Demand Analysis of Frozen Chicken and Fish in Ekiti State, Nigeria

F. Osundare

Department of Agricultural Economics and Extension services,
Ekiti State University, Ado-Ekiti.

E-mail: foluso.osundare@eksu.edu.ng

Abstract

This study described the socio-economic characteristics of the consumers of frozen chicken and fish; examined their buying habits; identified and estimated the factors influencing the demand and determined the cross-price elasticity of the demand for these commodities in Ekiti State. The analysis was based on purposively selected 60 frozen chicken and 60 frozen fish consumers in Ekiti State as respondents to structured questionnaire and interview schedule. Descriptive statistics of frequency counts and percentages and regression analysis were used for data analysis. The results show that the mean age of the respondents was 49 years while Muslims, Christians and traditional religion adherents consumed frozen chicken and fish in almost equal proportions. The ease of preparation was the main reason for purchasing these food items. The prevalent habits exhibited by consumers were: buying the quantity needed at a time, making advance payment and making purchase within the first week of receiving salary. The own price per kg, household disposable income of consumers and own price per kg of substitute were the significant (P=0.05) determinants of demand. The demand for both commodities was price- and income-inelastic suggesting that the demand increased as the income of the buyers increased which implies that they were "superior" goods. Also the cross-price elasticity indicated that they were substitutes. Thus, the results from this study could be explored as a framework to the formulation of food policies aimed at improving consumer welfare.

Keywords: Demand, frozen chicken, frozen fish, consumers, elasticity

Introduction

The widening gap between demand and food in supply from domestic sources and widespread incidences of protein-energy malnutrition, vitamin and micronutrient deficiencies, as accentuated by widespread poverty, are indicators of the food and nutrition crisis in Nigeria (FMARD, 2016). Thus, the contribution of the poultry and fishery industries in the supply of energy, animal protein, macro- and micro-nutrient requirements, employment and income generation, rural development and foreign exchange potentials will be significant in providing solutions to the twin problems (Omotayo, 2007). Besides, fish and poultry products ensure diversity in the monotonous starchy staple foods that dominate the diets of Nigerian families (Thilsted, 2013).

Fish is a source of high-quality protein, lipids, vitamins and minerals that are essential for human brain development (Tacon and Metian, 2013). Unfortunately, fish consumption in Nigeria is affected by inadequate supplies as the total aggregate domestic supply from capture fisheries and aquaculture at less than 0.7 million tons (t) is far below the 2.66 million t annual demand (Atanda, 2012). The situation is similar for poultry meat with local annual consumption of about 1.5 million t and domestic production at less than 0.45 million t indicating a huge demand-supply deficit (Eze, 2017). The abysmal performances have been attributed to perishability (of fish), price fluctuations, inadequate processing facilities, high costs of feeds, inaccessibility to credit facilities, poor infrastructure, escalating cost of

production and inconsistent policies (on importation). Also, the consumption is characterized by lopsidedness, being higher in the southern states than in the north (Dauda and Yakubu, 2013).

The attempts at bridging the shortfall engendered government policies which encouraged the unrestricted importation of frozen chicken meat and fish. Atanda (2012) observed that about 0.7 million t of fish valued at $500 million are imported annually to augment the supply shortfall. Also, the greater portion of poultry meat consumed (about 1.0 million t valued at over ₦1.0 trillion) comes from official imports and smuggling (Eze, 2017). The criticisms to importation of frozen foods, as a short-run measure to bridging the supply-demand gap, include: 1) food import bills constitute a huge drain on the dwindling and scarce foreign exchange reserves; 2) some imported food consignments might have been contaminated or have residues of the preservatives and storage chemicals which pose potential dangers to consumers, handlers and the environment; 3) imported frozen meat is cheaper and convenient to cook and avoids slaughtering, dressing and cutting into parts which constitute economic activities that should be carried out under local production efforts; and 4) the difficulty to trace sources of contamination within the import chain. These necessitated a ban on the importation of frozen foods, to encourage local farmers and ensure profitable investment of resources in local production of fish and chicken which can be frozen without the preservatives needed for the long storage and shipping.

The demand for a product is a direct demand based on the expected marginal utility (Jhingan, 2009). One of the major types of demand is elasticity and this refers to the degree of responsiveness of quantity demanded of a commodity to a change in price or a measure of the degree of responsiveness of a variable (quantity demanded) when the other variable changes. Elasticity could be point or arc. Point elasticity is the elasticity measurement if the changes in the variable of interest are very small while arc elasticity refers to elasticity measurement if the changes in both quantity and the factors of interest are large. The measurement of elasticity is important to the achievement of profit maximization objective of a marketing activity. When a small change in the price of a product causes a major change, it is perfectly elastic demand whereas when a change in price does not bring a proportionate change in quantity demanded, it is perfectly inelastic. Unitary elastic demand occurs when a proportionate change in price produces the same change in the quantity demanded. Cross-price elasticity (which is of interest to this study) refers to the change in quantity demanded for one commodity (X) as a result of the change in price of another commodity (Y).

From the foregoing, it implies that the demand for one commodity is likely to affect the price of another commodity if they are interrelated. This study would attempt to answer the following research questions: what are the socio-economic characteristics of the frozen chicken and fish consumers in the state; what are the factors influencing the demand for frozen chicken and fish; what are the buying habits exhibited by the consumers; and how does the demand for these commodities affect each other. Therefore, the objective of the study is to describe the socio-economic characteristics of the consumers of frozen chicken and fish; examine the buying habits; identify and estimate factors influencing the demand; and determine the cross-price elasticity of demand for the commodities in Ekiti State.

Methodology

Sampling Procedure and Data Collection

The study was carried out in Ekiti State which experiences tropical climate characterized by rainy season (April to October) and dry season (November to March). Primary data were collected through the use of structured questionnaire administered on the consumers of frozen chicken and fish. Purposive sampling was used to select 60 consumers each of frozen chicken and fish and data were collected on prices, quantity demanded of each product, the buying habits, socio-economic characteristics and monthly disposable income.

Data Analysis

Descriptive statistics were used to analyze the socio-economic characteristics and buying habits while regression was used to estimate the relationship between the dependent and independent variables. The multiple regression analysis involving the Ordinary Least Square (OLS) method was used to estimate the functional relationships existing between the dependent variables and set of explanatory variables in separate demand functions for frozen chicken and fish. Two demand models were postulated for frozen chicken and fish as presented in equations 1 and 2 below:

QFC = f (PFCi, PFFi, YFCi, LFCi, DFCi) EFCi ---------- (1)

QFF = f (PFFi, PFCi, YFFi, LFFi, DFFi) EFFi ---------- (2)

where:

QFC = Quantity of frozen chicken demanded by consumers (kg)

PFCi = Price/kg of frozen chicken demanded by the i^{th} consumer

YFCi = Monthly disposable income of i^{th} frozen chicken consumer.

LFCi = No of years spent in school by the i^{th} frozen chicken consumer.

DFCi = Distance travelled to purchase frozen chicken by the i^{th} consumer.

QFF = Quantity of frozen fish demanded by the consumers (kg)

EFCi= Error term associated with collecting information from the i^{th} chicken consumer.

PFFi = Price/kg of frozen fish purchased by the i^{th} consumer

YFFi = Disposable income of frozen fish purchased by the i^{th} consumer

LFFi = No of years spent in school by the i^{th} frozen fish consumer (years)

DFFi = Distance travelled to purchase frozen fish by the i^{th} consumer

EFFi = Error term associated with collecting information from the i^{th} frozen fish consumer.

The linearized Cobb-Douglas functional form fitted into data. The explicit form is presented in the following equations:

$\log QFCi = a_o + a_1 \log PFCi + a_2 \log PFFi + a_3 \log YFC + a_4 \log LFCi + a_5 \log DFCi + EFCi$ --- (3)

$\log QFFi = a_o + a_1 \log PFFi + a_2 \log PFCi + a_3 \log YFFi + a_4 \log LFFi + a_5 \log DFFi + EFFi$ --- (4)

where:

a_1 ---------- a_5 represent the estimated parameters while all variables remain as earlier defined.

Cross-Price Elasticity of Demand

This is a measure of how the quantity demanded of frozen chicken responds to the changes in the price of frozen fish *ceteris paribus*. This relationship was measured mathematically and expressed as (Jhingan, 2009)

$$Exy = \frac{\partial qx}{\partial py} \times \frac{py}{qx} \quad \text{---------- 5}$$

where:

Exy = Cross price elasticity of demand

qx = quantity demanded of commodity x

Py = Price of commodity y

Qx = change in quantity demanded of commodity x

Py = change in price of commodity y.

The cross-price elasticity can be positive or negative; Exy can take three values: less than 1, greater than 1 and equal to 1.

Applying this to cross-price elasticity of the demand for frozen chicken and fish, we have:

$$EDC = \frac{\partial Q_c}{\partial P_F} \times \frac{P_F}{P_C} \quad \text{..... (6)}$$

$$EDF = \frac{\partial Q_F}{\partial P_C} \times \frac{P_F}{P_C} \quad \text{..... (7)}$$

where:

EDC = cross price elasticity of demand for frozen chicken
EDF = cross price elasticity of the demand for frozen fish
∂Q_c= change in the quantity of frozen chicken demanded (kg)
∂P_F = change in price/kg of frozen fish (₦)
P_C = price/kg of frozen chicken
∂Q_F = change in quantity of frozen fish demanded (kg)

When:

ED = negative, the goods are complements
ED = zero, the two goods are independent
ED = positive, the goods are substitutes
ED = infinity, the goods are perfect substitutes

Results and Discussion

The socio-economic characteristics of the respondents are shown in Table 1. The modal age of the respondents was between 31-40 years (42%) with maximum and minimum ages at 70 and 22 years respectively. With the mean age at 49.3 years, the respondents are of middle age and could still consume either frozen chicken or fish because in the medical parlance, people from 40 years and above are advised to eat less of red meat. Thus, both fish and chicken are suitable for both young and old people. About one-third (31.67%) of the respondents was female while 36.67 and 34.16 % were married and single respectively. Both Christians (36.67%) and Muslims (34.16) consumed frozen chicken and fish in almost equal proportions. All the respondents had formal education although majority of them (88.33%) spent 9 years and below in school, equivalent of Junior Secondary School 3 while 11.67% had education beyond secondary school level. The mean annual income was ₦517,869 with minimum at ₦100,000 while 12.5% earned more than ₦1 million. The annual income of the respondents could encourage the demand for chicken and fish.

Table 1: Socio-economic characteristics of the consumers of frozen chicken and fish in Ekiti State

Characteristics	Frequency	Percentages
Age Range (Years)		
21-30	36	30.0
31-40	42	35.0
41-50	29	24.2
51-60	6	5.0
61 and above	7	5.8
Total	120	100
Mean	49.3	
Maximum	70	
Minimum	22	
Marital Status		
Single	35	29.16
Married	38	31.67
Divorced	21	17.5
Widow/widower	26	21.67
Total	120	100
Religion		
Christianity	44	36.67
Islam	41	34.16
Traditional	35	29.17
Total	120	100
Levels of Education		
1-6years	51	43.33
7-9years	54	45.0
10-14years	14	11.67
Total	120	100
Mean	8	
Minimum	3	
Maximum	15	
Annual Income (₦)		
₦100,000	12	10.0
100,001 – 200,000	14	11.7
200,000 – 300,000	24	20.0
300,000 – 400,000	12	10.0
400,000 – 500,000	30	25.0
500,000 – 600, 000	13	10.8
>600,001	15	12.5
Total	120	100
Mean value	₦ 517,869	
Minimum	₦ 100,000	
Maximum	₦ 1,000,000	

Source: Data analysis

Reasons for consuming frozen chicken and fish in Ekiti State

The responses to the reasons for consuming frozen foods are presented in Table 2. Most of the respondents (65.00%) consumed frozen chicken and fish because they were easy to prepare, did not require dressing and have been cut into different parts thereby making it convenient to cook/prepare. Therefore, it saves time especially when there is a need for

urgent meals. The preference of 20% of the respondents for frozen chicken and fish was because they do not require slaughtering which is a good reason as some of the female respondents claimed they could not slaughter life animals. The other reasons were attractive packaging (10%) and cheap price (5%). As at the time of this study, a life chicken of about 3.5 kg was sold for ₦ 4,000-5,000 while 1 kg of frozen chicken was ₦800. Another important reason given by the respondents was availability (30%). They claimed that frozen chicken and fish were the most readily available among the other frozen foods consumed. Besides, there are different points of sale in each town. Oral interview responses showed that frozen chicken and fish were the most commonly consumed frozen foods among the respondents because they are required during celebrations and festivities. Thus, consumption was the only reason for purchasing these two commodities.

Table 2: Distribution of respondents according to the reasons for consuming frozen chicken and fish in Ekiti State

Reasons	Frequency	Percentage
Availability	40	18.19
Easy to prepare	78	35.45
Packaging	12	10.0
Cheap	50	5.45
Request for desired parts	40	18.19
Total	220*	100

Source: Data analysis **Multiple responses*

Respondents buying habits for frozen chicken and fish in Ekiti State

The buying habits of the consumers of frozen chicken and fish are presented in Table 3. The respondents exhibited the same habits in the purchase of frozen chicken and fish though in varying degrees. The commonest habit among the frozen chicken consumers was buying the quantity needed at a time (90%) while only 50% of fish consumers did not exhibit this habit. Three major reasons for this habit are: (1) lack of enough storage facilities to preserve the items if purchased in excess of the quantity needed (2) financial incapability (3) the children will consume the excess thereby defeating the essence. Payment in advance was the most common reason among frozen fish consumers (58.33.33%). About sixty three percent (63.33%) purchased frozen fish for children only. This further corroborates the claims in the medical parlance that fish is more preferable for elders. About 28% and 76% respectively purchased frozen chicken and fish within the first week of receiving salary. The proportion of consumers who bought more than the quantity needed was 65.83% for fish consumers and 34.17% for frozen chicken. The only reason given was that excess fish can be smoke-dried. Inadequate storage facilities and epileptic power supply make the use of cold rooms or freezers almost impossible for the storage of excess frozen chicken or fish purchased.

Table 3: Distribution of respondents according to buying habits of frozen chicken and fish

	Chicken		Fish	
Buying Habits	Frequency	Percentage	Frequency	Percentage
Buying the needed quantity at a time	108	90.0	60	50.0
Making advance payment	70	58.33	112	93.33
Buying the quantity needed and paying later	81	67.5	72	60
Buying more than the quantity needed and storing	41	34.17	79	65.83
Making a purchase as the last resort	69	57.50	51	42.50
Making purchase for the consumption of children only	30	25.00	76	63.33
Making purchase in the first week salary payment	33	27.5	87	75.5
Making purchase only during festive periods	55	45.83	40	33.33

Estimated Demand Models

The frozen chicken demand model hypothesized in equation 1 is:

log QFCi = 392.0-0.096 PFCi + 0.084 log YFCi + 0.080 log LFCi + 0.16 log DFCi +(0.383)*(0.017)*(0.943)(0.016) 0.070logPFCi ---------- (8)

(0.024)*R^2 = 0.65 * Significant at 5% level

The figures in parentheses are the standard error of estimated coefficients.

The t-test showed that price/kg of chicken (PFCi) disposable income of frozen chicken consumers (YFCi) and price/kg of frozen fish (PFCi) were significantly different from zero at 5.0% level. The negative sign on the coefficient of price/kg of frozen chicken (PFCi) implies that an increase in the price/kg of frozen chicken will lead to an increase in the quantity demanded and this conformed to the postulate of economic theory that the higher the price of frozen chicken the lower the quantity demanded all other things remaining unchanged. The positive sign on the disposable income of frozen chicken consumers suggested that 1% change in income would lead to 0.084 increase in quantity demanded. A similar finding was reported by Dauda *et al*. (2016).

The demand model for frozen fish is presented in equation 9. The adjusted R^2 value was 61% indicating that the postulated repressors explained 61% of the variations in the quantity of frozen fish demanded while the t-test (25.31) indicated that the model was significant at 5.0% level

.

log QFC = 13.8-0.051 log PFFi + 0.047 log YFFi + 0.118 log LFFi - 0.034 log DFFi + (0.031) * (0.016) * (0.2591) (0.720) 0.059 log PFCi + EFFi ---------- (9)

(0.110)* R^2 = 61.0%; F test = 25.31* Significant at 5%

The equation shows that price/kg of frozen fish (PFFi), monthly disposable income (YFFi) and retail price per kg of frozen chicken (PFC), as a substitute were the significant determinants (at 5%) of the quantity of frozen fish demanded by the respondents. The negative sign on the retail price/kg of frozen fish (PFFi) shows that a 1% increase in the price/kg of frozen fish caused the quantity demanded of frozen fish to decrease by 0.051%. The disposable income of

the consumers of frozen fish was positive suggesting an increase in the quantity of frozen fish demanded which implies that frozen fish is a 'superior' commodity in the area of study. Although the estimated elasticity of 0.077 shows that the demand for frozen fish is income inelastic, that is, 1% change in income leads to a less proportionate change in quantity demanded.

Demand elasticities for frozen chicken and fish in Ekiti State

Price elasticity of demand is the degree of responsiveness of quantity demanded to changes in commodity prices. The elasticity of demand for frozen chicken and fish can be deduced from equations 8 and 9 since the estimated coefficients were the direct elasticities of the quantity demanded. As shown in equation 8, the coefficient of own price/kg of frozen chicken (logPFCi) was inelastic (-0.10) with respect to the quantity of frozen chicken demanded. This implies that a 1% change in price/kg of frozen chicken would lead to 0.10% increase in the quantity demanded of frozen chicken suggesting that a 1% change in price led to a less than 1% change in quantity demanded. Also, the demand for frozen chicken was income inelastic with estimated elasticity of 0.084 (logYFCi) meaning that a change in household disposable income of frozen chicken consumers would lead to a small change in quantity demanded. Similarly, the estimated elasticity of demand for frozen fish follows the same trend. The own price/kg (logPFFi) of frozen fish was -0.051 suggesting income inelasticity which is attributable to the indispensability of food. This finding agrees with Dauda *et al*. (2016) that the demand for frozen chicken was inelastic. Also, Delgado *et al*. (2003), Aderinola *et al* (2001) and Ogundari and Akinbogun (2010) had found the demand for fish and chicken to be inelastic suggesting that a change in price did not have an appreciable effect on the quantity demanded of chicken and fish. However, the result of this study differs in certain respects from those of Aderinola *et al*. (2001) and Dauda *et al*. (2016) who found the demand for frozen chicken and fish to be complementary in their relationship.

The cross-price elasticity of demand refers to the change in quantity of commodity (X) as a result of the change in the price of another. The cross-price elasticity of the demand for frozen chicken and fish is presented in Table 4.

Table 4: Cross-price elasticity of the demand for frozen chicken and fish in Ekiti State

Frozen chicken		Frozen fish	
PFCL	PFFi	PFFi	PFCi
-0.096	0.070	-0.051	0.059

Source: Data analysis

This type of elasticity usually arises in the case of interrelated commodities and the aim of this section of the paper is to determine the relationship between the demand for frozen chicken and fish. Table 3 shows that own price/kg of frozen fish (LogPFFi) was positive with respect to the quantity of frozen chicken demanded implying that they are substitutes. Also own price/kg of frozen chicken (LogPFCi) with respect to the quantity of frozen fish demanded was also positive implying that these two commodities are substitutes. This is expected since both of them have the same nutritive value (supply of proteins) and are served in similar occasions or festivities. Thus, an increase in the price of one will induce on increase in the quantity demanded of the other. However, this contradicts the position of Jhinghan (2009) that the cross elasticity between two goods whether substitutes or complementary is only a one-way traffic meaning that if commodity A is a substitute of B it does not imply that B is a substitute of A

Summary and Conclusion

The study identified reasons for consuming frozen chicken and fish and the buying habits exhibited by the consumers which included:

buying just the quantity needed at a time; making advance payment for frozen chicken and fish, buying the commodities within the first week of receiving salary; buying in excess of quantity needed and keeping/preserving the remaining and buying on credit with a promise to pay later. The determinants of the demand for frozen chicken and fish were identified and estimated. Own price/kg, monthly disposable income of consumers and retail price per kg of substitute were the major determinants of household demand for frozen chicken and having elasticity estimates of -0.096, 0.084, 0.070 and 0.051, 0.047 and 0.059 for the demand for frozen chicken and fish respectively. Estimated demand elasticity indicated that the demand for the two communities were price and income inelastic because the two commodities were necessities. The cross price elasticity indicated that the two commodities were substitutes suggesting that an increase in own price/kg of one will induce a decrease in the quantity demanded of the other. The inelastic demand of frozen chicken and fish means that the ban on importation of these commodities is not likely to be effective. Thus, from the policy standpoint, the evidence from this study could be explored to formulate food policies aimed at consumer welfare improvement

.

References

Aderinola, E.A., Kulepa, A.A. and Osundare, F.O. (2001). The demand for fish in Osun State, Nigeria. *Applied Tropical Agriculture: An International Journal* 06(02): 1107-1110

Atanda, A.N. (2012). Fish species diversification in agriculture for the success of Agriculture Transformation Agenda: The role of Tilapia Production. FISON Annual Public Lecture 2012. 21pp

Dauda, A.B. and Yakubu, S.O. (2013). Fish consumption pattern and of fish farming among inhabitants of Dutsin-Ma LGA, Katsina State. *Nigerian Journal of Fisheries* 10: 586-594.

Dauda, A.B., Ojoko, E.A. and Fawole, B.E. (2016). Economics analysis of frozen fish demand in Katsina Metropolis, Katsina State, Nigeria. *Journal of Fisheries and Aquatic Science* 11(1): 93-99.

Delgado, C.L., Wada, N., Rosegrant, M.W., Meijer, S. and Ahmed, M. (2003). Fish to 2020: Supply and Demand in Changing Global Markets. International Food Policy Research Institute, World Fish Center, Wellington, New Zealand: 29-44.

Eze, J. (2017). Nigeria: Adewole- Nigeria's Poultry Industry is Worth Over ₦1.2 Trillion. ThisDaylive.com 12 Dec 2017

FMARD (2016). The Agricultural Promotion Policy (2016-2020) - Building on the Successes of ATA, Closing the Gaps: Policy and Strategy Document. Federal Ministry of Agriculture and Rural Development, Abuja. 59pp

Jhingan, M.L. (2009). Advanced Economic Theory. 31th Edition, printed at Nisha Enterprises, New Delhi.

Ogundari, K. and Akinbogun, O. (2010) Modeling production efficiency with risk: A study of fish terms in Nigeria. *Marine Resources* 25(3): 295-308

Omotayo, F. (2007). How fisheries contribute to food security in Nigeria' the National/President of Fisheries Society of Nigeria (FISON). www.panoramaaccicola.com/noticia/2007/02/19/ how fisheries contribute to food security in Nigeria. Html

Tacon, A.G.J. and Melian, M. (2013). Fish matters: Importance of aquatic foods in human nutrition and global food supply. *Review of Fishery Science* 21(1): 22-38

Thilsted, S.H. (2013). Fish diversity and fish consumption in Bangladesh. In: Fanzo, J. Hunter, D., Borelli, T and Mattei, F. (Eds). Diversifying Food and Diets: Using Agricultural Biodiversity to Improve Nutrition and Health. Earthscan, London: 270-282