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Economic Analysis of Frozen Fish Demand in Katsina Metropolis, Katsina State, Nigeria

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ABSTRACT

Demand for frozen fish has been on the increase due to knowledge on the nutritive value of fish as a source of animal protein. This study was carried out to examine the determinants of frozen fish demand in Katsina metropolis in Katsina State, Nigeria. Cross-sectional data from purposively sampled 89 respondents was used; descriptive statistics and multiple regression analysis were used to analyze the data. The socioeconomics characteristics of the sampled frozen fish consumers indicated 65% male with majority (62.9%) between the ages of 21 and 40 years. Those with tertiary education constitute 70 and 43.8% are civil servants. Also 57.3% of the respondents are married with 68.5% having household size between 1 and 5. The linear regression result showed that the adjusted R^2 is 0.424 with F-ratio of 6.45 which is significant at 1% level. Majority of the respondents (44.94%) in the study area are in the high income group. The own price elasticity was found to be 0.78, which indicated that demand for frozen fish in the study area is inelastic, while the cross price elasticities for chicken and beef were -0.076 and -0.63, respectively, which implied that frozen fish and chicken and beef are complimentary goods in the area. Also, the income elasticity is 0.11, which implied that frozen fish is a normal good in the study area. The research established that price of fish, consumer's income, household size, educational status and species of fish are important factors influencing demand for frozen fish in the study area.

Key words: Demand, frozen fish, nutritive value, consumption, elasticity, Katsina metropolis

INTRODUCTION

Nigeria is a country with abundant natural and human resources, but despite the resources it still remains among the least consumers of protein in Africa (Ajani, 2000). According to Onyeneke and Nwaiwu (2012), food is not distributed equally among the households in Nigeria, this may be attributed to high level of poverty in some region of the country. Most households consume minimum level of calorie but unable to satisfy the protein requirements. Protein is an essential part of human diet and it is sourced from either plant or animal, generally plant product contains different ratios of amino acids and lower concentration than animal products (Britton, 2003). Animal proteins are said to be superior to plant proteins because it contains all amino acids needed in the body as oppose to plant proteins that has inadequacies in one or more of the essential amino acids (Oloyede, 2005). Hence animal protein is referred to as complete protein.

Fish has been acknowledged as an important source of animal protein, it contributes significantly to the survival and well being of a large number of the people around the world. Fish is known to be efficient converter of food for human consumption and saving children from kwashiorkor due to low protein intake and unbalanced diet and there is little or no religious restriction on its consumption (Dauda and Yakubu, 2013). Fish is an important source of essential nutrients which includes; protein, lipids, vitamins and minerals (Tsado *et al.*, 2012).

In Nigeria almost 50% of the total animal protein intake is from fish, it occupies this unique position being the cheapest source of animal protein and it has contributed immensely to the economy as it employs a good percentage of the active labor force in the agricultural sector (FDF, 2009). However, it worth being noted that consumption of fish like other food products is not evenly distributed in Nigeria, according to Dauda *et al.* (2013) fish consumption in Nigeria is only high in the Southern part of the country but very low in the northern part. Fish supply in Nigeria is either through capture fisheries, fish farming or by importation (Anene *et al.*, 2010), but unfortunately far above this, half of fish consumed in Nigeria is imported. Nigeria requires about 2.66 million Mt of fish annually to satisfy the dietary requirement of its citizens (160 Million). Regrettably, the total aggregate domestic fish supply from all sources (capture and culture fisheries) is less than 0.7 million Mt per annum. Nigeria has to import about 0.7 million Mt of fish valued at about USD 500 million annually to augment the shortfall (Atanda, 2012). In 2009, about N97 billion was spent importing fish into Nigeria. This massive importation of frozen fish in the country has ranked Nigeria the largest importer of frozen fish in Africa (Atanda, 2012). Frozen fish importation in Nigeria may still continue for some time because supply from captured fisheries in Nigeria has been erratic and on the decline in recent years (FDF, 2007) and the growth rate in aquaculture is not yet sufficient for the ever increasing demand.

It is therefore important to study the economic analysis of frozen fish demand and understand the factors that affect it. This study investigates the demand for frozen fish in the far northern part of the country where fish consumption has been regarded to be very low. Katsina State, a major state in the core North and the fourth most populated state in the country was used for the study.

MATERIALS AND METHODS

The study area for this research is Katsina metropolis. Katsina State is one of the seven states in North-west Nigeria. It is located in the Sudan savannah agro-ecological zone. The state lies between longitude 12°59' N and latitude 7°36' E. The state is bounded in the East by Kano and Jigawa States, in the West by Zamfara State, in the South by Kaduna State and in the North by Niger Republic. It has a total land area of 1.64 million ha. Rainfall in Katsina State ranges from 400-800 mm in the Northern and Southern part, respectively (Adekunle *et al.*, 2005). The state has a population of about 5,792,579 (NPC., 2006). Katsina State feature prominently in the cultivation of crops like millet, sorghum, maize, rice, sugarcane, cowpea, groundnut, cotton and vegetables. The major livestock produced in the state include cattle, sheep, goat, poultry, donkey and camel.

Data collection and analysis: The cross-sectional data used for this study was collected from primary source through the administration of well-structured questionnaires. The sampling techniques used in this study to select the samples for study is purposive sampling. About 100 questionnaires were administered in the study area, out of which 89 were returned. Descriptive statistics and multiple regression analysis were used to analyze the data.

Multiple regression analysis was used for estimating the relationship between the dependent and independent variables in order to estimate the determinants of frozen fish demand in Katsina metropolis in Katsina State.

The regression model used is stated in Eq. 1:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 D_1 + \beta_8 D_2 + \beta_9 D_3 + \mu \quad (1)$$

where, Y is the quantity of frozen fish demanded (kg), X_1 is the retail price of frozen fish (naira), X_2 is the monthly disposable income (naira), X_3 is the retail price of chicken (naira), X_4 is the retail price of beef (naira), X_5 is the household size (number), X_6 is the level of education (years), D_1 is the 1 if form of fish is Mackerel (Titus), 0 otherwise. D_2 is the 1 if form of fish is Horse Mackerel (Kote), 0 otherwise, D_3 is the 1 if form of fish is Sardinella (Shawa), 0 otherwise and μ is the error term.

The above demand function was estimated using four different functional forms: linear, semi-log, exponential and Cobb-Douglas (double-log).

Elasticity and Marginal Propensity to Consume (MPC):

$$Y = b_0 + b_1 x_1 + e_i \quad (2)$$

$$\text{Elasticity} = \frac{b_1 x_1}{y} \quad (3)$$

RESULTS AND DISCUSSION

The socioeconomics characteristics of the sampled frozen fish consumers in Katsina metropolis is shown in Table 1, larger percentage (65%) of the respondents are male with majority (62.9%) between the age of 21 and 40 years. People with tertiary education dominated the respondents constituting as high as 70% and majority of them (43.82%) are employed as civil servant. Also, 57.3% of the respondents are married with majority (68.54%) having household size of between 1 and 5. The dominant age range indicated a youthful age therefore the respondents tends to be well informed and provide genuine information, the occurrence of majority with tertiary education have good tendency of influencing their fish consumption and demand because consumers with a high level of education are more concerned about their health than those with a low level of education and this is in line with the findings of Amao *et al.* (2006) and Dalhatu and Ala (2010). The marital status of the respondents with majority married may also have positive impact on frozen fish consumption though the relatively small size of households may be another limiting factor; also the higher percentage being civil servant implies a tendency for high income and consequently high demand for frozen fish (Onyeneke and Nwaiwu, 2012).

Table 2 shows the linear regression results for the demand for frozen fish in Katsina metropolis. The linear functional form of the regression was chosen as the lead equation based on the significance of statistical tests such as the coefficient of determination (Adjusted R^2 value) and other diagnostic statistics. The coefficient of determination is 0.424 with F-ratio 6.45 which is significant at 1% level ($p = 0.000$), this indicated at 1% level of significance, 42.4% of the frozen fish demand can be explained by the explanatory variables (own price, price of chicken, price of beef, income, household size, educational status, Mackerel, Horse mackerel and Sardinella). This implies

Table 1: Socio-economic characteristics of frozen fish consumers in Katsina metropolis

Socio-economic characteristics	Frequency	Percentage
Gender		
Male	58	65.00
Female	31	35.00
Age (years)		
≤20	14	15.73
21-30	30	33.71
31-40	26	29.21
41-50	15	16.85
51 and above	4	4.49
Educational level		
Arabic education	9	10.11
Primary education	4	4.49
Secondary education	14	15.73
Tertiary education	62	69.66
Marital status		
Single	32	35.96
Married	51	57.30
Divorced	3	3.37
Widow	3	3.37
Household size		
1-5	61	68.54
6-10	24	26.97
11-15	2	2.25
16 and above	2	2.25
Primary occupation		
Unemployed	10	11.24
Civil servant	39	43.82
Trading	23	25.84
Farming	2	2.25
Others	15	16.85
Total	89	100.00

Source: Field survey (2014)

Table 2: Factors affecting frozen fish demand in Katsina metropolis

Variables	Coefficient	T-ratio	p-value
Constant	-11.050	-0.05	0.957
Own price	0.421**	2.47	0.016
Price of chicken	-0.034	-0.32	0.748
Price of beef	-0.291***	-2.55	0.013
Income	0.001*	1.48	0.070
Household size	22.042***	4.73	0.000
Educational status	34.640*	1.68	0.097
Fish type 1(Titus)	82.303***	3.41	0.001
Fish type 2 (Kote)	6.714	0.16	0.872
Fish type 3 (Shawa)	-15.325	-0.37	0.711
R ²	0.424		
F-ratio	6.45		0.000

***, **, *Significant at 1, 5 and 10% level

that the explanatory variables have effect on the frozen fish demand and therefore the individual effect of the variables produced by the equation can be relied upon, this is in agreement with the report of Onyeneke and Nwaiwu (2012).

The results indicated that; own price with t-value 2.47 which is significant at 5% level ($p = 0.016$), price of beef with t value -2.55 which is significant at 1% level ($p = 0.013$), income with t value 1.48 which is significant at 10% level ($p = 0.070$), household size with t value 4.73 which is significant at 1% level ($p = 0.000$), educational status with t value 1.68 which is significant at 10% level ($p = 0.097$) and Titus (species of frozen fish) with t value 3.41 which is significant at 1% level ($p = 0.001$) are the factors determining the demand of frozen fish in the study area.

Monthly income is positively signed with coefficient of 0.001, this indicated that frozen fish is a normal good in Katsina metropolis. This result agrees with findings of Delgado *et al.* (2003), that the demand for fish is positively related to income, that is, as people's purchasing power (disposable income) increases, they demand for more quantity of fish with the knowledge of its nutritive value. The coefficient of household size (22.04) is also positive and highly significant. This is an indication that increases in household size brings about increase in the population of family members that will consume fish, thereby increasing consumption and demand (Joseph, 2004). The level of education of the frozen fish consumer has a positive coefficient with fish demand, implying that an increase in the level of education of a consumer leads to an increase in quantity of fish demanded. This could be attributed to the fact that educated people are more aware of the nutritive value of fish as a good protein source (Amao *et al.*, 2006). The type of frozen fish (Mackerel, Horse mackerel and Sardinella) available also determines the quantity of frozen fish consumed by the respondents. This shows the effect of taste and preference on demand for a product. The availability of Titus fish was significant and positively related (82.303) to the demand for frozen fish in the study area, indicating that the respondents prefer Titus fish to any other type of frozen fish in Katsina metropolis.

Income level and demand for frozen fish: Income level plays a fundamental role in the nutritional value of an individual. People tend to demand for more or change their taste over time as their income level appreciates. Disposable income is one of the major factors that affect the demand for frozen fish and its consumption (Ye, 1996). Therefore, it is expected to be a major determinant of frozen fish demand in the study area. Table 3 shows that 23.60, 31.46 and 44.94% of the respondents belong to the low, medium and high income groups respectively. Majority of the respondents in the study area are in the high income group and as revealed by the regression analysis (Table 2), therefore, frozen fish consumption increases as their income increases, this indicated that consumption of frozen fish in Katsina metropolis is not because of poverty, but because of the knowledge of high nutritive value of fish as influenced by their high educational status. Hence, increase in price of fish does not deter their level of fish consumption as shown in Table 2, where own price is having a positively signed coefficient (0.421).

Elasticities of demand for frozen fish: Price elasticity of demand is the relative responsiveness of quantity demanded to changes in commodity prices (Asche and Bjørndal, 1999). In Table 4, the own price elasticity was found to be 0.78, which indicate that demand for frozen fish in the study

Table 3: Distribution of frozen fish consumers' based on their monthly income

Income groups	Income level (₦/month)	Frequency	Percentage
Low	Below 19,999	21	23.60
Medium	20,000-49,999	28	31.46
High	Above 50,000	40	44.94
Total		89	100.00

Source: Field survey (2014)

Table 4: Types of elasticity of demand for frozen in the study area

Types of elasticity	X/Y	Coefficients	Elasticity
Own price elasticity	1.84747	0.42097	0.78
Cross price elasticity			
For chicken	2.2474	-0.0337	-0.076
For beef	2.1491	-0.2907	-0.625
Income elasticity	146.328	0.00075	0.1098

area is inelastic, that is, changes in price has a relatively small effect on the quantity of frozen fish demanded in Katsina metropolis. The cross price elasticity of demand shows the responsiveness of the quantity demanded of a commodity to changes in price of related commodity (Asche and Bjorndal, 1999). From Table 4, the cross price elasticities for chicken and beef are -0.076 and -0.63, respectively. The negative sign shows that frozen fish and chicken and beef are complements in the study area. This may be due to the fact that even though the respondents eat frozen fish as a result of their knowledge of its nutritive value, culturally in the study area, the consumption of animal protein in the form of beef and chicken is still prevalent, that is, they do not abandon one for the other. This is in line with the study of Joseph (2004), who found a complementary relationship between the consumption of fish and other animal protein sources.

Table 4 shows that the income elasticity of demand for frozen fish in the study area is 0.11, the positive sign implied that frozen fish is a normal good. A similar findings was reported by Delgado *et al.* (2003), who reported that the demand for fish products at the household level and national level, is quite responsive to income.

CONCLUSION

The determinant of frozen fish demand in Katsina metropolis has been found to include the income level of the respondents, the type of frozen fish (Titus, Kote or Shawa) available, consumer's purchasing power, household size, educational status and price of beef (substitute). The own price elasticity and cross price elasticities for beef and chicken (close substitutes) also, revealed that the demand for frozen fish in the study area is inelastic and that fish, chicken and beef are complementary goods.

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