



E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2018; 6(4): 363-370

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www.fisheriesjournal.com

Received: 13-05-2018

Accepted: 14-06-2018

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International Journal of Fisheries and Aquatic Studies

Determinants and elasticities of the demand for fresh catfish (*Clarias gariepinus*) in the Wouri division, Littoral region of Cameroon

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Abstract

This study on the determinants and elasticities of the demand for catfish (*Clarias gariepinus*) in the Wouri Division of the Littoral region of Cameroon has as aim to describe the socio-economic characteristics of catfish consumers; to estimate the average quantity of catfish consumed per household; to assess the determinants of the demand for catfish; and to determine the income, price and cross elasticities of the demand for catfish. Quantitative and qualitative data were obtained from 100 catfish consuming households in five sub-divisions of the Wouri Division. The data obtained were analyzed using descriptive statistics and multiple regression with Ordinary Least Squared method of analysis. Results from the analysis show that respondents comprised of 55% female household heads and 45% male with an average age of 40 years. The surveyed catfish consuming households have an average size of six persons and an average monthly household income of 185,500 FCFA. The average price per kilogram of catfish is 2,184.34 FCFA and the average substitute price is 2,054.55 FCFA/Kg. The results indicate an average monthly household catfish consumption of 6.33 Kg. Product price (P_r), consumers' income (Y), family size (P_x) and substitute price (P_s) were found to significantly influence the demand for catfish at one percent level of probability. The demand for catfish is price elastic ($P_E = 2.382$), the relatively positive income elasticity for catfish ($Y_{\epsilon D} = 0.138$) suggests a potential for the emergence of a large market for catfish in the future in the Wouri Division. Estimated cross elasticity coefficient between catfish and its substitutes shows a positive cross elasticity ($C_{\epsilon D} = 0.218$) for the Wouri Division. Aquaculture production could be assisted through efforts that promote technological change with the adoption of modern processing techniques in catfish production. This will go a long way to generate increased demand for catfish in the Wouri Division.

Keywords: Elasticity, demand, catfish, determinants, Wouri and Cameroon

1. Introduction

Catfish (*Clarias gariepinus*) like most seafood, is a very rich source of protein and plays an important role in food security for millions of people worldwide. In many developing countries like Cameroon, fish is mainly for direct human consumption. Generally, fish is consumed in all parts of Cameroon as an important source of animal proteins in the diet of both rural and urban households indicating a good future for the fishing sector ^[1]. However, production is usually on small scale. According to Senauer ^[2] estimated fish production in Cameroon stood at about 100,000 tons/yr in 1988. Because of this low production, Cameroon highly relies on imported fish to meet the demand of its existing markets. What this entails is that excess production from other parts of the world is traded in Cameroon.

The Food and Agriculture Organisation (FAO) ^[3] pointed out that protein for human consumption comes from two main sources, plants and animals. Plant proteins are deficient in certain essential amino acids notably methionine, tryptophan and lysine which are essential for healthy growth. However, animal proteins are rich in these amino acids and are therefore described as first class or good quality protein. In recent years, increased knowledge and awareness of human requirement for healthy growth have focused increasing attention on the unique roles of livestock and fisheries resources in human development.

Based on studies ^[4,5] that aimed at exploring fish consumption and evaluating the determinants of its demand and consequently the price elasticity of that demand, and despite the progress made in the last decade, it was recorded that poverty and malnutrition remains a serious

problem in sub-Saharan Africa and in Cameroon in particular. Recent statistics revealed that while agricultural production increased to 12.3% of GDP in 2009, yet 72.1% of the population lives on less than \$2 per day, 28% consume inadequate calories and 24% of the children below 5 years are underweight [1].

Urban agglomerations get more than half of their food supply from rural areas. But while the production of food crop drops in rural areas (due to the rural-to-city migration of farmers), the cities' demand in food as well as in other goods rather follows an increasing trend over the years (due to a high urban population growth rate). Hence, in order to satisfy the need of the urban population, the import of commodities is often necessary to supplement some locally manufactured products [6].

Adeniyi *et al.* [7] emphasized that the extent and depth of food insecurity in the developing world remains a big challenge. The development of a country cannot be complete without that of the agricultural sector in all its dimensions (cash and food crop cultivation) [8]. Out of about 800 million people of the developing world, one sixth is still found not to have sufficient food in both quantity and quality to live a healthy and productive life. The tremendous decline in food production and supply brought about by the neglect of the agricultural sector because of the oil boom in the 1970's has a negative effect on the nutritional status of the Cameroonian population.

Aquaculture seems to be the alternative to face the continuing decline in fish catch and to reduce the import of frozen fish. In 2012, the import of fish in Cameroon increased by 30%. This was evaluated at 200 million US dollars. Yet Cameroon offers enormous potential for the production of fish. Investors and youth (men and women) have been urged to invest in this sector that generates employment and income [9].

Gordon *et al.* [10] highlighted that Sub-Saharan African trade in fish products showed strong growth over the period 1990–2007. The region had a positive trade balance in food fish, with export value exceeding import value by about 6% in the early 1990s and rising to nearly 50% by 2007. However, throughout this period import volumes had exceeded export volumes (by roughly 70% by 2007). Despite the importance of imports to African food fish consumption, the region accounts for only 2% or less of global import volumes.

Few works have been realised on fish consumption and even lesser on the determinants of its demand. The studies carried out in many African countries like Burundi, Ivory Coast, Gambia, Ghana, Mali and Senegal were interested in quantities consumed per individual and per annum, to the study of the fish farming sector, to its constraints and to the fish market structure [4]. This study combines consumption quantity per household, determinants of demand and elasticities to investigate the apparently low level of catfish consumption in a production area (Wouri Division).

2. Methodology

2.1 Presentation of the Study Area

The Littoral Region, one of the ten regions of Cameroon, is considered as the economic heart of Cameroon. It differs from other parts of the country by its geographical location, demography and economy. The Region has four divisions including the Wouri which coincides almost to the city of Douala its headquarters; the Nkam Division with Yabassi as its capital; Mungo Division with Nkongsamba as its capital; and the Sanaga-Maritime Division Edea as its capital. Located between 4.25° N and 9.31° East, the Littoral Region covers a

surface area of 20,248 km² or 4.4% of the national territory. Douala is located within latitudes 4°05'00' North, 9°42'00' East and 4°34'11' North, 10°09'49'' West and 13 meters elevation above sea level. The climatic characteristics of the region give it many advantages for the development of agricultural activities in particular, to combine diversification of production, distribution and spatial crop specialization¹¹.

Douala is the largest city in Cameroon, with a total surface area of 210 Km² and the head quarters of Cameroon's Littoral region. Host to central Africa's largest seaport and its major international airport, it is the commercial and economic capital of Cameroon and the entire CEMAC region comprising Gabon, Congo, Chad, Equatorial Guinea, Central Africa Republic and Cameroon. Consequently, it handles most of the country's major exports, such as oil, cocoa, and coffee, timber, metals and fruits.

As of 2010, the division and its surrounding area had an estimated population that surpassed 3,000,000 inhabitants. In this study with the difficulty to distinguish the catfish consuming from the catfish non-consuming households, the population of analysis consisted of the population that regularly consume catfish. The unit of analysis is the catfish consuming households.

2.2 Sampling Technique and Sample Size

The multi-stage sampling survey method which involves taking some units of the population by successive steps and generalising the results was used. A purposive random sampling technique was used for the study. The procedure of selecting the sample was firstly a selection of five major catfish consuming Sub-divisions in the Wouri (Douala 1, Douala 2, Douala 3, Douala 4 and Douala 5) because catfish is mostly consumed by the Bassa and Nigerians, so the Sub-divisions selected were those with the highest Bassa and Nigerians population proportions. There was then a random selection of 20 individual households from each of the chosen Sub-divisions of this catfish consuming population giving the possibility to every single individual household of this population to be selected for the sample. This gave a total sample of 100 catfish consuming households. Table 1 presents the distribution of the individual households that constituted the study population.

2.3 Data Analysis

Data from the study were analysed with the use of descriptive statistics and econometric methods with the help of the Statistical Packages for the Social Sciences (SPSS) software.

2.4 Model specification for the socio-economic determinants of demand

According to literature [7, 12], the demand for catfish is determined, *ceteris paribus*, by factors such as catfish price, consumer income, household size, gender, age, and price of substitute good. An ordinary least square (OLS) linear regression model used by Adeniyi *et al.* [7] to assess the socio-economic determinants of catfish demand was used in this study and is presented as follows;

$$Q_d = b_0 + b_1P_f + b_2Y + b_3P_x + b_4P_s + b_5A + b_6G + b_7E + \varepsilon \dots (1)$$

Where Q_d= quantity of catfish demanded

b₀ to b₇ are the coefficients and

ε = error term

Where the variables used in the model as well as the expected signs are presented in table 1.



Fig 1: Map of Cameroon showing the Littoral region

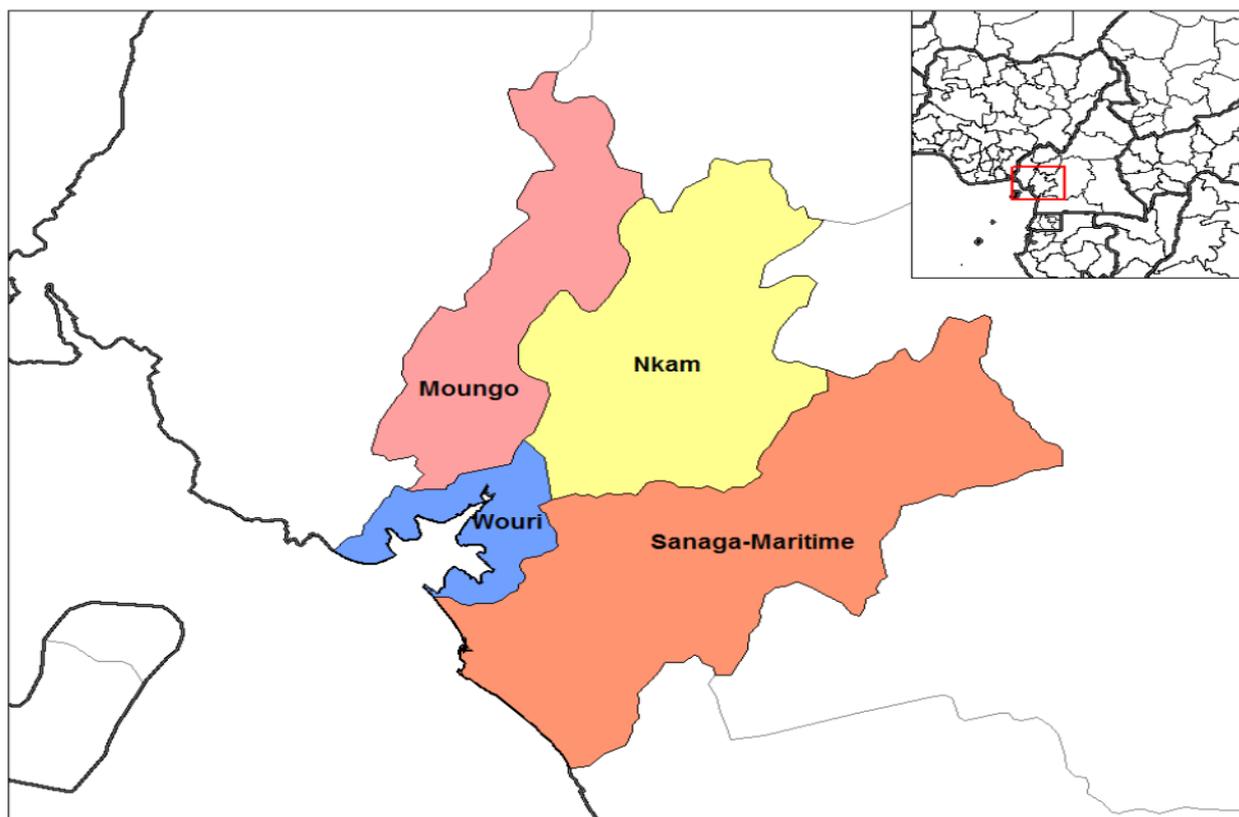


Fig 2: Map of the Littoral region showing the Study area Source: Essaga [13]

Table 1: Variables and expected signs for the linear model

Variable	Expected sign
P _f = Catfish price	-
Y = Consumer income	+
P _x = Household size	+
P _s = Price of substitute	+
A = Age	-
G = Gender	-
E = Education level	+

2.5 Model specification for the elasticities

The model used for the elasticities was a Cobb Douglas (log-log) single quantity dependent regression function as used by Omezzine *et al.* [14]. Taking natural logarithms on both sides of the equation (1) and eliminating the less significant variables A (age) G (gender) and E (educational level)) from the linear model gave the Cobb Douglas model,

$$\ln Q_d = b_0 + b_1 \ln P_f + b_2 \ln Y + b_3 \ln P_x + b_4 \ln P_s + \varepsilon \dots \dots \dots (2)$$

Where the variables used in the model as well as the expected signs are presented in table 2.

Table 2: Variables and Expected signs for the Cobb-Douglas model

Variable	Expected sign
$\ln P_f =$ catfish price	-
$\ln Y =$ consumer income	+
$\ln P_x =$ household size	+
$\ln P_s =$ substitute price	+

For this study, the choice of the variables was done based on previous literature, that is studies that had been realized in the same domain. For instance, like Omezzine *et al.* [14] and Dey *et al.* [15] who studied fish demand and elasticities in Asian countries and had chose the following variables as the main determinants of demand, which were also used for this study.

Demand for catfish (Q_a): It is the quantity of catfish consumed by each household on monthly basis. It is measured in Kg.

Price for catfish (P_f): This is the average charge for the purchase of one kilogramme of catfish. It is measured in Francs CFA.

Consumer's income (Y): This is the average monthly revenue per household and measured in Francs CFA.

Household size (P_x): This represents the number of individuals living in a household.

Price of substitute (P_s): This represents the average price to purchase one kilogramme of a substitute commodity to catfish.

Gender (G): This is a binary variable representing the sex of the consumers. It is noted; 0 for female and 1 for male.

Age of respondents (A): This is a quantitative variable that represent the age of the respondents (household head) and it is measured in years

Level of education (E): This represents the level of school of the respondents and they are in 4 categories; primary (1), secondary (2), university (3) and no education (4).

3. Results and Discussions

This section presents the results obtained after analyzing data collected from the field and their discussions. Its structure is focused on the objectives set, namely: describe the socio-economic characteristics of catfish consumers; to estimate the average quantity of catfish consumed per household; to assess the determinants of the demand for catfish; and to determine the income, price and cross elasticities of the demand for catfish. Firstly, a description of selected socioeconomic characteristics of the target population is presented. Note that the tables and figures presented in this section are as a result of field data analysis.

3.1 Socio-economic characteristics of the respondents

This section presents the distribution of respondents according to selected specific socioeconomic characteristics which includes; gender, age, marital status, the level of education, and family size. These variables give an idea about the nature and behaviour of actors in the catfish subsector in

the coastal region.

Table 3: Socio-economic characteristics of the respondents

Socioeconomic characteristics	Frequency	Percentage
Sex		
Male	45	45
Female	55	55
Total	100	100.00
Age of respondents (years)		
<25	5	5
25-35	38	38
36-50	34	34
>50	23	23
Total	100	100.00
Marital Status		
Married	58	58
Single	32	32
Divorced	4	4
Widow (er)	6	6
Total	100	100.0
Level of education		
Never been to school	1	1
Primary	7	7
Secondary school	39	39
University	53	53
Total	100	100.0
Household size		
<3	11	11
3-6	57	57
7-10	26	26
>10	6	6
Total	100	100.0

The results in table 3 indicates that 55% of catfish consuming households surveyed heads were female and 45% are male. This result may imply that women have realised that by cooking this fish species (for their men), which is particularly appreciated by men, they are able to obtain particular favours from these men. This result is in conformity with the findings of Omezzine *et al.* [14] in their study on the demand elasticities of fresh fish in Oman that women constituted in majority consumers of fresh fish commodities. The result of more female household heads than male in catfish consumption may be due to the fact that women are more involved in household nutrition than the men.

Age is an important characteristic in the consumption context as it affects the nutrition requirement of the consumer. Results (Table 3) also show that 72% of the respondents have ages ranging from 25 to 50 consume catfish. This might be explained by the awareness of these persons of locally produced fish species which provide equal level of satisfaction as does the imported frozen species which are abundant on the market.

The marital status of the respondent generally influence the consuming habits of the household in the sense that a married person will have more pressure to satisfy the nutritional needs of his or her family. Information from table 4 reveals that a slight majority (58%) of the respondents are married, and thus the pressure to provide for all the food needs of the family.

The level of education of a person affects his or her awareness about nutritive contents of foods. A great majority (92%) of the respondents have attained at least the secondary level of education. This result is in line with the findings of Cho¹⁵. The results show that the respondents have the ability to understand the nutritive contribution of catfish to their health and wellbeing.

The family size here refers to the number of individuals permanently living in a household. It was found from the study that, 57% of the catfish consuming households surveyed in the Wouri Division consist of 3 to 6 individuals, 26% consist of 7 to 10 individuals. This indicates that the majority of the surveyed households are relatively large enough to consume important catfish quantities.

3.2 Average Monthly Quantity of Catfish consumed

The average quantity of catfish consumed in this study refers to the average quantity of monthly household catfish consumption in the Wouri Division. Quantities were classified into three categories; 3Kg, 8Kg, and 13Kg. Table 4 presents the distribution of respondents according to their average monthly catfish consumed

Table 4: Distribution of respondents according to average monthly quantity of catfish consumed

Average monthly quantity consumed (Kg)	Frequency	Percentage
0 - 5	44	44
6 - 10	46	46
11 - 15	10	10
Total	100	100.0

It can be observed from Table 4 that 46% of the catfish consuming household surveyed consume six to 10 Kg of catfish per month. It was also determined from descriptive statistics that the average monthly quantity of catfish consumed is 6.33Kg This result is slightly different from the average monthly quantity consumed of 7Kg found by Dey *et al.* [16] in their study of the demand for fish in Asia.

3.3 Determinants of demand for catfish in the Wouri division

There are some key factors that are considered to influence a consumer for any commodity. These factors include income of the consumer, price of the commodity and the price of close substitutes. These will be examined from the standpoint of the respondent before assessment of the determinants of the demand for catfish in Wouri division.

Consumers' income is one of the important factors that affect the demand for any commodity or product. This study took into consideration the average monthly earnings of the catfish consuming household heads. The households were classified into four revenue groups; less than 50,000 FCFA, between 50,000 and 150,000 FCFA, between 151,000 and 300,000 FCFA and more than 300,000 FCFA monthly. Figure presents the distribution of respondents according to income

Table 4: Distribution of respondents according to their income

Revenue group (FCFA)	Frequency	Percentage
Less than 50,000	4	4
50,000 - 150,000	52	52
151,000 - 300,000	43	43
More than 300,000	1	1
Total	100	100.0

It can be observed (Table 5) that 52% of the catfish consuming households surveyed had an average monthly income ranging from 50,000 FCFA to 150,000 FCFA, and 43% had an income ranging from 151,000 FCFA to 300,000 FCFA, This indicates that overall, the surveyed households possess revenue relatively large enough to enable them

purchase the quantity of catfish they need.

The price of a commodity is an important factor to be considered as far as consumption is concerned. Different prices per kilogram of catfish were given by respondents in the study area and the table 6 shows the distribution of respondents according to these prices

Table 6: Distribution of respondents according to product (catfish) purchase price

Price per Kg	Frequency	Percentage
1800	7	7
1900	8	8
2000	29	29
2100	10	10
2200	3	3
2300	6	6
2400	9	9
2450	1	1
2500	28	28
Total	100	100

The results show that the price per kilogram of catfish in the study area is not constant, but vary from 1,800 FCFA to 2,500 FCFA. The results showed that, 29% of the consumers buy at 2,000 FCFA/Kg, 28% buy at 2,500 FCFA/Kg, 10% buy at 2,100 FCFA/Kg, and 1.0% at 2,450 FCFA/Kg. Results also show that the average price of catfish in the study area is 2,184.34 FCFA/Kg. This variation in catfish price may be associated to the different costs encountered by every catfish seller. This makes catfish more affordable than other animal protein sources (substitutes) in the Wouri such as pork, cow meat and chicken whose average prices are respectively 2,800 FCFA, 2,700 FCFA and 2,500 FCFA, these are presented in table 7.

Table 7: Distribution of respondents according to purchase price of substitute product

Substitute commodity	Frequency	Percentage	Price per Kg (FCFA)
Any other fish	1	1	1400
Bar fish	25	25	1500
Carp fish	1	1	1500
Chicken	12	12	2500
Cow meat	15	15	2700
Mackerel fish	21	21	1500
Pork	20	20	2800
Tilapia fish	4	4	1100
Total	100	100	

Results in Table 7 show that there is no dominant substitute commodity to catfish in the study area, 25% of the consumers substitute catfish with bar fish, 21% substitute with mackerel fish, 20% substitute with pork, 15% substitute with cow meat. The different prices to these substitutes were applied, and the study estimated the average substitute price for catfish to be 2,054.55 FCFA/Kg. This average substitute price is smaller than the average price for catfish of 2,184.34 FCFA/Kg obtained earlier, making the substitute commodity to be more affordable than catfish.

Econometric analysis was used to assess the effect of the socio-economic characteristics (gender, age, level of education, household size and consumer income) on the quantity of catfish demanded. Table 8 presents the results obtained from the linear regression of the quantity demanded on the farmers' socio-economic characteristics.

Table 8: Results of the regression model on socio-economic determinants of demand for catfish

Variable	Coefficients	t-statistics	Significance
Constant	12.289***	4.577	0.000
Gender	-0.369	1.209	0.230
Age	-0.023	1.390	0.168
Level of education	0.160	0.681	0.497
Family size	0.387***	4.438	0.000
Consumer income	0.00001117***	4.609	0.000
Product price	-0.005***	5.072	0.000
Substitute price	0.001**	2.268	0.26

Dependent variable = Quantity of catfish consumed per month
 $F(7, 98) = 66.223$ Prob > F = 0.000
 R Squared = 0.836 Adjusted R square = 0.823
 Number of observations = 100

Note: ** and *** represent significance at 5% and 1% level respectively

The results in table 8 reveal that the quantity of catfish demanded is explained by 82.3% of the variations in the variables included in the model. This permits the rejection of the first null hypothesis H_1 that the demand for catfish does not depend on consumers' socio-economic characteristics. Specifically, the findings reveals that, product price is significant at 1% significance level and has a negative contribution to quantity of catfish demanded. This means that, an increase in the product price by 1 FCFA will result in a decrease in the quantity demanded by 0.005 Kg. This is in line with the results obtained by Omezzine *et al.* [14] who analyzed the demand elasticities of fresh fish commodities in Oman and Dey *et al.* [16] who analyzed the demand for fish in India.

Findings of the study also reveal that consumer income is significant at 1% level of probability and has a positive contribution to the quantity of catfish consumed. This means that, an increase in the consumers' income by 1 FCFA will result to an increase in the quantity of catfish demanded by 0.00001117 Kg. This finding verifies the Keynesian fundamental law of consumption which states that "men are disposed as a rule and on average to increase their consumption as their income increases but not by as much as the increase in income".

Also, the study similarly observed a positive contribution of

family size to the quantity demanded with significance at 1% confidence level. An increase in the family size by 1 individual results in an increase of the quantity of catfish demanded by 0.387 Kg. This is reasonable because as the household size increases, more of catfish is required to satisfy every person in the household.

The results also reveal that substitute price is significant at 5% significance level and has a positive contribution to the quantity of catfish demanded. This means that, an increase in the substitute price of 1 FCFA will bring about an increase in the quantity demanded of catfish by 0.001 Kg. This is logical because an increase in the price of a substitute commodity will dissuade the consumer from purchasing the substitute but instead persuade him/her to consume more of the principal product.

From the results obtained, consumer's age and gender have negative contributions to the quantity of catfish demanded and are not significant for the study at any significance level. Finally, the results show a positive but not significant contribution of education to the quantity of catfish consumed by the households in the Wouri Division. The implication could be that, as a consumer's education increases, the quantity of catfish he/she consumes also increases by 0.160 Kg. This relation between education level and quantity consumed can be explained in that, the more educated a consumer is, the more aware he becomes as concerning nutrition requirements.

The linear regression equation (equation 1) can therefore be written as follows;

$$Q_d = 12.289 - 0.005P_f + 0.00001117Y + 0.387P_x + 0.001P_s - 0.023A - 0.369G + 0/160E... (3)$$

3.4 Income, price and cross elasticities of demand for catfish

Econometric analysis was used to assess the effect of the independent variables; natural logarithms of household size ($\ln P_x$), consumer income ($\ln Y$), product price ($\ln P_f$) and substitute price ($\ln P_s$) on the dependent variable, natural logarithm of the quantity demanded ($\ln Q_d$). Table 9 presents the results obtained from the regression of the Cobb-Douglas model.

Table 9: Results of the Cobb-Douglas regression model on elasticities of demand for catfish

Model	coefficients	t-statistics	Significance
Constant	19.871***	6.099	0.000
Price	-2.832***	8.221	0.000
Family size	0.176**	2.470	0.015
Consumer income	0.138**	2.118	0.037
Substitute price	0.218**	2.578	0.011

Dependent variable = quantity of catfish consumed
 $F(4, 98) = 102.178$ Prob > F = 0.000
 R Squared = 0.813 Adjusted R square = 0.805
 Number of observations = 100

Note: ** and *** represent significance at 5% and 1% level respectively

The results reveal that the quantity of catfish demanded is determined at 80.5% of the variables included in the model. The results reveal that product price is significant at 1% significance level and has a negative contribution on the quantity consumed. This means that, a 1% increase in product price will reduce the quantity consumed by 2.832% (coefficient of elasticity, P_E), thus demand is price elastic since $P_E > 1$. This is in contrary to Boubaker¹⁷ findings that

the price of catfish is inelastic with respect to quantity demanded. Nevertheless, this result complies with the law of demand which states that "as the price of a commodity increases, the quantity demanded of this commodity drops".

The study also reveals that family size is significant at 5% significance level and influences positively the quantity of catfish demanded. This implies that; an increase in the family size by 1% will result in an increase of the quantity demanded by 0.176%. This can be explained by the fact that as an

additional individual is present in the household, an additional quantity of catfish is required to satisfy this individual.

Consumer income is also significant at 5% significance level and influences positively the quantity demanded such that, a percentage increase in the income of a consumer increases his/her quantity demanded by 0.138%. This is in line with the findings of Omezzine *et al.* [14] and Dey *et al.* [16] who found the income elasticity of catfish demand to be positive. Hence catfish is a normal good since its income elasticity is positive. Finally, the results shows that substitute price is equally significant at 5% confidence level and positively influences the demand for catfish: an increase in the price of a substitute will increase the quantity demanded of catfish to increase by 0.218 Kg.

These results of the demand for catfish being price, income and cross elastic permits the rejection of the second null hypothesis H_2 that the demand for catfish is not elastic with respect to consumer's income, catfish price and price of a substitute commodity.

The Cobb-Douglas model (equation 2), can now be written as;

$$\ln Q_d = 19.871 - 2.832 \ln P_f + 0.138 \ln Y + 0.176 \ln P_x + 0.218 \ln P_s, \dots \dots \dots (4)$$

According to the results obtained from this study, the following income, price and cross elasticities of the demand for fresh catfish in the Wouri Division were obtained. The demand for catfish has positive income elasticity (0.138). This means that as consumer income increases, the quantity of catfish demanded also increases but to a smaller extend then the increase in income, thus implying that it is a normal good. The demand for catfish is price elastic, this implies that the coefficient of price elasticity is greater than one (2.832). and the percentage change in quantity demanded is greater than the percentage change in price. The demand for catfish has a positive cross elasticity of demand (0.218). this confirms with literature from Stonier and Hague, (1972) in their textbook on economic theories that the goods are substitute goods. This result of catfish being a normal good is in conformity with similar findings from Omezzine *et al.* [14] from their study of demand elasticities of fresh fish commodity in Oman who equally found fish to be a normal good with positive income elasticity.

4. Conclusion

The specific aims of the study were to; describe the socio-economic characteristics of catfish consumers; estimate the average quantity of catfish consumed per household; assess the determinants of the demand for catfish: and determine the income, price and cross elasticities of demand for catfish. The study results show that the catfish consuming households in the Wouri Division are constituted more of female household heads (55%) with an average age of 40 years for the household heads. The catfish consuming households have an average size of 6 persons and the average monthly household income of 185,500 FCFA. The average price per kilogram of catfish is 2,184.34 FCFA and the average substitute price is 2,054. FCFA/Kg and an average household catfish consumption per month of 6.33 Kg.

The results of the analysis in determining the elasticities of demand revealed that family size, consumer income and substitute price significantly and positively influences the quantity demanded. Catfish price is also significant, but negatively influences the quantity demanded: positive income

($Y_{\epsilon D} = 0.138$) and cross elasticities ($C_{\epsilon D} = 0.218$) of demand and negative price elasticity ($P_{\epsilon} = -2.832$) of demand for catfish in the study area.

Based on the study results, it can be concluded that more women headed households are involved in catfish consumption in the study area. The study also concludes that the law of demand is verified: since the greater the selling price of catfish, the lower the quantity demanded by the consumer. In spite of the numerous factors that may affect the quantity of catfish consumed per household in the study area, family size, catfish price, consumer income and substitute price are the determinants that significantly influences this demand. In addition, catfish is a normal good.

The diversification of aquaculture production could be assisted through efforts that promote technological change in agricultural production, and diversification in food demand patterns.

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