Analysis of economic and socio-demographic factors influencing consumption of beef and fish in Banjul, the Gambia

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Abtract

This study investigated the determinants of demand for beef and fish in Banjul. The main objective of the study was to assess the factors affecting the demand for these products with a view to ascertain the influence of the socio-economic and demographic features of the respondents affecting the demand for these products to gaining more insight. Data used for the analyses were obtained through personal interviews conducted between April and May 2001 using structured questionnaire. A sample of 100 consumers was drawn from the study area using cluster sampling technique. The data were analysed using descriptive statistics and multiple regression analysis. The results obtained showed that income, prices of the products, and household size were the major determinants of variation in the consumption of beef and fish among the respondents. Both products were found to be normal goods and generally price inelastic with fish being a close substitute to beef in the beef market. Increase in income leads to increased demand for meat in the area. Religion of household head as socio-demographic variable was found to be significant variable influencing demand for beef in the beef market.

Keywords: beef, fish, socio-demographic, demand, Banjul

1. Introduction

Protein is one of the basic components of a balanced diet needed for growth and replacement of worn out tissues (Oyenuga, 1974). Protein sources could be either of plant or animal origin with minimum daily requirements per person being 65g out of which 25g should come from animal source (FAO, 1971). Unfortunately, in Africa, animal protein foods from all sources contribute between 7g and 15g per person per day (Oyenuga, 1974). This study was therefore carried out in order to determine the level of animal protein intake and to identify the factors influencing demand for meat in formulating useful policy targets when government policies are to be geared towards the sustenance of an improved level of animal protein intake by Gambians. Studies have shown the fisheries sub-sector to be an important foreign exchange earner with estimated export earnings of US $ 2 million annually (Mendy, 1999). This was approximately 0.79% of the GDP in 1998 (Central Bank of The Gambia, 1998).

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Specifically, the study attempted to ascertain whether socio-economic and demographic features of the respondents have influence on the demand for animal protein; and to estimate price and income elasticities of demand for beef and fish in Banjul.

2. Literature review

The literature is replete with model specification and estimation procedures in food demand studies. Because of specific peculiarities of each particular situation, researchers in search of true functional forms may end up with *ad hoc* specification. Theoretically, a system of well-behaved demand functions should satisfy the various theoretical restrictions of adding-up, homogeneity, symmetry and negativity conditions. Furthermore, the theoretical restrictions provide useful checks for computational accuracy as well as exploring interdependencies that may exist among products. Over the years, a number of models have been developed that handle these concerns better than the traditional single equation demand models estimated by ordinary least squares method. Notable among these models are the Linear Expenditure System (LES) developed by Stone (1954); the Rotterdam model developed by Theil (1976); the Translog model developed by Christensen *et al*., (1975); as well as other more recent flexible functional forms like the Almost Ideal Demand Systems (AIDS) model of Deaton and Muellbauer (1980) to the Generalized Almost Ideal Demand Systems (GAIDS) of Bollino and Violi (1990) all provide better performance in terms of estimation of elasticities and conformity with theoretical restrictions even though estimation require substantial amount of data or sample size.

Regardless, several food demand studies have been carried out by a number of researchers. Hahn (1988) elucidated on aggregation problems at the household level associated with market demand for meats. Sidhu *et al*., (1993) estimated demand functions for eggs in Punjab, India, where occupation, income, and temperature were significant determinants of egg consumption. Aromolaran (1999) in analyzing household preferences and determinants of consumption expenditure on meat, fish, and eggs in Warri, Nigeria, observed variations in the consumption of these products due to income of household head, household expenditure on food and household size. Oguru (1992) also estimated regression equations of per capita demand for fish in Rivers State of Nigeria and found that the demand for fish in the state was price inelastic. Locally produced fish was found to be a normal good while imported "frozen" fish was an inferior good.

Molla *et al*., (1974) reported that poultry meat was a luxury food item of the urban consumers in Bangladesh; while potato and *brinjal* were found to be necessities. Further, among high-income families, expenditure on poultry meat was highly responsive to beef price changes than other substitutes like mutton and fish. A similar analysis for

low-income families produced erratic and perversive results. The reason given for this was that most purchases of poultry meat or other meat by low-income families were based on obligatory consumption needs in order to entertain guests or eat better food on religious or ceremonial occasions. Capps and Pearson (1986) showed that households meat consumption pattern in the United States of America was mainly affected by income among several other factors. Aromolaran and Akintunde (1998) found that variations in total monthly expenditure on food explained the highest proportion of variations in household consumption of some selected animal products; monthly household income was next best followed by age of household head.

3. Methodology

3.1 Study area

This study was undertaken in The Gambia, a small West African country virtually surrounded by Senegal from all sides except for the Atlantic coastline in the west. The country lies within latitudes 13°0'N and 13°42'N and longitudes 13°42'W and 16°40'W. It has agriculture as its main industry based on groundnut monoculture. It also engages in fishing and livestock rearing which are important contributors to the agricultural sector of the gross domestic product (GDP). The study was carried out in Banjul, the Capital of The Gambia. Banjul, with a population of about 30,000, is located in the western division of the country on latitude 13°28'N and longitude 16°40'W. As the seat of government, it is cosmopolitan in nature with the inhabitants coming from all-over the country. Notable ethnic groups include Wollof in the majority, followed by Fula, Mandinga and Aku (Central Statistics Department, 1993).

3.2 Sample size and sampling technique

The target population consists of beef and fish consuming households represented by the heads of households. Cluster sampling technique was used in selecting the respondents in order to reflect the geo-political zone of the study area. The study area was divided into three clusters made up of the city's geo-political zones of north, south and central constituencies from which random samples of 37, 38 and 25 respondents were selected, based on their proportions, respectively. This gave a cumulative sample size of 100 respondents.

3.3 Data and data collection procedures

Using structured questionnaire, data on age of household head, sex, household size, household heads' income, education, consumption of fish and beef and their prices

were collected between April and May 2001. Other relevant socio-demographic information collected were religion and main occupation of the household head.

3.4 Model and Data analysis procedures

3.4.1 Descriptive statistics

The data collected were subjected to descriptive statistical analyses in which pertinent information were summarized into frequencies and means to give discernable information on the demand for beef and fish and household characteristics in the study area.

3.4.2 Specification of the beef and fish demand functions

Multiple regression analysis using the ordinary least squares method (OLS) was used in analyzing the data obtained without prejudice to other more flexible functional forms (Berndt *et al*., 1977) as well as those others highlighted in the literature review section due to peculiarities of the situation at hand such as cost and data paucity. The Cobb-Douglas model was specified and used in the analysis. In this study, it was postulated that demand for beef and fish in Banjul was determined by socio-economic and demographic features of the respondents such as gender of the household head, religion, occupation, age, household size, educational level, income and prices of the products. In order to facilitate the empirical estimation of the demand coefficients (b_i's) in the Cobb-Douglas equations, the variables were transformed into double-logarithmic form specified as follows:

$$\text{Log}Y_b=\text{Log}a+b_1X_1+b_2\text{Log}X_2+b_3\text{Log}X_3+b_4\text{Log}X_4+b_5\text{Log}X_5+b_6\text{Log}X_6+b_7\text{Log}X_7+b_8X_8+b_9X_9+e \quad ..(1)$$

$$\text{Log}Y_f=\text{Log}a+b_1X_1+b_2\text{Log}X_2+b_3\text{Log}X_3+b_4\text{Log}X_4+b_5\text{Log}X_5+b_6\text{Log}X_6+b_7\text{Log}X_7+b_8X_8+b_9X_9+e \quad ..(2)$$

Where: Y_b = quantity of beef demanded in kilogram (kg)/annum;

Y_f = quantity of fish demanded in kilogram (kg)/annum;

a = Constant in the regression equation (intercept);

b_1 - b_9 = regression coefficients;

X_1 = Sex of household head; Male = 1, 0 = otherwise;

X_2 = Age of household head (years);

X_3 = Educational level of household head (1 = Quranic; 2=primary; 3= secondary; 4 = post Secondary; and 5 = all);

X_4 = Household size (number of individuals);

X_5 = Price of beef in Dalasis per kg ;

X_6 = Price of fish in Dalasis per kg;
X_7 = Annual income (Dalasis);
X_8 = Religion of household head; 1 = Islam, 0 otherwise;
X_9 = Occupation of household head; 1 = civil servant, 0 otherwise; and
e = Stochastic error term.

4. Results and Discussions

4.1 Descriptive statistics

This section presents the results of the descriptive statistical analyses and frequency tabulations on key variables used in the study which offered discernable information on the nature of the data employed. Table 1 shows the nature of variability in the key variables used in the regression analysis based on information obtained from the means and standard deviations. The table revealed great variability in prices income and quantity demanded of beef and fish among the respondent households. More importantly, the per capita consumption of meat (beef and fish combined) among the sampled respondents vary from 0.88g to 46.03g with mean consumption of only 10.503g which is far short of the daily per capita minimum requirement of 25g from animal protein source recommended (FAO, 1971).

Further analyses on the socio-demographic characteristics of the respondents revealed that majority of the household heads (71) were males compared to 29 females. The age distribution of respondents show that majority of the household heads were aged between 25-45 years with only 7% of respondents older than 55 years of age. Information on religion and occupation revealed 91% of the respondents were Muslims and 54% were employed as civil servants with the remaining engaged in non-civil service occupations. The educational characteristics were such that 41 household heads had secondary level of education with additional 22 with post secondary level of schooling. Household consumption behaviour is posited to be influenced more by household size. The survey data revealed wide distribution of household size among respondents. Majority of the households (32%) had between 7-9 members with another 21% with 10-14 members (Table 2).

Table 3 presents the socio-economic characteristics of the respondent households in terms of beef and fish consumption as well as prices and income information. Income distribution among household heads showed 33% of them with annual income of 10,000 to 19,999 dalasis, another 29% with 20,000-29,999 dalasis. A quarter of the respondents had income greater than 30,000 dalasis. The annual consumption of beef and fish among the households is presented in Table 3. Twenty-seven per cent of the households consumed between 50-100kg of beef with only 13% of households who consumed 200kg

or more per year. Although same proportion of households consumed 50-100kg of fish, much higher proportion (29%) consumed 200kg or more of fish than households who consumed same amount of beef. The daily per capita consumption of meat (beef and fish combined) in the Banjul area revealed that more than half (54%) of the households consumed less than 10g of meat. Another 24% of respondents consumed 10 – 19.99g per capita per day. In fact, 94% of households consumed less than the recommended minimum daily per capita animal protein requirement of 25g (FAO, 1971). This finding has serious implication for households in terms of daily dietary animal protein requirements as well as policy direction for government in terms of trying to meet its citizens' dietary protein requirements. Information on prices paid per kg of beef vary widely perhaps due to differences in source and quality such as bazaar, cold stores, supermarkets, satellite markets etc. More than half of the respondents (58%) paid 20.1 to 30.0 dalasis per kg with another 21% who paid more than 30 dalasis per kg of beef. With respect to fish, majority of the respondents (58%) bought one kg of fish for 15 dalasis or less. Only 6% of the households bought fish at more than 30.0 dalasis per kg during the period of study (Table 3).

4.2 Regression analysis

The estimated coefficients of the demand functions specified in equations 1 and 2 are presented in Table 4. The results presented in this section should be understood within the limitations in which this preliminary study was carried out under limited cost and time. We are hopeful that it will serve as an impetus for more rigorous study in this area in the country. It should be observed that in both models, the R^2 were low with some variables not statistically significant perhaps because of the nature of cross-sectional data and small sample size. Gender (X_1) exhibited a negative relationship with consumption, thus, revealing that female-headed households consumed both products more than their male-headed household counterparts, but not at a significant level. Capps and Pearson (1986) found a contrasting scenario when they opined that households with female heads in the United States of America paid substantially less per week for meat and meat alternatives. However, in this study, in our opinion the observed relationship could be because, women show more concern for nutritional well-being of their households than men within the African context as concurred by Aromolaran (1999). Age (X_2) indicated a positive relationship with beef and fish consumption, implying that demand for beef and fish increases with an increase in the age of the consumer though not statistically significant. Contrary to Schrimper (1986) who found a negative relationship between age and beef consumption in the United States of America and concluded that elderly people definitely decrease consumption of red meats especially beef. The results from the United States study may equally reflect cultural differences and perceptions about age and nutritional requirements. However, Sharu (2000) reported age to be a significant determinant of demand for small ruminant meat in Runjin Sambo area of Sokoto metropolis, Nigeria.

The level of education (X_3) of the consumer manifested insignificant relationship with the consumption of meat though surprisingly, because we expected the more educated the household head, the more nutritional conscious the consumer and hence, would be inclined to demand more meat. Capps and Pearson (1986) revealed that households with college educated heads spent significantly less on meat and meat alternatives than did household heads without college education. There is strong positive relationship between household size (X_4) with beef and fish consumption, suggesting that an increase in household size significantly leads to an increase in the demand for beef and fish. This is in order because, the larger the household size, the more the demand for meat to meet the nutritional requirements of household members. Ibrahim (1999) noted that larger families in Kano demanded more soybeans for consumption than smaller ones. Similarly, Sharu (2000) reported family size to be a significant determinant of meat consumption in Sokoto metropolis, Nigeria.

Price of beef (X_5) revealed an inverse relationship with the quantity demanded, but, an unexpected negative sign in the fish consumption demand equation (Table 4). Similar view was also expressed by Oguru (1992) who found a negative relationship between price of beef and quantity demanded in Rivers State, Nigeria. In the same vein, Fatunla *et al*. (1982) argued that in most developing countries, quantities supplied of basic food items such as fish often fall short of demand and the usual presumption that quantity demanded and cross-price of substitutes relate in a direct manner does not always hold. Compared to the model for beef consumption, it shows that consumers are more responsive to fish price changes as a substitute to beef than those of beef as a fish substitute in the study area.

Price of fish (X_6) had the *a priori* positive sign (cross-price) with beef consumption though not significant and an expected negative sign for own price-effect which was statistically significant at the 1% level. This is in agreement with the study by Oguru (1992). The result however, is in contrast with the findings of Fabiyi (1985) with unexpected sign on own price of fish.

Income of the consumer (X_7) had the expected significant positive sign in both models, suggesting that beef and fish are normal goods in the study area during the time of investigation. This notion was also held by Idachaba (1981) who reported that growth in per capita income tends to increase the consumption of non-starchy foods like fish. Other studies have also shown the consistent and pronounced influence of personal income on meat consumption (Fabiyi, 1985; Guseman and Sapp, 1986; Schrimper, 1986; Aromolaran and Akintunde, 1998). Other socio-demographic variables such as religion (X_8) revealed that the Christian residents significantly demanded more beef than their Muslim counterparts for whatever reason, but on the other hand, the Muslims demanded more fish than their Christian brethrens, though not at a significant level. Households with civil service employed heads demanded more meat than their non-

civil servant headed households though not at a statistically significant level as revealed by the occupation (X_9) variable.

Table 5 shows that demand for fish and beef in Banjul is relatively price and income inelastic. These results suggest that fish and beef are normal goods. Table 5 also shows the cross-price elasticities. The results manifest that fish is a substitute to beef in the beef market while, beef is a complement to fish in the fish market. This can happen only if the fish consumers are so specialised to the extent that they can only consume beef with fish (complementarity) relationship. This is however, inconsistent with *a priori* expectation, this is probably because cross-price elasticities are difficult to estimate and are very sensitive in sign and magnitude to the specification of demand equations, data, estimation procedures, and the level of aggregation in time and across commodities (Hassan and Safyurtlu, 1986). The model specification problem is also of paramount importance because best estimates of demand studies are obtained using complete systems of demand functions which was not possible in the current study due to several limitations such as data paucity and cost. A typical situation in Banjul is the obligatory consumption of beef over the weekends in order to maintain the custom of a presumed better diet meant for weekends as days of leisure and rest. This custom is important because the average household in Banjul eats fish five or more days in a week (perhaps because of its coastal location). Abott and Makeham (1988) have also noted the story of influence of custom on food demand and consumption as observed in this study.

5. Conclusion

This study revealed that household size, prices of the products, and income of the consumer were major determinants of consumption of beef and fish in Banjul. The demand for the products was relatively price inelastic. Both products were found to be normal goods with positive income elasticity coefficients. It can therefore be said that, as the level of income of the consumer increases, the demand for the products is expected to rise. Fish was found to be a close substitute to beef in the area. Even though this study is limited to some extent because of its use of single demand equation specification as opposed to complete demand systems, nevertheless, it does have some lesson to offer as an eye-opener on meat demand studies in The Gambia. Future studies in this area should focus more on using complete demand systems in estimating demand functions in order to have far-reaching conclusions and recommendations. Income and family size have been found to be most influential in stimulating demand which must be recognized in formulating demand and supply side policies for beef and fish consumption and production in The Gambia. The survey data revealed that over 90% of the households consume less than the minimum 25g daily animal protein per capita intake requirement. This situation could lead to a larger segment of the population suffering from animal protein deficiency in which the most vulnerable could be children, the elderly and the poor. Thus, government policy targeting both supply and demand should be in place to ensure meeting the minimum daily per capita animal

protein intake requirements especially in improving the income level of the households as well as improving supply of beef and fish.

References

Abott,J.C and J. P.,Makeham(1988) *Agricultural Economics and Marketing in the Tropics. Low-priced* edition, Longman Group, London, England. Pp. 9-22. 210p.

Aromolaran, A.(1999). "Analysis of household preferences and determinants of consumption expenditure on meat, fish and eggs." *Nigeria Journal of Economic and Social studies*: 41 (1): 44 - 58.

Aromolaran, A.B and O.A Akintunde (1998). "A socio-economic Analysis of consumption Pattern and Consumer Preferences for selected Animal products in Delta State, Nigeria." Proceedings of the 3rd Annual conference of Animal Science Association of Nigeria, September 22 - 24., In: Ologhobo, A.D and E.A. Iyaji (eds.). The Nigerian Livestock Industry in the 21st century.

Berndt, E.R, M.N. Darrough and W.E. Diewert (1977). "Flexible functional forms: an application to Canadian consumer demand functions." *International Economic Review*. 18(3):651-657.

Bollino, C.A. and R. Violi (1990). "GAITL: A generalized version of the almost ideal and translog demand systems." *Economics Letters* Elsevier 34(2):27-29.

Capps, O. Jr., and J.M. Pearson (1986). "Analysis of convenience and non convenience food expenditures by U.S. households with projections to the year 2000." In: Capps, O. Jr., and B. Senauer (eds.) *Food Demand Analysis: Implications for future consumptions,* Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A, pp. 233 - 250.

Central Statistics Department (1993) Livestock Statistics in the Gambia, Government Printers, Banjul, The Gambia. 12p.

Christensen, L.R., D.W. Jorgenson and L.J. Lau (1975). "Transcendental logarithmic utility functions." *American Economic Review*. 65: 367-383.

Deaton, A. and J. Muellbauer (1980a) "An Almost Ideal Demand System". *American Economic Review* 70:312-326.

Deaton, A. and J. Muellbauer (1980b) *Economics and Consumer Behaviour* Cambridge. Cambridge University Press.

Fabiyi, Y.L. (1985) *Demand for fish in Calabar, Cross-Rivers State, Nigeria.* Proceedings of the 4th Annual Conference of the Fisheries Society of Nigeria, Port Harcourt, November 26th-29th, pp 62-70.

F.A.O (1971). *The State of Food and Agriculture*. F.A.O, Rome, pp 25-40.

Fatunla, G.T., O.L. Oludimu and O.O. Ladipo (1982**).** "A Quantitative Analysis of Demand for Fish in Nigeria." Proceedings of the 2nd Annual Conference of the Fisheries Society of Nigeria, Calabar, January 25 - 27, pp 201-206.

Guseman, P.K and S.G. Sapp (1986). "Popular scale, composition, and income effect on Per Capita and Aggregate Beef consumption: A Temporal and Spatial Assessment." In: Capps, O. Jr., and B. Senauer (eds.) *Food Demand Analysis, Implication for future consumption*. Virginia Polytechnic Institute and State University,Blacksburg, Virginia, U.S.A, pp 185-213.

Hahn, W.F. (1988). Measuring the effects of the distribution of income upon consumer demand for meats. Staff Paper National Economics Divison, Economics Research Service, U.S.D.A. 17p.

Hassan, Z.A. and A.N. Safyurtlu (1986). "Market Demand Functions." In: Capps, O. Jr., and B. Senauer (eds). *Food Demand Analysis, implications for future consumption*, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A p1.

Ibrahim, M. (1999). Factors Affecting Soya Bean consumption in Municipal Local Government Area, Kano State. An unpublished Project Submitted to the Faculty of Agriculture, UDUS, . 47p.

Idachaba, S.F (1981). *Elements of Rural Economics*. Ibadan. Ibadan University Press (IUP), Ibadan, Nigeria, Pp. 23 - 24. 510p.

Mendy, A. (1999). Profile of Marine Resources of the Gambia. Fisheries Department, Banjul, the Gambia, Pp.1-6.

Molla, R.I, M.R Sarker, H.Kabir, and S.Hussani (1974). "A Note on the Nature of Demand Elasticities of Poultry, Potato and Brinjal: Using Panel Data in Mymensingh Town, Bangladesh." *Indian Journal of Agricultural Economics*. 29(4):54-60.

Nash, D.A. (1967). "Demand for fish and fish Products with special Reference to New England." *Proceedings of the Recent Developments and Research in Fisheries Economics*, 2(10): 31 - 40.

Oguru, A.A. (1992). "Econometric Analysis of Aggregate Demand for fish in Rivers state, Nigeria." *Delta Agric. Journal,* 1(2): 1 - 5.

Oyenuga, V.A. (1974). "Feeds and Foods of Tropical Africa." In: Leosli, J.K, V.A. Oyenuga; and G.M. Babatunde (eds). *Animal Production in the tropics*, Heinemann Educational Books (Nigeria) Plc, Ibadan, Nigeria, pp 27-47.

Schrimper, R.A. (1986). "Effect of Increasing Elderly Population on Future Food Demand and Consumption." In: Capps, O. Jr., and B. Senauer (eds). *Food demand analysis, implications for future consumptions*. Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A, Pp. 163 - 176.

Sharu, A.A. (2000). Economic Analysis of the Factors Affecting the demand for beef and small ruminants meat in Sokoto: A case study of Rujin Sambo Quarters. Unpublished project submitted to the Faculty of Agriculture, UDUS, 57p.

Sidhu, D.S., M.P. Gupta, and A.S. Sorohi (1993). "Estimation of Demand Functions for Eggs in Punjab - An Econometric study." *Indian Journal of Agriculture Economics*, 27 (3): 20-37.

Stone, R. (1954). *The Measurement of Consumers' Expenditure and Behaviour in the United Kingdom*. Cambridge. Cambridge University Press.

Theil, H. (1976). *Theory and Measurement of Consumer Demand*. Amsterdam. North Holland Publishing Company.

Table 1: Descriptive statistics of variables used in the study (n = 100 observations)

Name	*Variable Description*	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*
Y_b	*Quantity of beef demanded per annum (kg)*	*6.00*	*960.00*	*111.775*	*119.063*
Y_f	*Quantity of fish demanded per annum (kg)*	*6.00*	*900.00*	*168.260*	*147.753*
X_1	*Gender (Male =1; female =0)*	*0*	*1*	*0.71*	*0.456*
X_2	*Age of household head in years*	*25*	*65*	*34.15*	*10.032*
X_3	*Educational level of household head (1-5)*	*1*	*5*	*3.18*	*1.226*
X_4	*Family size*	*1*	*39*	*9.42*	*6.396*
X_5	*Price of beef in Dalasis* per kg*	*2.09*	*40.85*	*27.228*	*7.618*
X_6	*Price of fish in Dalasis* per kg*	*2.00*	*45.00*	*15.96*	*9.25*
X_7	*Annual income (Dalasis*)*	*3000.00*	*120000.00*	*24068.670*	*16803.16*
X_8	*Religion 1 = Islam, 0 otherwise*	*0*	*1.0*	*0.910*	*0.2876*
X_9	*Occupation (1 = civil servant)*	*0*	*1.0*	*0.540*	*0.5009*
X_{10}	*Meat (beef and fish) Consumption Per day per capita (grams)*	*0.88*	*46.03*	*10.503*	*7.986*

Note: * = During the study period the exchange rate was D25 = US$1.00

Table 2: Frequency distribution of households by important socio-demographic variables (n =100 observations)

Variable/Characteristic	Frequency	Variable/Characteristic	Frequency
Gender		**Education**	
Male	71	Quranic	15
Female	29	Primary	6
Age (Years)		Secondary	41
25-35	42	Post-secondary	22
36-45	40	All	16
46-55	11	**Household size**	

> 55	7	1-3	9
Religion		4-6	24
Islam	91	7-9	32
Christianity	9	10-14	21
Occupation		> 14	14
Civil servant	54		
Non-civil servant	46		

Note: Because sample size is 100, frequency is same as percentage proportion

Table 3: Frequency distribution of some important socio-economic characteristics relating to beef and fish demand (n=100)

Variable/Characteristic	Frequency	Variable/Characteristic	Frequency
Income per annum (Dalasis)*		**Meat consumption per capita per day (g)**	
≤ 10000	13	≤ 5.0	19
10,000 – 19,999	33	5.1 – 10.0	45
20,000 – 29,999	29	10.1 – 15.0	15
30,000 – 39,999	13	15.1 – 20.0	9
40,000 – 49,999	7	20.1 – 25.0	6
≥*50,000*	5	> 25.0	6
Price of Beef (Dalasis/kg)		**Beef consumption per annum in kg**	
≤ 10	3	≤ 25.0	16
10.10 – 15.00	6	25.1 – 50.0	19
15.10 – 20.00	12	50.1 – 100.0	27
20.10 – 25.00	19	100.1 – 150.0	18
25.10 – 30.00	39	150.1 – 200.0	7
>*30.00*	21	> 200.0	13
Price of Fish (Dalasis/kg)		**Fish consumption per annum in kg**	
≤ 10	37	≤ 25.0	11
10.10 – 15.00	21	25.1 – 50.0	8
15.10 – 20.00	19	50.1 – 100.0	27
20.10 – 25.00	9	100.1 – 150.0	15
25.10 – 30.00	8	150.1 – 200.0	10
>*30.00*	6	> 200.0	29

Note: Because sample size is 100, frequency is same as percentage proportion

* = During the study period the exchange rate was D25 = US$1.00

Table 4: Results of the Cobb-Douglas function regression analysis for beef and fish demand

Variable	Coefficient (Beef)	T-value	Coefficient (Fish)	T-Value

Constant	0.836		1.697	
	(1.775)	0.479	(1.911)	0.888
	- 0.0401		-0.301	
X_1 (Gender)	(0.189)	0.212	(0.207)	1.452
	0.154		0.003	
L X_2 (Age)	(0.325)	0.473	(0.356)	0.001
	- 0.128		0.204	
LX_3 (Education)	(0.198)	0.648	(0.216)	0.945
	0.268		0.307	
LX_4 (Household size)	(0.131)	2.051**	(0.143)	2.145**
	- 0.653		- 0.052	
LX_5 (Price of beef)	(0.219)	2.976*	(0.240)	0.215
	0.214		- 0.671	
LX_6 (Price of fish)	(0.143)	1.491	(0.157)	4.271*
	0.469		0.396	
LX_7 (Income)	(0.160)	2.932*	(0.175)	2.261**
	- 0.648		0.348	
X_8 (Religion)	(0.303)	2.139**	(0.332)	1.050
	0.133		0.100	
X_9 (Occupation)	(0.188)	0.709	(0.206)	0.488
F-value	5.440*		3.896*	
R^2-value	0.352		0.280	
Durbin-Watson	2.439		2.503	

Source: Field survey, 2001.
Note: Figures in parentheses are standard errors.
* = significant at 1% level. ** = significant at 5% level. n = 100

Table 5: Estimated demand elasticities for beef and fish in Banjul, The Gambia

Commodity	Own-Price Elasticity	Income Elasticity	Cross-price Elasticity
Beef	-0.653*	0.469*	0.214a
Fish	-0.671*	0.396**	- 0.052b

Note: a Denotes price elasticity of fish in relation to beef
b Denotes price elasticity of beef in relation to fish
** = significant at 1% level. ** = significant at 5% level. n = 100*