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COMPARATIVE ANALYSIS OF RURAL HOUSEHOLDS' CONSUMPTION EXPENDITURE ON ANIMAL PROTEIN IN OYO STATE, NIGERIA

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ABSTRACT

Nigeria has a deficiency in animal protein intake, especially among rural households. This study investigated rural households' consumption expenditure on animal protein with more emphasis on beef and fish. The study covered selected rural households in two Local Government Areas of Oyo State, Nigeria: Atisbo and Saki West. Data were collected from 150 respondents selected randomly in the study areas. The collected data were analysed using descriptive and inferential statistics, including frequency distributions and percentages, the budget share index, and the Linear Approximate Almost Ideal demand systems (LA-AIDS) model. The mean age of respondents was 44 years, with an average household size of five (5). All respondents (100%) were fish consumers, while 95.4% were beef consumers. The monthly expenditure of beef and fish consumers was N8,667.35 and N7,256.76, respectively. The price per kilogram was positively related to the budget share of fish. Consumers' incomes positively influence the consumption of beef and fish at 5% level of significance. Major constraints to household consumption of beef and fish in the study area included high prices, low incomes, rapid spoilage, and limited supply. It was therefore

recommended that cattle and fish farmers establish markets closer to consumers to increase availability and supply.

Key Words: Budget share, demand, consumers, expenditure, beef and fish

INTRODUCTION

Food is a basic necessity of life. It is consumed to provide nutritional support for an organism. Food is usually of plant, animal, or fungal origin and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, and minerals. Deficiency in both diet quality and quantity is today a global problem (Rahji *et al.,* 2014). Food plays an important role in the development of a nation and in livestock production, as food, in the long run, constitutes a key component of the agricultural economy in developing countries. It is an instrument of socioeconomic change, improved income and quality of rural life in Nigeria. (Sanusi *et al.,* 2017). Eating food with the wrong nutrient composition can lead to malnutrition. Wardlaw *et al.* (2002) define malnutrition as a condition of impaired development caused by either a long–term deficiency or an excess in energy and or nutrient intake. Malnutrition is a state in which adequate nutrients are not delivered to cells to provide the substrates for optimal functioning (Akinyele, 2005). Nigeria, like many other developing countries, faces a worsening protein deficiency. The Nigerian population may not necessarily be at the point of starvation, but the people are highly undernourished.

Proteins are so important in the body because of the essential and non-essential amino acids they contain, and failure to receive even one of these amino acids results in serious health problems and muscle and bone degradation over time, as the body actually strips them from the muscle and bone structures. Proteins in human nutrition can be divided into two types: animal and plant sources. The animal sources of protein are richer in these essential amino acids than proteins from plant sources. The reason is that animal sources of protein contain all 20 amino acids required for protein synthesis in the body, whereas no single plant protein source contains all 20 (Adekunmi *et al.*, 2017). However, Nigerian animal protein intake per capita is 9.3g daily, compared with the Food and Agriculture Organisation's recommended minimum daily intake of 35g of protein (FAO/WHO/UNU, 2002).

Beef is a product of livestock farming, which has remained an essential component of the Nigerian agricultural sector. Livestock is a good source of animal protein, which is needed for a proper and balanced diet, and beef is the meat obtained from mature cattle. Beef is a major source of animal protein because it contains many nutrients and nourishing substances needed by the human body. Its high protein content is available for the growth and repair of the body and as a source of energy. It is an important source of several vitamins, minerals and other nutrients, including potassium, phosphorus, sodium, iron, zinc, manic, riboflavin and thiamine. (Dafwang *et al.*, 2001). On the other hand, fish species, according to Imade and Ogieva (2022), are the cheapest source of protein available to man. In Nigeria, fish remains an important dietary element, especially in the southern part of the country, where fish is highly valued and one of the cheapest sources of protein available to many Nigerians (FAO, 2021).

People in rural areas need greater attention to their diets, especially protein intake, to avoid undermining agricultural production. Manson *et al*. (2018) reported that the average Nigerian diet falls 20 per cent short of the recommended requirement. This is no doubt responsible for most problems of malnutrition among all age groups, particularly children and infants, who are less than the recommended requirement. The availability and access to fish and beef within the household can be important determinants of household members' well-being. Most research in Nigeria (Amao *et al*., 2016; Inyang *et al.*, 2018; Barnabas *et al*., 2019) on fish and beef focused on factors affecting demand by urban households. Therefore, this study compares the rural households' consumption expenditures on beef and fish in Oyo State, Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted in two Local Government Areas of Oyo State: Saki West and Atisbo. Oyo State is located in the South-West geopolitical zone of Nigeria. The state lies between latitudes $7°31^{I}$ N and $9°21^{I}$N of the Equator and longitudes $2°47^{I}$ E and $4°23^{I}$E of the Greenwich Meridian. It has a projected population of 7,466,391 in 2018 (National Bureau of Statistics, 2016). It is bounded in the south by Ogun State, in the north by Kwara State, in the west by Ogun State and the Republic of Benin, and in the East by Osun State.

Oyo State's topography is favourable for small, medium and large-scale farming and for tourism. Cash and food crops cultivated include yams, cotton, tobacco, maize, beans, guinea corn, millet, ginger, rice, and cassava. They are also involved in animal rearing, poultry farming and fish farming. The animals reared include cattle, sheep, goats and pigs, while the fish reared include tilapia and catfish. Although livestock resources in the state are still on a small scale, which results in the importation of livestock products from other countries (NPC, 2006)

Sampling procedure

A multi-stage random sampling technique was used to select the households for the study. The first stage involved the random selection of Atisbo and Saki West Local Government Areas of Oyo state. The second stage was the random selection of three villages from the two Local Government Areas, which gave a total of six (6) villages. The villages were Gaa Sambo, Obada, Oore in Atisbo, and Ataye, Koomi, and Barrack in Saki West L.G.A., respectively. These three villages were selected based on the significance of their socioeconomic characteristics as they pertain to the occupation common among the villagers. Five per cent (5%) of the households were randomly selected from the household list obtained from the Oyo State Urban Planning and Development Authority (OSUPDA) in the selected villages. These gave a sample size of 150.

Method of data analysis

The analysis tools employed in the studies include descriptive and inferential statistics. Descriptive statistics, such as means, frequencies, and percentages, were used to summarise the data collected from household heads.

Budget share index:

This was used to estimate the budget share of household expenditure on beef and fish. It is expressed mathematically as:

$$wi = \sum_{i=1}^{n} \left(\frac{xi}{X} \right) \text{ ---------- (1)}$$

Where;

Wi = budget share on each of the animal protein source demanded by the i^{th} household

Xi = expenditure on each of the animal protein source demanded by the i^{th} household (₦/month)

X = Expenditure on all food items consumed by the household ((₦/month), and i=1,2…. n(n= total number of respondents).

The budget share was done separately for each of the animal protein source (beef, fish).

The Linear Approximate Almost Ideal Demand System (LA-AIDS) Model:

The general form of the expenditure share equation for the LA-AIDS model is expressed (equation 2) as follows.

$$wi = ai + \sum_{i=1}^{n} \gamma ij \ln(pi) + \beta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The explicit system of demand equations for beef, fish, chicken, egg and goat meat captured during the survey was estimated simultaneously using Seemingly Unrelated Regression (SURE). Chicken, egg, and goat meat were added as close substitutes.

The equation 3 below is a re-written form of the LA-AIDS model that shows the various parameters.

$$\begin{bmatrix} \boldsymbol{W_B} \\ \boldsymbol{W_F} \\ \boldsymbol{W_C} \\ \boldsymbol{W_E} \\ \boldsymbol{W_M} \end{bmatrix} = \begin{bmatrix} \boldsymbol{a_1} \\ \boldsymbol{a_2} \\ \boldsymbol{a_3} \\ \boldsymbol{a_4} \\ \boldsymbol{a_5} \end{bmatrix} + \begin{bmatrix} \boldsymbol{l_{n\,PB}} \\ \boldsymbol{l_{n\,PF}} \\ \boldsymbol{l_{n\,PC}} \\ \boldsymbol{l_{n\,PE}} \\ \boldsymbol{l_{n\,PM}} \end{bmatrix} \begin{bmatrix} \boldsymbol{\Upsilon_{11}\ldots\Upsilon_{15}} \\ \boldsymbol{\Upsilon_{21}\ldots\Upsilon_{25}} \\ \boldsymbol{\Upsilon_{31}\ldots\Upsilon_{35}} \\ \boldsymbol{\Upsilon_{41}\ldots\Upsilon_{45}} \\ \boldsymbol{\Upsilon_{51}\ldots\Upsilon_{55}} \end{bmatrix} + \begin{bmatrix} \boldsymbol{\beta_1} \\ \boldsymbol{\beta_2} \\ \boldsymbol{\beta_3} \\ \boldsymbol{\beta_4} \\ \boldsymbol{\beta_5} \end{bmatrix} \begin{bmatrix} \boldsymbol{l_n(\frac{x}{p})} \\ \boldsymbol{l_n(\frac{x}{p})} \\ \boldsymbol{l_n(\frac{x}{p})} \\ \boldsymbol{l_n(\frac{x}{p})} \\ \boldsymbol{l_n(\frac{x}{p})} \end{bmatrix} + \begin{bmatrix} \boldsymbol{Z_1} \\ \boldsymbol{Z_1} \\ \boldsymbol{Z_1} \\ \boldsymbol{Z_1} \\ \boldsymbol{Z_1} \end{bmatrix} \begin{bmatrix} \boldsymbol{\delta_{11}\ldots\delta_{15}} \\ \boldsymbol{\delta_{21}\ldots\delta_{25}} \\ \boldsymbol{\delta_{31}\ldots\delta_{35}} \\ \boldsymbol{\delta_{41}\ldots\delta_{45}} \\ \boldsymbol{\delta_{51}\ldots\delta_{55}} \end{bmatrix} + \begin{matrix} \boldsymbol{e_1} \\ \boldsymbol{e_2} \\ \boldsymbol{e_3} \\ \boldsymbol{e_4} \\ \boldsymbol{e_5} \end{matrix} \,\mathbf{..(3)}$$

Where:

W_B = Household budget share on beef

W_F = Household budget share on fish

W_C = Household budget share on chicken

W_E = Household budget share on egg

W_M = Household budget share on goat meat

P_B = Price of beef (Naira/kg)

P_F = Price of fish (Naira/kg)

P_C = Price of chicken (Naira/kg)

Z_1 = Age of household head (years)

Z_2 = Sex (male or female)

Z_3 = Household size (number)

Z_4 = Household income (Naira/month)

Z_5 = Educational level of household head (number of years spent in school)

X = Total household expenditure on all food items (naira)

P = stone's price index, this was used to allow to overcome the problem of non-linearity,
it is represented as lnp = Σ wln(pi),

$\Upsilon_{11.....}\Upsilon_{15}$ = Price coefficient

$\beta_1 - \beta_1 =$ Expenditure coefficient

a_1 - a_6 = Constant terms

$\delta_{1.....}\delta_5$ = Coefficient of demographic variables

$e_{1.....}e_5$ = Error term

RESULTS AND DISCUSSION

The results of the socio-economic characteristics of the respondents, as presented in Table 1, revealed that 71.5% were aged 41-50 years, with a mean age of 44 years. The results imply that the rural households were in the most productive age group. There is a likelihood that they will consume more fish than beef. The study also showed that 57.6% of respondents were male, indicating that men dominated households in the sampled communities. The study indicated that the majority (52.3%) of the respondents have a tertiary education with a mean household size of 5 persons. Table 1 further showed that all the respondents consume fish, while about 95% consume

beef. This means that households preferred fish to beef. This result agrees with the findings of Dauda *et al.,* (2016) who found out that majority of households in Katsina prefer fish to beef and chicken.

Share of household expenditure on beef and fish.

The share of household expenditure on beef and fish is the proportion of total household expenditure on these products. It is the total monthly budget for animal protein food. The findings in Table 2 show that the respondents' average monthly income is about ₦21,041.20. The finding disagrees with that of Robert *et al.* (2012), who reported a mean monthly income of ₦35, 543 in Imo State. Income could be a major determinant of demand and of household budget share allocation.

Table 1: Socio-economic characteristics of respondents in the study area

Variables	Frequency	Percentage	Mean
Sex			
Male	87	57.6	
Female	64	42.4	
Age (Years)			
21-30	9	6.0	
31-40	18	11.9	
41-50	108	71.5	44 years
51-60	15	9.9	
61-70	1	0.66	
Household size			
1-5	93	61.6	5 persons
6-10	57	37.7	
11-15	1	0.66	
Educational level			
Secondary	72	47.7	
Tertiary	79	52.3	
Consumption of beef			
Yes	144	95.4	
No	7	4.6	
Consumption of fish			
Yes	151	100.0	

Source: Data Analysis, 2021

Table 2: **Share of Monthly Household Expenditure on Beef and Fish**

Variables	Frequency	Percentage	Mean
Household income (₦)			
10,000-20,000	35	23.2	
20,001-30,000	52	34.4	₦21,041.20
30,001- 40,000	36	23.8	
40,001-50,000	16	10.6	
50,001-60,000	5	3.3	
60,001-70,000	2	1.3	
70,001-80,000	5	3.3	
Expenditure on beef			
0-3,000	18	11.9	
3,001-6,000	49	32.5	₦8,667.35
6,001-9,000	25	16.6	
9,001-12,000	38	25.2	
12,001-15,000	7	4.6	
15,001-18,000	1	0.7	
18,001-21,000	7	4.6	
>21,000	6	4.0	
Expenditure on fish			
0-3,000	38	25.2	
3,001-6,000	49	32.9	₦7,256.76
6,001-9,000	20	13.2	
9,001-12,000	27	17.9	
12,001-15,000	8	3.3	
15,001-18,000	1	0.7	
18,001-21,000	4	2.6	
>21,000	4	2.6	
Expenditure on foodstuff			
<10,000	19	12.6	
10,001-20,000	73	48.3	
>20,000	59	39.1	₦40,920

Source: Field survey, 2021

The budget share for beef and fish, as presented in Table 2, was ₦8,667.35 (21.18%) and ₦7,256.76 (17.73%), respectively. This implies that beef constituted a large proportion of household expenditure, followed by fish among the animal protein foods included in the system.

The results align with Yusuf's (2012) findings, which reported that a large proportion of the household's monthly expenditure on animal protein is spent on beef, followed by fish. The observed pattern of a higher household budget share could result from a higher price per kilogram of the product. Beef meat is more expensive on a per-kilogram basis than that of fish. The mean income of the respondents was ₦21,041.20, which greatly influenced the share of expenditure between beef and fish.

Factors affecting beef and fish consumption

The factors affecting beef and fish consumption were estimated using the Linear Approximate Almost Ideal Demand System (LA-AIDS) model with the Seemingly Unrelated (SURE). The estimated parameter results for the Almost Ideal Demand System (AIDS) model are presented in Table 3. The result revealed that the coefficient for the price/kg of fish (5540.887) was positively associated with the budget share of fish, whereas that for meat (-385.468) was negatively associated with the budget share. This means that a 1-unit increase in the price of fish led to a 5540-unit increase in the budget share, while a 1-unit increase in the price of beef led to a 385.46-unit increase in the budget share. Furthermore, the price/kg of fish was statistically significant at a 0.01 probability level ($P<0.01$). This means that as the price of fish increases, households will increase their budget share for fish, and vice versa. This might be due to the low cholesterol in fish meat.

The various socio-economic factors that affect beef and fish consumption were also shown in Table 3. These factors are the age of the household heads, educational qualification and income. The coefficients for age (-50.46) and educational qualification (-144.77) were negatively related to the budget shares of beef and fish and were statistically significant at the 0.05 and 0.01 probability levels, respectively. This means that an increase in these variables will decrease the budget on both beef and fish. This result is at variance with that of Ojegele *et al*. (2024), who found that educational level significantly influences demand for animal protein foods in Osun State, Nigeria.

Table 3: Determinants of factors affecting beef and fish consumption

Variables	Coefficient	T	P>t	|t|
Fish (kg)	5540.887	9.09***	0.000	4336.241
Beef (kg)	-385.468	-1.69	0.094	-1578.407
Age (Years)	-50.46318	-2.08**	0.040	-142.4782
Gender	42.90336	0.07	0.944	-1161.752
Household size (No.)	-269.3359	-1.33	0.186	-670.3499
Education (Years)	-144.7704	-4.96***	0.001	441.9367
Income(₦)	0.000753	2.07**	0.049	100.1913
Constant	9753.098	2.98	0.003	3294.486
R^2 =0.6166				
Adj.R^2 =0.5930				

** = 5%, ***=1%

The coefficient for household income (0.0075) was positively related to the budget share of beef and fish and was statistically significant at the 0.05 level (P<0.05). This means that a unit increase in rural household income led to a 0.0007-unit increase in the beef-and-fish budget share. This means that beef and fish are important sources of animal protein. This finding corroborates that of Dalhatu *et al.* (2010), who found that households with higher incomes spend more on fish.

The result presented in Table 4 reflects the constraints households face in consuming beef and fish. The constraints enumerated by the respondents were arranged according to the severity of the problems consumers faced in demanding the product. The results indicated that an insufficient number of beef and fish markets (87% and 94%, respectively) were major constraints for respondents in consuming beef and fish, respectively. This implies that the price constraint on fish and beef demand was due to an inadequate number of fish markets, leading to the unavailability of beef and fish in the study area. The result further indicated that the high prices of beef and fish (66.2% and 65%, respectively) were a major constraint on respondents' consumption of both. High product prices may be due to high transportation, production, and preservation costs. A lack of power supply leads to higher preservation costs, which in turn increase the product's price. Low product supply can lead to limited distribution, resulting in an insufficient market.

Table 4: Constraints faced by consumers of beef and fish

Constraints	Frequency	Percentages
Beef		
High prices	100	66.2
Beef spoilage	105	69.00
Low supply	115	76.00
Insufficient Numbers of beef Market	132	87.00
Fish		
High prices	98	65.00
Fish spoilage	106	70.00
Low supply	117	78.00
Insufficient Numbers of Fish Market	142	94.00

Source: Data analysis 2021.

CONCLUSION AND RECOMMENDATIONS

The study therefore concludes that rural households' expenditure on beef is higher than on fish, while price is positively associated with the budget share of fish. Based on the study's findings, the following recommendations are made to improve beef and fish demand in the study area. (i) Since price is a major determinant for consumers' demand, individuals, government and Non-Governmental Organisations (NGOs) should invest in beef and fish farming in order to make the products available. (ii) There is a need for cattle and fish farmers to establish markets closer to the consumers, which will also increase availability and supply.

REFERENCES

Adekunmi A.O., Ayinde J.O & Ajala , A.O. (2017). An assessment of animal protein consumption pattern among rural dwellers in Osun State. *Ife Journal of Agriculture*, 29(1).

Akinyele, O. (2005). Poverty, Malnutrition and the Public Health dilemma of disease. University of Ibadan Post -graduate school 25th interdisciplinary Research Discourse pp 1-45.

Amao, J.O., Oluwatayo, I.B & Osuntope, F.K. (2016). Economics of fish demands in Lagos State, Nigeria. *Journal of Human Ecology*, 19(1), 25-30.

Barnabas,C., Yisa, E.S & Adebayo, C.O.(2019). Economic analysis offish demand among urban households in Taraba State, Nigeria. *Proceedings of the 52nd Annual conference of Agricultural Society of Nigeria (ASN)*, 21st-25th October, 2019, Pp. 356-359.

Dafwang, I. I.; Ikani, E. I.; Chikwendu, D. O. & Iwuanyanwu, I. E. (2001). Adoption of Non-conventional feedstuffs by poultry and pig farmers. *Journal of Nigeria Society of Animal Production*, 2(4), 250-253

Dalhatu,M. & Ala, A.L. (2010). Analysis of fish in Sokoto Metropolis, Sokoto, Nigeria. *Nigerian Journal of Basic and Applied Science*, 18(2), 154-159.

Dauda, A.B., Ojoko, E.A & Fawole, B.E. (2016) Economic analysis of frozen fish demand in Katsina Metropolis, Katsina State, Nigeria. *Journal of Fisheries and Aquatic Science*, 11:93-99.

Food and Agriculture Organization (FAO) (2021). The state of world fisheries and aquaculture 2020. http://www.fao.org/state-of-fisheries-aquaculture (18.08.2021)

FAO/WHO/UNU (2002). Expert consultation on protein and amino acid requirements in human nutrition. WHO technical Report series 935, Geneva, Switzerland.

Inyang, H.B. & Onu, J.I. (2018). Compensated and uncompensated elasticities estimation of the major animal protein demand in Adamawa State, Nigeria. A paper presented at the 19th Annual national conference of Nigerian Association of Agricultural Economists (NAAE) from 15th-18th October.

Imade, O.S. & Ogieva, O.F. (2022). Economic efficiency of catfish production in Edo State, Nigeria. *Agricultural Economics and Extension Research Studies* (AGEERS), 10(1), 35-46.

Manson N., Ayoola G., Kopep D., & Emeka N. (2018) Agriculture Joint Sector Review, rural dwellers report on healthy food choice from a pictorial-style menu: 22-23.

National Bureau of Statistics (2016). Annual Abstract of Statistics Report. Pp. 51-52 (www.nigerianstat.gov.ng)

NPC (2006) Legal Notice on Publication of the Details of the Breakdown of the National and State Provisional Totals 2006 Census. National Bureau of Statistics at www.nigerianstat.gov.ng. Retrieved on 20th of May, 2011.

Ojegele, B., Awosikunde, T.F., Adewumi, T.J., Egbukichi, E.O., Omogbeme, A.O. & Adeyemi, M.O. (2024). Analysis of consumption expenditure on animal protein among farming households in Osun State, Nigeria. *World Journal of Advanced Research and Reviews.* 23(01), 1869-1879. (https://doi.org/10.30574/wjarr.2024.23.1.2126.)

Rahji, F.R. & M.A.Y. Rahji (2014). A comparative analysis of diet quality in urban and rural households in Ibadan zone of Oyo State, Nigeria. *Agrosearch,* 14(2):90-102.

Robert, U. O. & Juan, N. (2012). Micro Level Analysis of Beef and Fish Consumption in Imo State, Nigeria, *Journal of Agricultural Research and Review*. 1(1): 1-8.

Sanusi M. M.& Ashaolu O. F. (2017). Nutritional status and school performance of primary school children in Ogun State, Nigeria. *Ife Journal of Agriculture*, 29(1),1-5.

Wardlaw, G.M. & Kessel M. (2002). *Vitamin A. In: Perspectives in nutrition*, 5th edition. McGraw Hill, Boston, Toronto. Pp 792-818.

Yusuf, O. I. S. (2012). A System Analysis of the Demand for Animal Protein in Rural and urban Nigeria. A case Study of Ibadan Metropolis, *JORID* 10(2). Retrieved from www.ajol.info/journals/jorind.