	0.2587	1.4004	-0.22216	-2.1238	-0.09525	-1.4854	-0.05598	-0.5612	-0.0559	-2.1654	-1.4721	-0.0027
γ_9	0.02987	0.2347	0.43074	2.2748	-0.01434	-0.1416	0.018432	0.2916	0.14786	2.261	0.020682	0.7141	-0.29205	-2.163
γ_{10}	-0.27951	-1.7229	0.17353	0.7666	-0.00714	-0.0697	0.005939	0.0896	0.049421	0.8093	-0.0637	-1.6537	-0.1686	-1.4884
γ_{11}	0.10751	1.0938	-0.02248	-0.2085	-0.09298	-2.6786	0.002714	0.1274	-0.02066	-1.0553	0.049327	2.068	-0.00736	-0.2604
γ_{12}	-0.16159	-0.6533	-0.95474	-2.4471	-0.22025	-1.0704	0.1672	1.2906	0.17757	1.0415	-0.10938	-1.9576	0.41312	-
γ_{13}	0.053463	0.4296	-0.03589	-0.1784	0.22336	2.011	-0.12401	-1.8087	-0.11737	-1.1916	-0.01464	-0.5183	0.3581	0.6637
γ_{14}	0.028624	0.1948	0.060269	0.2859	-0.19426	-1.9806	0.026337	0.4174	-0.10894	-1.8852	-0.08673	-2.5127	0.031374	0.2908
γ_{15}	0.19502	0.9972	-0.1606	-0.5954	-0.00685	-0.0587	-0.06775	-0.8978	-0.15651	-2.2245	-0.03414	-0.7614	0.071172	0.6098
R^2	0.014443		0.085527		0.122492		0.181536		0.114725		0.30834		0.124387	
R^{2*}	0.184612		0.093726		0.07825		0.04527		0.217513		0.230027		0.157405	

Source: Field survey, 2022

Table 2: Continued …….

Variable	Garri		Semovita		Spaghetti		Indomie noodles		Fish		Meat		fish	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
α	-0.08745	-0.0002	0.059293	1.4278	0.10717	2.0926	0.31093	8.159	0.14619	-	0.031788	0.3065	-0.04119	-0.9751
β	-0.0445	-4.694	0.013373	1.168	-0.02154	-1.3244	0.1401	4.8247	-0.02259	-1.0187	0.026679	2.4608	-0.05191	-3.7117
γ_1	0.055362	0.4879	0.02987	0.2347	-0.27951	-1.7229	0.10751	1.0938	-0.16159	-0.6533	0.053463	0.4296	0.028624	0.1948
γ_2	0.2587	1.4004	0.43074	2.2748	0.17353	0.7666	-0.02248	-0.2085	-0.95474	-2.4471	-0.03589	-0.1784	0.060269	0.2859
γ_3	-0.22216	-2.1238	-0.01434	-0.1416	-0.00714	-0.0697	-0.09298	-2.6786	-0.22025	-1.0704	0.22336	2.011	-0.19426	-1.9806
γ_4	-0.09525	-1.4854	0.018432	0.2916	0.005939	0.0896	0.002714	0.1274	0.1672	1.2906	-0.12401	-1.8087	0.026337	0.4174
γ_5	-0.05598	-0.5612	0.14786	2.261	0.049421	0.8093	-0.02066	-1.0553	0.17757	1.0415	-0.11737	-1.1916	-0.10894	-1.8852
γ_6	-0.0559	-2.1654	0.020682	0.7141	-0.0637	-1.6537	0.049327	2.068	-0.10938	-1.9576	-0.01464	-0.5183	-0.08673	-2.5127
γ_7	-1.4721	-0.0027	-0.29205	-2.163	-0.1686	-1.4884	-0.00736	-0.2604	0.41312	-	0.3581	0.6637	0.031374	0.2908
γ_8	1.1579	0.0004	-0.05765	-0.4572	-0.00082	-0.0081	-0.03308	-1.3578	0.20159	0.0001	0.093315	0.1711	0.13833	1.3951
γ_9	-0.05765	-0.4572	-0.01671	-0.1145	0.11856	1.2046	-0.02211	-0.7651	-0.31235	-1.3655	0.22304	1.6992	-0.2042	-2.1373
γ_{10}	-0.00082	-0.0081	0.11856	1.2046	0.4352	2.9132	-0.02152	-0.5316	0.3283	1.6412	-0.23993	-2.212	-0.07274	-0.6999
γ_{11}	-0.03308	-1.3578	-0.02211	-0.7651	-0.02152	-0.5316	0.15277	2.1374	-0.01206	-0.2149	-0.05407	-1.9603	-0.01677	-0.4764
γ_{12}	0.20159	0.0001	-0.31235	-1.3655	0.3283	1.6412	-0.01206	-0.2149	1.2446	-	-0.39096	-0.4705	-0.15964	-0.8139
γ_{13}	0.093315	0.1711	0.22304	1.6992	-0.23993	-2.212	-0.05407	-1.9603	-0.39096	-0.4705	0.080058	0.1467	0.21338	1.9833
γ_{14}	0.13833	1.3951	-0.2042	-2.1373	-0.07274	-0.6999	-0.01677	-0.4764	-0.15964	-0.8139	0.21338	1.9833	0.12417	0.9124
γ_{15}	0.087708	0.8377	-0.06977	-0.636	-0.25698	-2.0559	-0.00923	-0.1979	-0.21136	-0.9797	-0.26784	-2.3623	0.2208	1.8957
R^2	0.268784		0.10367		0.133075		0.201846		0.027294		0.253684		0.185017	
R^{2*}	0.175249		0.290605		0.219814		0.178791		-0.02289		0.242288		0.093943	

Source: Field survey, 2022

Table 2: Continued …… (G/Oil)

Variables	Coeff.	SE	t-stat
α	0.092023	0.050192	1.8334
β	0.070887	0.018621	3.8067
γ_1	0.19502	0.19555	0.9972
γ_2	-0.1606	0.26973	-0.5954
γ_3	-0.00685	0.1167	-0.0587
γ_4	-0.06775	0.075458	-0.8978
γ_5	-0.15651	0.070358	-2.2245
γ_6	-0.03414	0.04484	-0.7614
γ_7	0.071172	0.11671	0.6098
γ_8	0.087708	0.10471	0.8377
γ_9	-0.06977	0.10971	-0.636
γ_{10}	-0.25698	0.125	-2.0559
γ_{11}	-0.00923	0.046631	-0.1979
γ_{12}	-0.21136	0.21574	-0.9797
γ_{13}	-0.26784	0.11338	-2.3623
γ_{14}	0.2208	0.11648	1.8957
γ_{15}	0.66633	0.20383	3.2691
R^2		0.252395	
R^{2*}		0.334646	

Source: Field survey, 2022

Note: R^2 = values of expenditure share; R^{2*} = values of quantity; Coeff. = coefficient; SE = Standard error

The uncompensated own price elasticity of local rice, foreign rice, semovita and indomie noodles being negative, signifies they are everyday food commodities in the food baskets of most households in the study area (Table 2). However, the remaining eleven food commodities can be categorized as Giffen commodity owing to their positive own price elasticity coefficients. A Giffen good in economics is referred to as a low income, non-luxury good that defies standard economic and consumer demand theory. The demand for a Giffen commodity increases with the rise in its price and vice-versa. This is quite possible in the study area because most of the households are low income earners, thus makes these food commodities to be low income goods with very little or no-substitutes. The expenditure elasticity of those food commodities that are negative and greater than unity, thus consistent with the demand theory, implies that households are highly sensitive to a price change in these commodities. In other words, local rice, foreign rice and semovita showed a very elastic behavior with respect to their elasticity magnitudes of -3.39, -1.29 and -1.44 respectively; while indomie noodle was inelastic. Therefore, a change in the price of the former will lead to a more than proportionate change in their respective demand; while it will lead to a decrease in the case of the latter.

Furthermore, based on the uncompensated own price elasticity estimate, the empirical evidence showed that if the prices of the local rice, foreign rice and semovita plummet by 1 percent, their demands would surge by 3.39, 1.29 and 1.44 percent respectively. As defined for complemented own price elasticity, out of this demand increase, price effect, i.e. substitution effect is purely responsible for 3.23, 1.23 and 1.39 percent respectively for the aforementioned commodities while the income effect due to the declined price accounts for 0.16 (3.39-3.23), 0.06 and 0.05 percent rise in the demand for the respective commodities as a result of increase in the real/relative income. Though, the absolute/nominal money income remains unchanged. However, due to the small budget shares of these commodities in the households' food basket, income effect is relatively small on their respective demands. In other words, changes in their respective prices had minimal effect on the households' relative/real income. Further, if a 1 percent increase in a per capita income is accompanied a percent decline in the price of any of these foregoing commodities, the demand for the local rice, foreign rice and semovita would rise by 4.35 (3.39 + 0.96), 1.67 and 2.78% respectively. Though, the rise in the per capita income represents a shift in the commodity (local rice/foreign rice/semovita) demand curve that normally leads to a surge in the commodity price. A compensation for a particular commodity is worthless if there is no distinction between the uncompensated and compensated own price elasticities. Consequently, based on the empirical evidences, uncompensated vis-à-vis compensated own price elasticities of all

the food items were approximately similar, and this might be attributed to their proportions in the total households' budgetary expenditures being marginal-to-small. However, for food items *viz*. local rice, indomie and groundnut oil that showed to some extent a reasonable margin, it is suggested that government should indemnify the households when it observes a surge in the prices of these food items to enable the consumers to maintain a status quo ante in their welfare level in case of price change in the study area.

Cross price elasticity

The degree of the responsiveness of demand for a good to a change in the price of another commodity is called cross elasticity. Positive and negative cross price elasticity respectively, imply that two goods are substitute and complements. The uncompensated cross price elasticity gives the 'gross cross' effect that includes both the substitution and income effects while the compensated cross price effect, the 'net effect' of price change on demand, represents only the substitution effect, i.e., the pure price effect. The empirical evidence showed that the uncompensated cross price elasticity has a total of 103 gross substitute and 122 complement commodities (Table 3a) while the compensated cross price elasticity has a total of 107 and 118 commodities that are net substitutes and complements respectively (Table 3b). The positive sign associated with the cross price elasticity of demand for local rice to the respective prices of foreign rice, beans, yam and semovita implies that the local rice and the commodities in pair are substitutes. In a nutshell, for example, the positive cross price elasticity of demand for local rice due to change in the price of foreign rice indicates that the duo commodities are substitute. The cross price elasticity of local rice-to-foreign rice, local rice-to-beans, local rice-to-yam, and local rice-to-semovita are positive because the price of the former in relation to the demand for the latter moves in the same direction. The pure price or substitution effect of 10% fall in local rice price will lead to a decrease in the demand of beans and yam by 7.69 and 2.26 percent respectively. The increase in the relative/real income, i.e. income effect, due to the fall in the local rice price will induced the consumers to plummet their beans and yam demands by 0.48 (i.e., 7.69-7.21) and 0.43 percent respectively. Furthermore, the cross price elasticity of demand for local rice due to a change in the price of meat being negative sign means that both commodities are complement. The pure price effect of a 10% fall in the price of local rice will lead to a decrease in the demand for meat by 8.40%. The increase in the relative income due to the decrease in the local rice price will make the consumers to increase the demand for meat by 0.86% (i.e., 9.26-8.40).

Between the uncompensated and compensated cross elasticities, the signs associated with some elasticity estimates differ. For example, millet-to-yam cross elasticity, the empirical evidence showed the uncompensated cross price elasticity to be negative, indicating the duo goods to be gross complement whereas the compensated cross price elasticity was positive, implying the two commodities to be net substitute. Given that yam has a relative high income elasticity of demand, an increase in the relative income due to a decrease in the price of millet will lead to a rise in the demand for yam. Since the price effect is lower than the income effect, thus it can be inferred that a fall in the pure price of millet will lead to an increase in the demand for yam. More uncertainty/ambiguity exists with respect to uncompensated cross-price elasticity. The significant cost impacts, however, undoubtedly have an impact. When looking for information on possible substitutions, compensated cross price elasticity is the most suitable.

Households' Demand Projection

The empirical evidence of households' projected demand of food commodities from 2022 to 2042 (four years interval) for the total demand (million metric ton) per year showed that local rice, Irish potatoes and indomie noddles will witness a steep rise in their future demand while the demand for foreign rice, yam, semovita, spaghetti and groundnut oil will be marked by a gentle rise in the future (Table 4 and Figures 2-3). Besides, the rise in the future demand for beans, millet, meat and fish will be marginal; though plato, the future demand for palm oil will witness a slight marginal increase. However, the future demand for garri will be on the decrease and this might be attributed to the status (inferior) of the commodity in the study area. Generally, the total demand for local rice, foreign rice, beans, maize, millet, yam Irish potatoes, garri, semovita, spaghetti, indomie noodles, meat, fish, palm oil and groundnut oil will increase respectively from 13.83, 12.02, 3.79, 1.46, 1.76, 3.39, 2.77, 1.42, 3.19, 5.03, 10.23, 6.71, 2.83, 3.32 and 6.05 million metric (MMT)/year in 2022 to 43.47, 27.32, 10.16, 1.81, 6.10, 11.15, 17.01, 1.35, 12.34, 13.41, 59.97, 18.68, 13.67, 5.57 and 32.84 MMT/year in the year 2042. Furthermore, on per capita basis (kg/year), local rice, Irish potatoes and indomie noodles will witness a steep increase in their future demand; whereas, yam, semovita, groundnut oil and meat will witness a gentle rise in their respective future demand. Besides, the future per capita demand of foreign rice, beans, millet, spaghetti and meat will be marked by a marginal rise.

Table 3a: Uncompensated own and cross price elasticities of demand for food items

Food	With respect to price							
	Rice (L)	Rice (F)	Beans	Maize	Millet	Yam	Irish	Garri
Rice (L)	-3.39217	1.067341	0.721301	-0.59188	-0.31202	0.183179	1.174451	0.31721
Rice (F)	1.266132	-1.29179	0.206292	1.52343	-0.10127	0.277113	-1.06112	1.60987
Beans	2.593545	0.619753	4.569141	-0.36699	0.24424	0.794034	1.505568	-4.50641
Maize	-4.62451	11.74311	-0.7966	3.866031	-0.6915	-0.5282	-6.13199	-4.57147
Millet	-2.55893	-0.87227	0.538052	-0.7134	7.340187	-0.03237	-0.82144	-2.60191
Yam	0.702559	0.887447	0.862719	-0.28531	-0.01349	2.801114	0.64491	-1.25518
Irish	5.770196	-5.24004	2.100559	-3.82666	-0.53916	0.788656	30.67372	-43.0558
Garri	2.986852	12.44141	-10.4861	-4.55123	-2.60955	-2.55856	-69.8162	53.99277
Semovita	0.701837	10.92124	-0.37605	0.47225	3.74862	0.509739	-7.44507	-1.45786
Spaghetti	-4.2621	2.703598	-0.09883	0.087928	0.771564	-0.96856	-2.58072	-0.01942
Indomie	0.660499	-0.25256	-0.7696	0.033998	-0.18926	0.336874	-0.13697	-0.23805
Meat	-1.77801	-10.7408	-2.47306	1.881098	2.00713	-1.22075	4.673388	2.26641
Fish	1.37047	-1.05559	6.224011	-3.46131	-3.30239	-0.44428	9.966369	2.626083
Palm Oil	0.824123	1.408538	-4.24693	0.567979	-2.37601	-1.86061	0.774409	3.029253
G/Oil	2.479174	-2.24049	-0.12589	-0.90625	-2.14246	-0.50682	0.894843	1.206897

Source: Field survey, 2022

Table 3b: Compensated own and cross price elasticities of demand for food items

Food	With respect to price							
	Rice (L)	Rice (F)	Beans	Maize	Millet	Yam	Irish	Garri
Rice (L)	-3.22468	1.220749	0.768795	-0.57169	-0.29135	0.22599	1.207324	0.33745
Rice (F)	1.332872	-1.23066	0.225217	1.531476	-0.09303	0.294172	-1.04802	1.617935
Beans	2.71126	0.72757	4.60252	-0.3528	0.258772	0.824122	1.528671	-4.49218
Maize	-4.74198	11.63552	-0.82991	3.851869	-0.706	-0.55823	-6.15504	-4.58566
Millet	-2.36012	-0.69018	0.594427	-0.68943	7.36473	0.018448	-0.78242	-2.57789
Yam	0.884112	1.053734	0.914201	-0.26343	0.008922	2.84752	0.680542	-1.23324
Irish	6.151385	-4.8909	2.208649	-3.78071	-0.4921	0.88609	30.74854	-43.0097
Garri	2.792725	12.26361	-10.5411	-4.57464	-2.63351	-2.60818	-69.8543	53.96931
Semovita	0.935107	11.1349	-0.3099	0.500372	3.777417	0.569364	-7.39929	-1.42967
Spaghetti	-4.14592	2.810003	-0.06589	0.101934	0.785905	-0.93886	-2.55792	-0.00538
Indomie	1.026504	0.082666	-0.66581	0.078122	-0.14408	0.430427	-0.06513	-0.19382
Meat	-1.64823	-10.622	-2.43626	1.896744	2.023151	-1.18758	4.698859	2.282093
Fish	1.674547	-0.77708	6.310236	-3.42466	-3.26485	-0.36656	10.02605	2.662828
Palm Oil	0.798818	1.385361	-4.2541	0.564929	-2.37913	-1.86707	0.769443	3.026195
G/Oil	2.820391	-1.92796	-0.02913	-0.86512	-2.10033	-0.4196	0.961812	1.24813

Source: Field survey, 2022

Table 3a: Continued ……

Food	With respect to price						
	Semovita	**Spaghetti**	**Indomie**	**Meat**	**Fish**	**Palm Oil**	**G/Oil**
Rice (L)	0.173523	-1.6037	0.627235	-0.37133	0.309362	0.164302	1.125383
Rice (F)	2.732969	1.115777	0.017321	-5.94523	-0.18788	0.376268	-0.92121
Beans	-0.27366	-0.13016	-1.80028	-4.43928	4.543726	-3.93575	-0.09358
Maize	0.964776	0.357923	0.559151	8.079171	-5.80713	1.250212	-2.99428
Millet	6.871927	2.293067	-0.99743	8.252254	-5.46963	-5.06831	-7.30168
Yam	0.462534	-1.43322	1.097425	-2.46082	-0.33153	-1.94883	-0.7731
Irish	-8.60817	-4.98719	-0.52078	12.00899	10.40776	0.92136	1.917125
Garri	-2.63048	0.055558	-1.02946	9.724636	4.562798	6.569111	4.463371
Semovita	-1.44219	2.997353	-0.64896	-7.95947	5.64664	-5.18772	-1.82018
Spaghetti	1.848814	5.737974	-0.24701	5.094223	-3.68652	-1.12464	-3.92356
Indomie	-0.23092	-0.21862	-0.0811	-0.16954	-0.49181	-0.12896	-0.22615
Meat	-3.50647	3.710768	-0.07051	13.04135	-4.39008	-1.79955	-2.34626
Fish	6.202169	-6.74698	-1.70443	-10.9899	1.195075	5.972721	-7.59847
Palm Oil	-4.44662	-1.55379	-0.0761	-3.44487	4.777472	1.73686	5.031614
G/Oil	-0.99435	-3.52246	-0.37133	-2.92691	-3.68446	2.992247	7.888445

Source: Field survey, 2022
Note: L = Local; F = Foreign

Table 3b: Continued …….

Food	With respect to price						
	Semovita	**Spaghetti**	**Indomie**	**Meat**	**Fish**	**Palm Oil**	**G/Oil**
Rice (L)	0.211384	-1.54143	0.749518	-0.84014	0.343742	0.207899	1.196432
Rice (F)	2.748056	1.140591	0.066047	-5.91121	-0.17418	0.39364	-0.89289
Beans	-0.24705	-0.0864	-1.71434	-4.37928	4.567889	-3.90511	-0.04365
Maize	0.938222	0.314248	0.473388	8.019295	-5.83124	1.219635	-3.04411
Millet	6.916867	2.366983	-0.85228	8.35359	-5.42882	-5.01656	-7.21735
Yam	0.503573	-1.36572	1.229973	-2.36828	-0.29427	-1.90157	-0.69609
Irish	-8.52201	-4.84547	-0.24248	12.20328	10.48601	1.020583	2.078824
Garri	-2.67436	-0.01662	-1.17119	9.625687	4.52295	6.51858	4.381024
Semovita	-1.38946	3.08408	-0.47866	-7.84057	5.694523	-5.127	-1.72123
Spaghetti	1.875075	5.781166	-0.16219	5.153437	-3.66267	-1.0944	-3.87428
Indomie	-0.14819	-0.08255	0.186118	0.017014	-0.41668	-0.03369	-0.07089
Meat	-3.47714	3.759019	0.024236	13.1075	-4.36344	-1.76577	-2.29121
Fish	6.270905	-6.63393	-1.48243	-10.8349	1.257492	6.051872	-7.46948
Palm Oil	-4.45234	-1.56319	-0.09457	-3.45777	4.772278	1.730273	5.02088
G/Oil	-0.91722	-3.3956	-0.12222	-2.75299	-3.61442	3.081065	8.033187

Source: Field survey, 2022

However, the future per capita demand of maize, garri and palm oil will plummet, i.e. will witness a marginal decline and the possible reason may be attributed to cultural consumption behavior of the study area towards these commodities. Generally, it can be inferred that the changes in the households' consumption expenditures in the study area owes to rise in income, population growth and cultural consumption behavior.

Consumption Constraints

To determine the common factors affecting consumption, the varimax rotation applied to the fifteen variables showed only five factors to be interpretable as evident by their respective Eigen values that were greater than unity (Table 5). From the total variance, the combined variance of these factors is 74.80%, wherein factors 1, 2, 3, 4 and 5 variances are 24.96, 17.87, 14.25, 10.14 and 7.59% respectively. Besides, Hair *et al*.(1998) as reported by Bagheri and Fami (2016) adjudged a contributory variance value of 70% or above to be satisfactory in social sciences. The Keiser-Meyer-Olkin (KMO) measure of sampling adequacy value being 0.51, a mediocre level, indicates that the R-matrix has a common factor; the correlation pattern is relatively compact and the factor analysis yielded distinct and reliable factors for prediction with certainty, efficiency and accuracy. Thus, the KMO value is within the threshold recommended to be acceptable by Keiser (1974) as cited by Field (2005).

Table 4: Projected total and per capita food demand from 2022 to 2042

Food	Total demand (million metric ton)						Per capita demand (kg)					
	2022	**2026**	**2030**	**2034**	**2038**	**2042**	**2022**	**2026**	**2030**	**2034**	**2038**	**2042**
Rice (L)	13.82966	16.99662	21.49368	27.18058	34.37216	43.46651	2975.144	3241.146	3633.173	4072.617	4565.213	5117.391
Rice (F)	12.02421	14.0399	16.58264	19.58589	23.13305	27.32264	2586.741	2677.317	2803.038	2934.662	3072.467	3216.743
Beans	3.790192	4.54224	5.554289	6.791831	8.305107	10.15555	815.3756	866.1758	938.8666	1017.658	1103.061	1195.632
Maize	1.46408	1.553079	1.614029	1.677372	1.7432	1.811612	314.9644	296.1621	272.8267	251.3299	231.5269	213.2843
Millet	1.757009	2.193629	2.832883	3.658424	4.72454	6.101335	377.9815	418.3109	478.855	548.162	627.5001	718.3211
Yam	3.391904	4.19826	5.359408	6.841704	8.733972	11.1496	729.6929	800.581	905.925	1025.13	1160.022	1312.662
Irish	2.76826	3.781967	5.507383	8.01997	11.67886	17.007	595.5297	721.1966	930.9378	1201.677	1551.153	2002.265
Garri	1.415768	1.441704	1.418843	1.396345	1.374204	1.352414	304.5711	274.9236	239.8335	209.2221	182.5179	159.2221
Semovita	3.185209	4.045848	5.346279	7.064699	9.335459	12.3361	685.227	771.5171	903.7057	1058.543	1239.91	1452.351
Spaghetti	5.028564	6.021609	7.355583	8.985075	10.97555	13.40698	1081.784	1148.282	1243.348	1346.284	1457.742	1578.428
Indomie	10.23004	13.87317	20.00413	28.84454	41.59179	59.97243	2200.766	2645.523	3381.388	4321.937	5524.105	7060.662
Meat	6.706847	8.087015	9.969985	12.29138	15.15329	18.68157	1442.829	1542.141	1685.272	1841.686	2012.618	2199.415
Fish	2.825447	3.717064	5.147113	7.127337	9.869403	13.66641	607.8322	708.8201	870.0397	1067.928	1310.826	1608.971
Palm Oil	3.315599	3.691564	4.092181	4.536274	5.02856	5.574271	713.2775	703.9575	691.7199	679.695	667.8792	656.2689
G/Oil	6.048505	8.103717	11.49774	16.31325	23.14561	32.83952	1301.201	1545.326	1943.515	2444.305	3074.135	3866.255

Source: Field survey, 2022

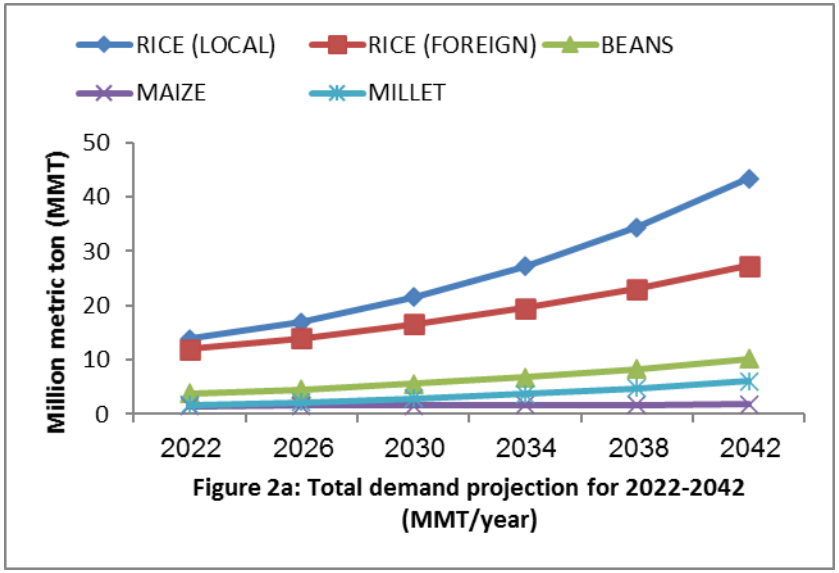

Figure 2a: Total demand projection for 2022-2042 (MMT/year)

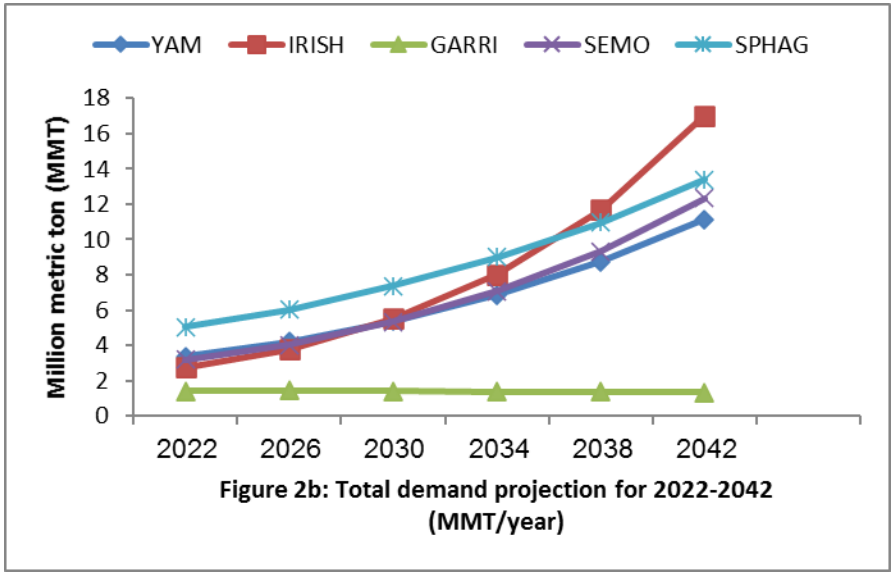

Figure 2b: Total demand projection for 2022-2042 (MMT/year)

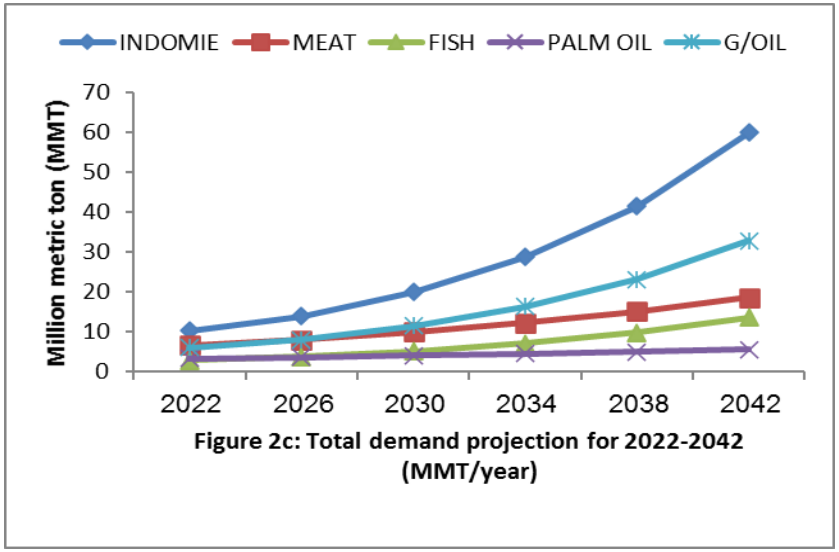

Figure 2c: Total demand projection for 2022-2042 (MMT/year)

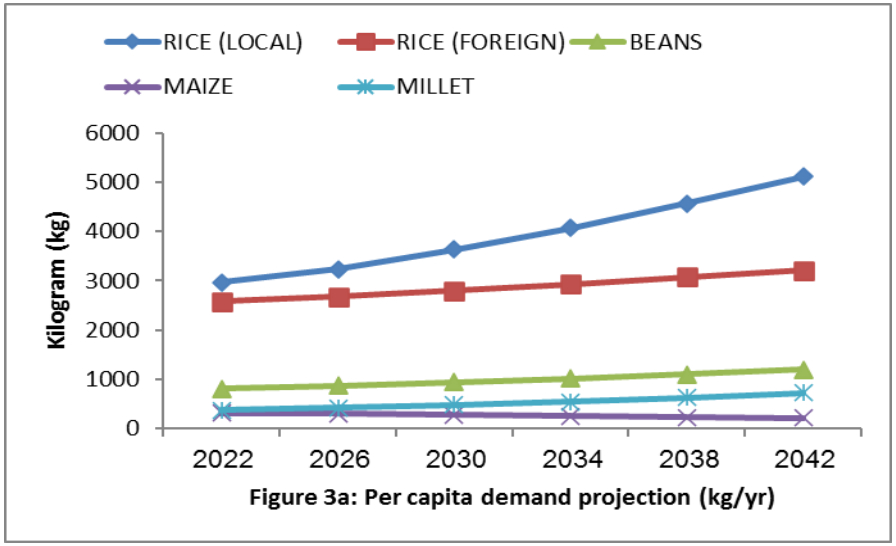

Figure 3a: Per capita demand projection (kg/yr)

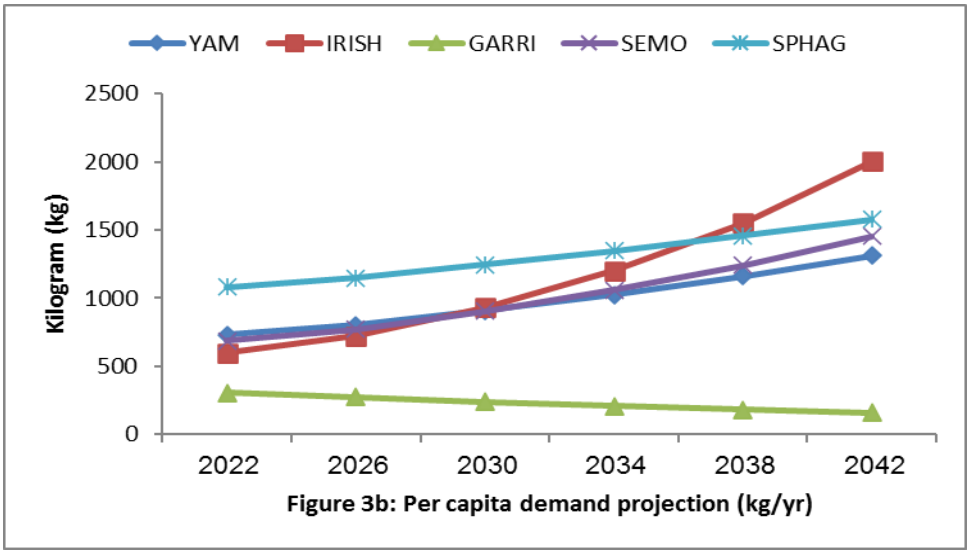

Figure 3b: Per capita demand projection (kg/yr)

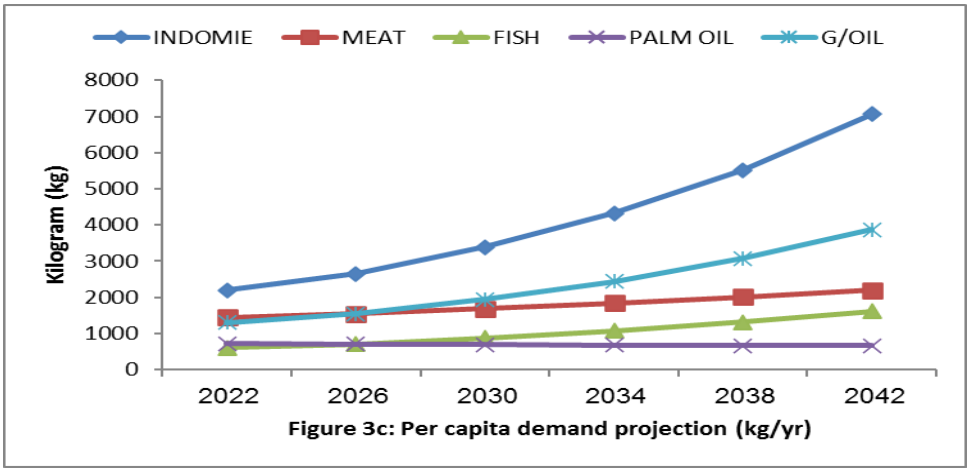

Figure 3c: Per capita demand projection (kg/yr)

Further, the Bartlett's test of Sphericity (BTS) being different from zero at 1% probability level implies that the R-matrix is not an identity matrix. Besides, each factor has an internal consistency in its factor loadings as evident by their respective Cronbach's Alpha test of reliability that is not less than 0.70, thus satisfactory reliable. A value less than 0.70 indicate unsatisfactory internal consistency reliability (Malhotra, 2009; Youssef *et al*., 2012). According to Nunnally (1978); Nunnally and Bernstein (1994); as cited by Prunomo and Lee (2010); Youssef *et al*.(2012); Sadiq *et al*.(2017); Sadiq *et al*.(2018a&b), the acceptable reliability estimates is within the range of 0.70 and above for social sciences.

Following Bagheri and Fami (2016); Sadiq *et al*.(2017); Sadiq et al.(2018a&b), for the extracted factors, factor loadings whose absolute values were less than 0.40 were out rightly excluded. In labeling the factor that was loaded from two factors, only the higher factor score was considered. The extracted factors affecting consumption were labeled inflationary, population explosion, occupational, debt and economic challenges. The dimension labeled "inflationary challenge", showed households concern on the effect of high inflation rate such as low monthly income, high cost of non-food expenditure, saving for future, high food price and misery instincts that inhibited their consumption. The dimension labeled "population explosion challenge", points to the households concern on the social menace such as vulnerability of households to population explosion-overdependence ratio and insecurity/theft that affected their consumption. The dimension labeled "occupational challenge", showed households concern on occupational hazards such as loss of employment and incessant salary cut that affected their consumption. The dimension labeled "debt challenge", showed households concern on how debt impaired them from access to good health care, thus affects their consumption. Lastly, the dimension labeled "economic challenge", showed households concern on economic woes such as the need to bequeath fortune and lack of steady income that affected their consumption.

Table 5: Constraints affecting households' food consumption pattern

Constraints	F1	F2	F3	F4	F5
Loss of employment			0.866		
Reduced salary		-0.423	0.682		
Sickness/ health expenditures				0.721	
Death of household head			-0.714		
High food prices	0.749	0.424			
Debt to reimburse				0.824	
Insecurity/ thefts		0.607			
Large household size	-0.515				0.496
Over dependency ratio		0.868			
Lack of steady income					0.755
Low monthly income	0.849				
High cost of non-food expenditure	0.846				
The need to bequeath fortune					0.811
Savings for future	0.761				
Misery instincts	0.615	-0.516		0.462	
Cronbach's Alpha	0.839	0.727	0.743	0.712	0.750
Eigen value	3.744	2.681	2.137	1.521	1.138
% of Variance	24.962	17.873	14.245	10.137	7.587
KMO			0.516		
BTS			1291.895 (0.000)		

Source: Field survey, 2022

CONCLUSION AND RECOMMENDATIONS

Based on the empirical evidence, it was established that food dietary diversity was very low as cereals dominate and this owes to food inflation that inhibited the purchasing powers of the households. Besides, rice, beans, spaghetti and meat were necessary commodities; millet, yam, Irish potatoes, semovita, fish and groundnut oil were luxury goods; while maize, garri and palm oil were inferior goods. In addition, rice, semovita and indomie noodles were every day goods as evident from the uncompensated own price elasticity; likewise, demands for rice and semovita that were highly price sensitive as established by compensated own price elasticity. The uncompensated own price elasticity showed that government should indemnify the households so as to maintain the welfare if it observes a surge in the food prices of local rice, indomie noodles and groundnut oil. Furthermore, it was established that the future per capita demand for local rice, Irish potatoes and indomie noodles will surged. Therefore, in order to bridge the increasing future demand of these commodities in particular, government is advised to increase their productivity. Nevertheless, the determined obstacles to households' food consumption were inflation, households' population explosion, occupational hazards, debt and economic woes. Thus, the study advice policy makers to soften the macro-economic policies, i.e., implements policies that have human-face and are economically friendly.

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