



THE DEMAND FOR BEEF IN WESTERN ZONE OF BAUCHI STATE, NIGERIA

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ABSTRACT

The study analyzed the demand for beef in western zone of Bauchi State, Nigeria. It specifically described the socio-economic characteristics of beef consumers; estimated the effects of socio-economic characteristics of the respondents on the demand for beef; described the pattern of beef demand; described the spatial and temporal price variability of beef; determined the factors affecting the demand for beef; and identified and described the constraints affecting the demand for beef in the study area. A multi-stage sampling technique was used to select 341 respondents from the study area. Out of the 341 questionnaire administered to the sampled households, 335 copies were correctly filled and eligible for data analysis; giving a response rate of 98%. Also, 10 beef marketers were randomly selected from the major markets in the study area. Data collected were analyzed using descriptive and inferential statistics. The results showed a mean age of 43 years among the respondents, with an average monthly income of ₦23,575 and a mean monthly expenditure on food items of ₦24,416. The coefficients of household size, education, and monthly income positively influenced the quantity of beef demanded at $P < 0.01$ level of significance; and age of the household head inversely influenced the quantity of beef demanded. Furthermore, 70% of the respondents consumed beef frequently and beef was rated as the most (67.5%) preferred, egg (35.2%) and fish (26.3%) products. The spatial and temporal price variability analysis showed fair level of fluctuations with a rise in price of beef in 2019. Beef prices were volatile especially in Birshi market which had the highest price value of ₦1,800 per kilogram. The price of beef, household expenditure on other food items, and distance to the market significantly ($P < 0.01$) reduced the quantity of beef demanded; and price of mutton significantly and positively ($P < 0.01$) affected the demand for beef. Low monthly income (-0.843), preference for substitutes (0.764) and low nutritive value (0.589) were the major constraints to beef demand among households in the study area. The study concluded and recommended that increase in households' income and reducing beef prices would be an effective strategy to increase the quantity of beef demanded, as it will uplift households' relative purchasing power.

Keywords: Beef, Demand, Household, Income, Price, Substitute.

INTRODUCTION

Food is used as a collective term for any nourishing substance that is eaten, drunk, or otherwise taken into the body to sustain life, provide energy and promote growth etc. Animal products are attractive and efficient sources of nutrient; as a result, global demand for dietary animal protein is rapidly increasing (Dave, 2003). Emokaro *et al.* (2014) had rightly envisaged that as consumers become more articulate and organized; their demand for wholesome animal protein will exert a powerful influence upon quality, production method and strategies. The reason for this increase in animal protein demand include growth in population, improving technology, distribution, nutritional requirements, changes in income and movements in relative prices (Maurizio, 2006).



Meat is the most important supplier of animal protein in Nigeria and undoubtedly, beef is the single most important meat to the Nigerian consumer. Literature are awash with studies to show that beef is second to fish as a basic source of animal protein mostly consumed in Nigeria and the study area specifically. Beef demand accounted for over 50% of total meat supply in the country (Food and Agriculture Organization [FAO], 2017). The demand for beef is motivated by the nutritive value and palatability of the meat. Besides, large expanding internal markets due to continuing rising standard of living, urbanization, population outburst, and higher purchasing power have made the demand for beef to outstrip supplies. This situation may even be more serious in certain areas with high population and insignificant production of cattle, especially in cities. Recent happenings in the country such as insurgency, banditry and clashes between herdsmen and farmers may have negative effect on the population of cattle available for slaughter. These are capable of affecting the supply and demand for beef in the country and Bauchi state in particular. Succinctly, evaluation of the demand function for beef in the study area is imperative and would point to future of cattle industry, food security and poverty alleviation. Furthermore, the demand for beef cuts across religion, tribe, culture and status. However, its effective demand is subject to certain conceivable factors that require empirical investigation to justify their effects. More often, beef has inelastic demand nature with respect to factors that have impact on its demand. Hence, the needs to establish an ordinary demand function for beef in the study area.

Over the years, there have been a number of studies on price transmission, market integration, market performance, market efficiency as well as marketing margin of food grains in Nigerian markets. Examples of such studies are studies conducted by Peterson (2004), Oladapo *et al.* (2007), Akpan and Aya (2009), Nuhu *et al.* (2009), Ugwumba and Okoh (2010), and Obayelu and Salau (2010). These studies concentrated on staple foods, cowpea and vegetables in specific location with scanty investigations on the demand for beef. Limited studies on beef analysis were carried out outside the study area. Also, some of these studies employed methods like correlation analysis, trend and time series analyses, co-integration analyses, granger causality and error correction model. There was little or no information on spatial and temporal price variability for beef in Bauchi State, Nigeria. The specific objectives were to; estimate the effects of socio-economic characteristics of the respondents on the demand for beef in the study area; determine the factors affecting the demand for beef in the study area; and identify and described the constraints affecting the demand for beef in the study area.

MATERIALS AND METHODS

The Study Area

The study was carried out in western zone of Bauchi State, Nigeria. There are seven local government area in Western Zone of Bauchi, these include; Alkaleri, Bauchi, Bogoro, Dass, Kirfi, Tafawa Balewa and Toro. The zone is located in the North-Guinea Savannah part of the State on latitude 9°03' and longitude 8°50'. The landmass is 24,270.701km² (BSADP, 2018) with an estimated population of 4,476.465 (National Population Commission [NPC], 2018) in the study area with the total population of 7,057.045 in Bauchi State. The rainfall and temperature ranges between 600-1200 mm and 9.11°C – 40.55°C, respectively. Arable farming is the main agricultural practice in the area. Pearl millet, sorghum, water melon, sweet potato and legumes are produced in commercial quantities as principal crops. The farmers in the study area also embark on small, medium and large-scale livestock production such as rearing of goats, sheep, cattle and poultry as well as marketing of their products (FAO, 2016)



The western zone has vast expanse of woodland savannah which is a mixture of several vegetation types. There is also a mixture of vegetation, and wooded savannah. Agriculture is the most significant economic activity in the area. About 80% of the people are farmers, engaging mostly in subsistence farming. The area has large acreage of cultivable land but less than ¼ is under cultivation. The climate and soil condition favors agriculture and livestock production. The area has two main seasons; the dry season, between November and March; and rainy season which is between April and October (Okediji, 2002).

A multi-stage sampling technique was employed to select the households for the study. The Western Zone of Bauchi State was selected for this study due to the high level of demand for beef and the presence of various beef markets in the area. In stage one, Western Zone of Bauchi was selected. In stage two, two (2) Local Government Areas (LGAs) from the Western zone in Bauchi State were selected for the study. In stage three, two districts in each of the LGA were randomly selected, giving a total of four (4) districts. In stage four, two (2) council wards were randomly selected from each of the districts, making a total of eight (8) council wards. In stage five, 20% of the total population selected from each of the 8 council wards were randomly selected to give a total of 341 households for the study. The proposed council wards, their population and the sample size selection process are as given in Table 1.

Table 1: Sampling Procedure

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Zone	LGA	District	Wards	Population	Sample size (20%)
Western zone	Dass	1. Dot	1. Durr	95	19
			2. Lukshi	91	18
		2. Bundot	1. Bundot	87	17
			2. Bagel	96	19
	Bauchi	1. Miri	1. Kundum	325	65
			2. Birshi	348	70
		2. Galambi	1. Kangere	374	75
			2. Turum	291	58
Total				1797	341

Source: Author's computation using 20% total population

Method of Data Collection

Both primary and secondary data were used for the study. Primary data were obtained through structured questionnaire and interview schedule to generate the information required for the study. The data were collected in line with the stated research objectives. Secondary data covered the wholesale monthly prices for 24 months (2015-2017) which were obtained from the Agricultural Development Programme Office (ADP) in Bauchi State. The data were collected on detailed prices of beef over time periods that were available.

Analytical Techniques

The implicit form of the ordinary least square (OLS) regression model used is specified as:

$$Y_i = f(X_i) \quad \dots(1)$$

where;

Y_i = dependent variables which represent the quantity of beef demanded by individual household and

X_i = independent variables of individual households.

The explicit form of the model is presented in the equation below:



$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + e_i \quad \dots(2)$$

Y_1 = Quantity of beef demanded (kg)

X_i = selected independent variables for socio-economic characteristics and other determining factors.

The relationship between the endogenous and each of the exogenous variables was examined using four (4) functional forms: linear, semi-log, Exponential and Double-log.

1. Linear:

$$\gamma = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e_i \quad \dots(3)$$

2. Semi-log:

$$\gamma = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + \beta_9 \log X_9 + e_i \quad \dots(4)$$

3. Exponential:

$$\log \gamma = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e_i \quad \dots(5)$$

4. Double-log:

$$\log \gamma = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + \beta_6 \log X_6 + \beta_7 \log X_7 + \beta_8 \log X_8 + \beta_9 \log X_9 + e_i \quad \dots(6)$$

The lead equation called the best linear unbiased estimate (BLUE) functional form was chosen based on econometric considerations such as magnitude of the estimates of independent variables, the coefficient of determination (R^2), magnitude of the error term, statistical significance of the coefficient of independent variables (Olayemi and Olayide, 1981), and more importantly, the economic reasonableness of the estimates, such as weight and direction of the coefficients.

Factor Analysis was used to analyze constraints of the study. Constraints affecting the demand for beef in the study area was identified using factor analysis. Factor Analysis is a dimension reduction technique that is useful in social science studies and other surveys (Johnson and Wicher, 2007). The constraints to the demand for beef in the state was determined using Factor analysis model. The simple model to be adopted is as shown in the equation 7:

$$X_j = a_{j1}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + e_j \quad \dots(7)$$

where;

$e_j = 1, 2, \dots, p$; p denotes the number of variables ($X_1, X_2, \dots, X_p$) and m denotes the number of underlying factors ($F_1, F_2, \dots, F_m$). X_j is the variable represented in latent factors. The model assumes that there are m underlying factors whereby each observed variable is a linear function of these factors together with a residual variate. The factor loadings will be $a_{j1}, a_{j2}, \dots, a_{jn}$ where; a_{j1} is the factor loading of j^{th} variable on the first factor. The specific factor is denoted by e_j . Explicitly, the factor loading gives an idea on how much the variable has contributed to the factor; the larger the factor loading, the more the variable has contributed that particular factor, and Vice Versa.



RESULTS AND DISCUSSION

Effect of Socio-economic Characteristics on Demand for Beef

The estimated ordinary least square (OLS) regression model used to determine the effect of selected socio-economic variables on the demand for beef in the study area is presented in Table 2. Output of the exponential functional form was chosen for discussion based on certain econometric considerations as described in the methodology.

Table 2: Effect of socio-economic variables on the demand for beef

Variables	Coefficient	Std. Error	t-value	Prob. Value
Constant	1.567	-0.199	7.883	0.000***
Sex	0.148	0.088	1.683	0.093 ^{NS}
Age	-0.027	0.004	-6.878	0.000***
Household size	0.040	0.013	3.201	0.002**
Education	0.039	0.011	3.535	0.000***
Monthly income	7.745E-6	0.000	5.556	0.000***
F-value	22.118			0.000***
R ²	0.659			

Note: *** = significant at $P < 0.01$, ** = Significant at $P < 0.05$, NS = Not Significant.

Source: Computed from Field Survey, 2020

For beef demand, the coefficient of determination (R^2) value was 0.659 which implies that 66% of variation in the quantity of beef demanded was explained for by the socio-economic variables included in the model. The remaining 34% was attributed to error term. F-value of 22.118 which was significant at $P < 0.01$ implies that the model has a good fit to the data. Out of the five (5) socio-economic variables included in the model, four (4) significantly influenced the demand for beef by households in the study area.

Table 2 also indicated that the estimated coefficient ($\beta = -0.027$) of age was statistically significant at $P < 0.01$ level and negatively influenced the demand for beef by households in the study area, meaning that the higher the age of a household head, the lower the quantity of beef demanded by the household. By implication, household demand for beef decreases with the aged. The result on age could be attributed to the medical effect of beef on the aging population. Indicatively, consumers shift their preference towards fish or egg with increase in age as it is always recommended for the aged due to its content. This result agrees with the findings of Igwe and Onyekwere (2007) and Sharu (2000) on their work on meat demand in Umuahia and Sokoto Metropolis of Nigeria, respectively.

The estimated coefficient ($\beta = 0.040$) of household size was positively signed and significant at $P < 0.01$ in influencing household demand for beef in the study area. The implication of this result is that, there is tendency for an increase in the quantity of beef demanded due to large household. More household members could imply more quantity per household. Consumers' preference may however shift towards other substitutes with lower price as household size increases. This finding agrees with the previous study on meat demand analysis in Maiduguri (Yakaka, 2012).

The estimated coefficient of education ($\beta = 0.039$) was positively related to household demand for beef. The estimate was also significant at the level of measurement. The positive sign is an indication that the demand for beef will increase with more years spent schooling. In other word, the higher the level of education of household head, the higher the quantity of beef demanded. This finding could be attributed to more awareness on the nutritive value of beef commodity as good nutrient source by the more educated household heads. This finding agrees



Yakaka and Bashir (2012) who reported similar finding on the demand for meat in Maiduguri, and indicated that a literate consumer would likely be conscious of the nutritional importance of meat, due which he would demand more. Also, an earlier report by Bello and Bah (2004) in Banjul, Gambia, that the more educated and nutritionally enlightened a consumer is the more the demand for beef as quality protein.

The estimated coefficient of income was significant at the $P < 0.01$ level of measurement and positively signed for beef demand in the study area. By implication, it has a direct (positive) bearing on the quantity of beef demanded by households. Indicating that people will prefer taking beef or increase their consumption of it when there is an increase in income. The finding on income partly agrees with Engle's law which states that the proportion of income spent on food declines as income increases, even if actual expenditure on food rises. An earlier report by Ikeme (1995) revealed a significantly positive relationship between consumption and income level of households. However, the finding contradicts the report of Umeh and Asogwa (2012) which show that there is an inverse relationship between income and food expenditure, therefore, as household income increases, the expenditure on food decreases.

Factors affecting the Demand for Beef

The estimated ordinary least square (OLS) regression model used to determine the factors that affect the demand for beef in the study area is presented in Table 3. Output of the semi-log functional form of the OLS regression model was chosen for discussion based on certain econometric considerations as described in the methodology.

Table 3: Estimates of the semi-log OLS model on the determinants of demand for beef

Variables	Coefficient	Std. Error	t-value	Prob. Value
Constant	82.870	50.957	1.626	0.105 ^{NS}
Price of beef	-11.548	5.921	-1.950	0.052*
Price of chevon	0.007	0.276	0.026	0.979 ^{NS}
Price of mutton	1.220	0.349	3.500	0.001***
Beef consumption experience	-0.162	1.740	-0.093	0.926 ^{NS}
Household expenditure on other food items	-8.677	0.294	-29.542	0.000***
Distance to the market	-8.087	4.383	-1.845	0.066*
F-value	231.618			0.000***
R ²	0.829			

Note: *** and ** = values significant @ $P < 0.01$ and $P < 0.10$ NS = Not Significant

Source: Computed from Field Survey, 2020

For beef demand, the coefficient of determination (R^2) value was 0.829, which implies that about 83% of variation in the quantity of beef demanded was explained for by the variables included in the model. The remaining 17% was attributed to error term. F-statistics of 231.618 which was significant at $P < 0.01$ implies that the model has a good fit to the data. Out of the six (6) factors included in the model, three (3) significantly affected the demand for beef by households in the study area. The coefficients of years of beef consumption and price of chevon did not significantly affect the demand for beef by households in the study area. Hence, discussion shall be made on the factors that significantly affect the demand for beef.

The coefficient of price of beef ($\beta = -11.548$) was negatively significant at $P < 0.10$ for the quantity of beef demanded. The negative sign implies that an increase in the price of beef, all things being equal will decrease the demand for beef. This finding confirms the common



law of demand which states that, the higher the price the lower the quantity demanded. Indicatively, consumers are always conscious of change in price. This finding agrees with Liu and Deblitz (2007) when they reported that price of meat inversely influenced its consumption.

The estimated coefficient of price of mutton was positively significant at $P < 0.01$. The direct relationship between price of mutton and beef demanded implies that an increase in the price of mutton will further increase the beef demanded by the households. This result agrees with the report of Omu (2000) who said that, consumers will arrange consumption in such a way that the marginal utility derived from each commodity is proportional to price. Similarly, Ajana (1999), in his study, found that relatively small changes in food prices affect the ability of consumers to meet basic nutritional requirements.

The coefficient of household expenditure on other food items was negatively signed for beef, demand. The coefficient was significant at the $P < 0.01$ level. The inverse relationship implies the higher the amount spent on other food items, the lower the quantity of beef demanded by households. This finding is in line with the a priori expectation in that, as more money is spent on food items due to rise in prices of food items, quantity purchased would decrease. This finding is not surprising as most rural households may consider the consumption of beef as luxury and not a necessity; especially with low income earners. Liu and Deblitz (2007) reported similar findings.

Constraints Affecting the Demand for Beef

The constraints affecting the demand for beef among households in the study area is presented in Table 4 and Table 5. Table 4 presents the mean score distribution of constraints while outcome of the factor analysis is presented in Table 5.

Table 4: Mean score distribution on factors affecting the demand for beef

Constraints	VS (3)	S (2)	NS (1)	MS	Ranking
Low monthly income	158	144	33	2.4	1st
Preference for other substitutes	131	127	77	2.2	2nd
High price of beef	123	133	79	2.1	3rd
Long distance and cost to the market	108	154	73	2.1	3rd
Low nutritive value	122	138	75	2.1	3rd
High level of cholesterol	122	128	85	2.1	3rd
Concerns about food safety	100	128	107	2.0	4th
Long time for preparation	96	149	90	2.0	4th
Microbial contamination	100	133	102	2.0	4th
Bad taste	104	147	84	2.0	4th
Untidy environment	81	113	141	1.8	5th
Non access to personal transport	55	130	150	1.7	6th
emerging stories about climate change	76	102	157	1.7	6th

Source: Field Survey, 2020



Table 5: Factor analysis of the constraints to beef demand

Constraints	Factor 1	Factor 2	Factor 3
Low monthly income	-0.843	0.052	0.075
High price of beef	0.689	-0.073	0.325
Long distance and cost to the market	0.677	-0.007	0.351
Emerging stories about climate change	0.545	-0.066	0.089
Untidy environment	0.357	-0.274	0.114
Preference for other substitutes	-0.173	0.764	0.036
Bad taste	-0.155	0.696	-0.014
Long time for preparation	0.210	0.512	0.133
Non access to personal transport	-0.200	-0.164	0.696
Low nutritive value	0.184	0.251	0.589
High level of cholesterol	-0.069	0.096	0.498
Concerns about safety	0.302	0.036	0.476
Microbial contamination	0.208	-0.058	0.425

Note: Extraction Method: Principal component analysis; Rotation method: Varimax with Kaiser Normalization (loading at 0.4 and above); KMO = 0.689***; Factor 1 = Financial constraints/factors; Factor 2 = Personal constraints/factors; Factor 3 = Food Quality/Safety constraints/factors
Source: Field Survey, 2020

The Kaiser-Meyer-Olkin (KMO) index of 0.689 and the Bartlett's sphericity of 0.000 shows the suitability of the data for factor analysis. According to Table 5, three (3) factors were extracted based on the items loadings as constraints to the demand for beef among households in the study area. These factors were: financial factors; personal factors, and food quality or food safety factors. The constraints that loaded on factor 1 were the major problems constraining the demand for beef by households in the study area; followed by constraints loaded under factor 2 and factor 3.

Specific constraints that loaded on factor one was low monthly income (-0.843), high price of beef (0.689), and long distance and transportation cost to the market (0.677). Low monthly income has the highest loading on factor one; this implies that it is the major constraint to beef demand in the study area. Compared to those with higher income, lower income households consume fewer quantity of 'luxury' goods such as beef. Namso *et al.* (2017) also reported a positive effect of income on consumption expenditure of staple meat or meat related products. High price of beef also loaded high as a constraint to beef demand. This is in line with basic economic thought that, if a change in food prices results in a higher share of total household expenditure on food, then this can result in the household being more resource constrained (i.e. becoming poorer) as a result of the increase in food prices. Consequently, depending on the specific foods, households that are very poor and already consuming the lowest-cost foods will be unable to substitute cheaper foods and will be forced to spend more on basic staples, reduce the quality of their diets, or even reduce the quantity consumed of the least expensive foods, while also reducing non-food expenditures that may be equally needed, e.g. on health and education (Lele *et al.*, 2016).

Preference for substitutes (0.764) and bad taste (0.696) were the constraints that loaded high under factor 2 (personal or individual factor). Taste and preferences often are cited as a primary motivator of individuals' food choices (Drewnowski and Levine, 2003). While preferences for some products may appear to be innate, other preferences such as that of beef are clearly influenced by early exposure.

On factor 3 (food quality and safety factors); low nutritive (0.589), high level of cholesterol (0.498), and concerns on food safety (0.476) loaded high as problems to beef



demand among households in the study. Although with low value of 0.425, microbial contamination was listed as a constraint to beef demand among households. Access to safe and healthy beef is an important public good. Animal products such as beef, are linked with human health risks, but the risk is only associated with gross overconsumption. At low to moderate intakes, beef and other animal products like egg and milk are highly beneficial, providing essential amino acids, minerals and vitamins. Indeed, an increase in consumption of animal products would be highly desirable in combating malnutrition. Furthermore, meat, milk and eggs are perishable products and susceptible to microbial contamination. Consequently, inappropriate handling, preservation and processing throughout the food chain can also pose a serious health risk to the consumer and this may affect their demand for such commodity. Although many such contaminations have no effect if the products are prepared appropriately (Emokaro and Dibiah, 2014).

CONCLUSION AND RECOMMENDATIONS

It was concluded from findings of this study that beef was highly preferred to egg and fish among the respondents. Price was an important determinant of the quantity of beef demanded by consumers. Other determining factors of quantity of beef demanded were household size, education, monthly income, age, household expenditure on other food items, and distance to the market. The demand for these three commodities was constrained by low income of the households and their preference for other substitutes. In order to increase beef consumptions in the area, increasing households' income and reducing beef prices would be an effective strategy as it will uplift their relative purchasing power. Based on the findings of this study, the following recommendations are made:

1. Considering the effect of price as a determining variable for the quantity of beef demanded by consumers, there is the need for efficient price policy in the study area.
2. Government price intervention programme should be introduced in order to stabilize the fluctuation in beef prices. There should also be policy measures that will ensure increase in purchasing power of people's income which will invariably contribute positively to the improvement of nutritional status of the people.
3. Education was also identified to be positively related to the quantity of beef demanded. Good education policy that will further enlighten the people on the importance of beef as source of nutrient and as food should be vigorously pursued.

REFERENCES

- Ajana, A. (1999). The evaluation of groundwater quality on successful hatchery culture of African catfish (*Clarias gariepinus*) in Ikwuno Oboro, Abia State. *World Journal of Pharmaceutical Research*, 5(1): 12-23.
- Akpan, S. B. and Aya, A. E. (2009). Variance in Consumer Prices of selected Food items among Markets in Cross River State. *Global Journal of Social Sciences*, 8(2): 59-62.
- Bauchi State Agricultural Development programme (2010). Western Zone Crop Area Yield Surveys. Bauchi State Agricultural Report. p.12.
- Bello, H. M. and Bah, S. (2004). *Econometric analysis of demand for beef and fish in Banjul The Gambia*. Proceedings of the 29th Annual Conference of Nigerian Society for Animal Production (NSAP), UDUS, H. M. Tukur, W. A. Hassan, S.A. Maigandi, J. K. Ipinjola, A. I. Daneji, K. M. Baba, and B. R. Olorede (Eds): 21st -25th March, Pp.419-423.



- Dave, M. (2003). Policy networks and the genetically modified (GM) crops issue: Assessing the utilization of a dialectical model of policy networks. *Public administration*, 81(2): 229-241.
- Drewnowski, A. and Levine, A.S., (2003). Sugar and fat from genes to culture. *The Journal of Nutrition*, 133(3): 8295-8305.
- Emokaro, C. O. and Dibiah, O. (2014). Demand analysis for chicken meat, beef and fish among urban households in Edo and Delta states, Nigeria. *Journal of Applied and Natural Science*, 6(1): 239-245.
- FAO (2016). ([Http://Faostat.Fao.Org/Site/339/Default.aspx](http://Faostat.Fao.Org/Site/339/Default.aspx). Accessed 14 September 2016].
- Igwe, K. C. and Onyekwere, O. N. (2007). Meat Demand Analysis in Umuahia Metropolis, Abia State. *Agricultural Journal*, 2(5): 550-554.
- Ikeme, N. A. (1995). The basic principles of democratic freedom in the political philosophy of Ives Rene Simon Cuadernos de Filosofia. *Excerpta e dissertation in Philosophia*, 1(10): 113-158.
- Johnson, R. A. and Wichern, D. W. (2007). *Applied multivariate statistical analysis*. 6th Edition, Pearson prentice hall, Upper saddle river.
- Lele, U., Masters, W. A. and Kinabo, J. (2016). *Measuring food and nutrition security: An independent technical assessment and user's guide for existing indicators*. Rome food security information network. Measuring food and nutrition security technical working group.
- Liu, H. and Deblitz, C. (2007). *Determinants of meat consumption in China*. Asian Agribusiness Research Centre (AARC). Working Paper 40, 1-16.
- Maurizio, P. (2006). *An Economic Mechanism of Industrial Ecology: Theory and evidence*. Pp. 14-22.
- Namso, N. F., Nsikan, B. and Kesit, K. N. (2017). Determinants of household expenditure on some major food items inn Uyo metropolis, Akwa Ibom State, Nigeria. *Asian Journal of Agriculture and Food Sciences*, 5(6): 234-240.
- National Population Commission [NPC] (2018). *Population and housing census enumerators' manual*. Federal Republic of Nigeria, National Population Commission, Nigeria, pp: 1-16.
- Nuhu, H. S., Ani, A. O. and Bawa, D. B. (2009). Food grain marketing in Northern Nigeria: A case study of spatial and temporal price efficiency. *American Eurasian Journal of Sustainable Agriculture* 3(3): 473-480.
- Obayelu, A. E. and Salau, A. S. (2010). Agricultural response to prices and exchange rate in Nigeria; Application of Co-integration and Vector Error Correction Model (ECM). *Journal of Agriculture and Science*, 1(2): 73-81.
- Okediji, A. A. (2002). *Analysis of household food consumption pattern in Abeokuta Local Government Area of Ogun State*. Unpublished M.Sc. project, Department of Agricultural Economics, University of Ibadan.
- Oladapo, M. O., Siaka, S. and Awoyinka, Y. (2007). Marketing Margin and Spatial Pricing Efficiency of Pineapple in Nigeria. *Asian Journal of Marketing*, 1(1): 14-22.
- Olayemi J. K. and Olayide, S. O. (1981). *Elements of Applied Econometrics* Lesshyraden Nigeria Ltd.
- Omu, F. (2000). *The Nigeria Press: Milestones in service*. In: Oseni, T. and Idowu, I. (eds) Hosting the 140th Anniversary of the Nigerian Press, Lagos: Solasprint (Nigeria) Ltd.
- Peterson, E. B. (2004). *A Comparison of Marketing Margins Across Sectors, Users, and Regions*. Paper Presented at the 7th Annual Conference on Global Economic Analysis. June 17 - 19, 2004, Washington, D.C. 2(4): 180-195.



- Sharu, A. A. (2000). *Economic analysis of the factors affecting 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, 57Pp.
- Ugwumba, C. O. A. and Okoh, R. N. (2010). Price spread and the determinant of catfish marketing income in Anambra State, Nigeria, *Journal of Agriculture and Social Science*, 6: 73-78.
- Umeh, J. C. and Asogwa, C. B. (2012). *Food insecurity determinants among rural farm households in Nigeria*. International conference on ecology, agriculture and chemical engineering (ICEAS), December 18-19, Phuket (Thailand).
- Yakaka, B. M. (2012). Analysis of Meat Demand in Maiduguri Metropolis, Borno State Nigeria. *The Empirical Economics Letters*, 10(11): 50-56.
- Yakaka, B. M. and Bashir, A. B. (2012). Determinants of Ruminant Meat Demand in Maiduguri, Borno State, Nigeria. *Greener Journal of Agricultural Sciences*, 2(8): 381-385.