

CONSUMER PREFERENCE AND SPATIAL–TEMPORAL PRICE VARIABILITY OF BEEF IN THE WESTERN ZONE OF BAUCHI STATE, NIGERIA

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ABSTRACT

Background: Beef is the single most important source of animal protein for Nigerian consumers, yet demand faces constraints from price volatility, insecurity, and household socioeconomic factors.

Objective: This study analyzed consumer preferences and temporal price variability of beef in the Western Zone of Bauchi State, Nigeria.

Methods: A multistage sampling technique was used to select 341 households, of which 335 provided usable data. Primary data were collected via structured questionnaires. Secondary data on wholesale monthly beef prices (2015–2017) were obtained from the Agricultural Development Programme. Data were analyzed using descriptive statistics and the Hays and McCoy (1977) spatial price model.

Results: The majority (86.9%) of households were male-headed, with a mean age of 43 years and a mean household size of 9 members. Most respondents (67.5%) expressed a high preference for beef, followed by eggs (35.2%) and fish (26.3%). Frequent weekly beef consumption was reported by 69.9% of households. Price trend analysis revealed fluctuations, with a maximum price of ₦1,800/kg (Birshi market) and a minimum of ₦1,200/kg. Prices moved together across rural and urban markets, suggesting market integration.

Conclusion: Beef is the most preferred animal protein in the study area, but prices exhibit notable temporal variability. The co-movement of prices indicates potential for market integration.

Keywords: Beef demand, consumer preference, price variability, spatial market integration, Bauchi State, Nigeria.

INTRODUCTION

Food is any nourishing substance consumed to sustain life, provide energy, and promote growth. Animal products are particularly efficient sources of nutrients, and global demand for dietary animal protein is increasing rapidly (Dave, 2003). Emokaro and Dibiah (2014) noted that as consumers become more articulate and organized, their demand for wholesome animal protein will exert a powerful influence on quality, production methods, and marketing strategies. Factors driving this increased demand include population growth, technological improvements, changing nutritional requirements, income growth, and relative price movements (Maurizio, 2006). The term *beef* derives from the Latin *bos*, whereas *cow* comes from Middle English *cou*. Humans have consumed bovine flesh since prehistoric times; cave paintings at Lascaux depict aurochs in hunting scenes. Cattle were domesticated around 8000 BC to provide ready access to beef, milk, and leather (Neolithic, 2008).

It is unclear exactly when people began cooking beef. Historically, cattle were used as draft animals (oxen), for milk production, or specifically for meat. With agricultural mechanization, some breeds were developed to increase meat yield, while others were selected for both meat and milk production. Beef is first divided into primal cuts during butchering; these are basic sections from which steaks and other subdivisions are cut. Meat from the legs and neck is toughest due to greater muscle use, becoming more tender with distance from the hoof and horn (Neolithic, 2008).

In most African countries, animal protein demand remains very low at about 25 g per day, and even lower in southern and eastern Nigeria, where production has not kept pace with rapid population growth (Obi, 2000). Regmi (2002) noted that unprecedented population growth has created additional demand for meat and food generally in developing countries. Projected meat consumption is expected to more than double between 1997 and 2025 (Rosegrant et al., 2005). This increase is partly attributed to the “Livestock Revolution” (Delgado et al., 2005). By 2050, annual per capita meat consumption in developing countries is projected to average 44 kg, with total consumption of 326 million tonnes (Thornton, 2010).

Household demand for meat products such as beef is constrained by market prices, consumer tastes, credit availability, and wealth (Adetunji & Rauf, 2012). These constraints can lead to unbalanced diets and poor nutritional status, resulting in weakness, lethargy, absenteeism, reduced productivity, and stress (Aromolaran, 2004; Jamison & Leslie, 2001). Given the rising population and urbanization, Nigeria may face a beef deficit unless appropriate measures are implemented. Such a deficit would negatively impact foreign exchange earnings from meat exports. Recently, the beef industry has experienced volatility due to banditry, Boko Haram insurgency, and herder-farmer conflicts in major beef-producing states (Olayemi et al., 2007).

Price volatility of agricultural commodities in Nigeria has been attributed to bargaining power disparities, cyclical income fluctuations, production seasonality, natural shocks (floods, pests, diseases), and inappropriate farmer responses to price signals (Adebusuyi, 2004; Udoh & Sunday, 2007). Short-run price fluctuations occur between production seasons (Pattillo & Cashin, 2000); prices are generally low at harvest due to surpluses and rise in the off-season as supply declines (Akpan, 2002). Agricultural commodity price is a major determinant of quantities supplied and demanded. Price instability is a regular phenomenon across Nigerian markets (Akpan, 2007).

Spatial pricing efficiency examines how prices in different markets are related, particularly through transport costs. When spatial trade is efficient, food shortages in deficit regions are transmitted to surplus regions via prices (Arndt et al., 1998), and arbitrage triggers food flows across space. Efficient spatial arbitrage spreads risk over a larger market area, stabilizes prices, and may prevent food shortages.

Understanding the transaction costs faced by input suppliers, farmers, retailers, and consumers is a crucial step toward improving market functioning (Goetz, 1995).

Prices observed over time reflect a mixture of seasonal, cyclical, trend, and irregular factors. The most common regularity in agricultural prices is a seasonal pattern: prices of storable commodities are lowest at harvest, rise as the season progresses, and peak just before the next harvest (Olukosi & Isitor, 1990). Selling directly to consumers reduces charges for possession utility; when an intermediary holds inventory, financing charges are included in the purchase price (Downey & Erickson, 2007). Beef is among the food products with unstable prices between seasons in northern Nigeria, including Bauchi State. Given this background, this study analyzes beef demand in the western zone of Bauchi State, with an emphasis on consumer preferences and spatial/temporal price variability.

Meat is the most important source of animal protein in Nigeria, and beef is the single most important meat for Nigerian consumers. Beef accounts for over 50% of the country's total meat supply (FAO, 2016). Demand for beef is driven by its nutritional value and palatability. Expanding internal markets due to rising living standards, urbanization, population growth, and higher purchasing power have caused demand to outstrip supply. This situation is particularly acute in areas with high population density and low cattle production, especially cities. Recent insurgency, banditry, and herder–farmer clashes may have reduced the number of cattle available for slaughter, affecting beef supply and demand nationwide and in Bauchi State specifically. Evaluating the demand function for beef in the study area is therefore imperative and will inform the future of the cattle industry, food security, and poverty alleviation.

Beef demand cuts across religion, tribe, culture, and socioeconomic status. However, effective demand is subject to several factors that require empirical investigation. Beef often exhibits inelastic demand with respect to its determinants. Hence, there is a need to establish an ordinary demand function for beef in the study area. Moreover, price volatility is a key aspect of beef demand.

Numerous studies have examined price transmission, market integration, market performance, efficiency, and marketing margins for food grains in Nigerian markets (e.g., Peterson, 2004; Oladapo et al., 2007; Akpan & Aya, 2009; Nuhu et al., 2009; Ugwamba & Okoh, 2010; Obayelu & Salau, 2010). These studies focused on staple foods, cowpea, and vegetables in specific locations, with scant investigation of beef demand. Limited beef analyses were conducted outside the study area. Some studies used correlation analysis, trend analysis, time-series analysis, cointegration, Granger causality, and error-correction models. There is little or no information on spatial and temporal price variability for beef in Bauchi State. Thus, the research problem is the lack of reliable information on beef demand patterns in the study area, as well as on the magnitude and direction of beef demand's response to changes in prices, income, and household demographic characteristics.

METHODOLOGY

The study was conducted in the Western Zone of Bauchi State, Nigeria. The zone comprises seven local government areas (LGAs): Alkali, Bauchi, Bogoro, DASS, Kirfi, Tafawa Balewa, and Toro. It is located in the North Guinea savannah belt of the state, lying between latitudes 9°03' N and 12°03' N and longitudes 8°50' E and 11°00' E. The land area is approximately 24,271 km² (BSADP, 2018), with an estimated population of 4,476,465 (NPC, 2018), accounting for 62.8% of Bauchi State's total population of 7,057,045. Annual rainfall ranges from 600 to 1,200 mm, and temperatures vary between 9.1°C and 40.6°C.

Arable farming is the predominant agricultural activity. Pearl millet, sorghum, watermelon, sweet potato, and legumes are produced in commercial quantities. Farmers also engage in small-, medium-, and large-scale livestock rearing (goats, sheep, cattle, and poultry) and the marketing of livestock products (FAO, 2016). The Western Zone contains extensive woodland savannah with mixed vegetation. Approximately 80% of the population are farmers, mostly practicing subsistence farming. Although the area has large tracts of cultivable land, less than one-quarter is under cultivation. The climate and soil conditions favor both crop and livestock production. Two main seasons prevail: the dry season (November to March) and the rainy season (April to October) (Okediji, 2002).

A multistage sampling technique was employed to select households for the study. The Western Zone was purposively selected due to its high beef demand and the presence of several beef markets. The stages were as follows:

Stage 1: Selection of the Western Zone of Bauchi State.

Stage 2: Random selection of two LGAs (DASS and Bauchi) from the zone.

Stage 3: Random selection of two districts from each LGA, giving a total of four districts.

Stage 4: Random selection of two council wards from each district, yielding eight council wards.

Stage 5: Random selection of 20% of households from each of the eight wards, resulting in a total sample of 341 households.

For analysis of spatial and temporal price variability, 10 beef marketers were randomly selected from each of the four major markets in the area: Mudalawan Market, Kangere Market, Zungur Market, and Birshi Market.

Both primary and secondary data were used. Primary data were collected using a structured questionnaire designed to address the study objectives. The questionnaire contained both closed-ended questions (listing alternatives for respondents to choose from) and open-ended questions (allowing free responses based on respondents' experiences).

Of the 341 questionnaires administered to sampled households, 335 were correctly completed and used in the analysis, yielding a response rate of 98%. All questionnaires administered to beef marketers (10 per market) were fully completed and used for the spatial and temporal price analysis (100% response rate).

Secondary data consisted of wholesale monthly beef prices for 24 months (2015–2017), obtained from the Agricultural Development Programme (ADP) office in Bauchi State.

Data were analyzed using descriptive statistics (frequencies, means, percentages) to describe the socio-economic characteristics of their respondents and examine the demand pattern for beef (Objective 2). Spatial and temporal price variability (Objective 3) was assessed using the spatial price model described below. The spatial price relationship model developed by Hays and McCoy (1977) was adopted to analyze price variability across markets. Muda Lawan market (in the heart of Bauchi) was designated as the central (base) market, while Kangere, Zungur, and Birshi markets were considered rural markets. Parity prices were calculated for each rural market relative to the base market.

The price spread was computed as follows:

$$PP_{ij} = P_i - HC_{ji} + TC_{ji} + AS_{ji}$$

Where:

PP_{ij} = The calculated parity price of one kg of beef from the i^{th} market (Muda Lawan market) in relation to the j^{th} markets (which are Kangere, Zungur, and Birshi markets, respectively).

P_i = The actual price of beef at the i_{th} market.

HC_{ij} = Handling costs involved in moving beef from the j_{th} to the i_{th} market.

TC_{ij} = Transport cost for moving beef from the j_{th} to the i_{th} Market.

AS_{ij} = The charge for the assemblers' service in moving the beef from the j_{th} to the i_{th} market.

The actual price spread between any two markets would be:

$$PS_{ij} = PP_{ij} - P_j$$

Where:

PS_{ij} = The price spread for the beef between the i_{th} and the j_{th} market.

P_j = The actual wholesale price of beef in the j_{th} market.

In a perfectly competitive market, where beef was moved from j_{th} to i_{th} market, PP_{ij} would always be equal to P_j and the price spread would be equal to zero (Hay and McCoy, 1977; Nuhu *et al.*, 2009)

The rule of thumb is that:

- i. If the price spread is positive, the traders are making more than normal profit.
- ii. If the price spread is zero, traders are making only normal profit, which can exist only in a perfectly and efficiently functioning market.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Beef Consumer Households

Table 1 summarizes respondents' socioeconomic characteristics. The majority (86.9%) of households were male-headed, while 13.1% were female-headed. This reflects the typical African context where males are household heads, though widows may assume headship. The finding agrees with Moses et al. (2015) among fish consumers in Yola North, Adamawa State. The mean age of household heads was 43 years (SD = 12.8 years), indicating an economically active population capable of undertaking occupational activities for family welfare (Emokaro & Dibiah, 2014). Most respondents (88.1%) were married; 5.4% were single, 3.6% widowed, 1.5% widower, and 1.5% separated. Marriage entails responsibility for food, shelter, and clothing. The heterogeneity reflects cultural and religious similarities (Adejobi, 2010).

The mean household size was 9 members (SD = 4), exceeding the national average of 6 (NPC, 2014). This large size, typical of northern Nigeria and developing societies, implies more mouths to feed and likely reduces per capita beef consumption given fixed income (Adeniyi, 2008; Ajani, 2011). Overall, 80.3% of household heads had formal education: 53.7% secondary, 15.8% primary, and 19.8% tertiary; 19.7% had no formal education. This contrasts with Lichter (1993), who reported low rural education. Education enhances awareness of nutritional value, potentially transforming luxury foods (beef, fish, eggs) into necessities (Emokaro & Dibiah, 2014). Farmers constituted 40.3%, traders 35.5%, food processors 20%, artisans 3.3%, and civil servants 0.9%. The prominence of farming underscores agriculture's role in rural employment and income (Adejobi, 2010).

Mean monthly income was ₦23,575 (SD = ₦14,877), indicating mostly low- to middle-income households, consistent with a 2016 World Bank report. About 40.6% spent ≤₦20,000 monthly. Mean monthly expenditure was ₦24,416 (SD = ₦18,083), spent on food items including beef, fish, and eggs. This reflects a significant share of income devoted to food consumption, typical of rural communities (Shaibu et al., 2020).

Pattern of Beef Demand

Demand for beef has been increasing rapidly in Nigeria, as in other developing countries, propelled by population growth and urbanization (Akolisa and Okonji, 2005). Yakaka *et al.* (2012) found that most households in Nigeria demand more beef than fish, milk, eggs, chicken, mutton and goat's meat. The distribution of respondents by beef demand pattern is presented in Figure 1 and Table 2. Figure 1 shows that the majority (69.9%) of respondents consumed beef frequently in a week, while 24.2% and 5.9% of households consumed beef regularly and occasionally, respectively. The findings on beef consumption frequency could be associated with respondents' income status. This is particularly in rural areas where meat consumption is perceived as a luxury. Higher income could increase the frequency of beef consumption among the respondents. Further explanation of this finding could be that some respondents shifted their consumption to other substitute commodities, such as fish and eggs, as shown in Table 2.

Table 1: Socioeconomic Characteristics of the respondents

Socio-economic indicators	Frequency	Percentage	Mean	Std. Dev.
Sex				
Male	291	86.9		
Female	44	13.1		
Total	335	100		
Age				
20 - 30	75	22.4		
31 – 40	111	33.1		
41 – 50	90	26.9		
51 – 60	42	12.5	43 years	12.8
61 – 70	17	2.1		
Total	335	100		
Marital status				
Single	18	5.4		
Married	295	88.1		
Widowed	12	3.6		
Widower	05	1.5		
Separated	05	1.5		
Total	335	100		
Household Size				
1 – 5	147	43.9		
6 – 10	159	47.5	9	3.6
11 – 15	21	6.3	members	
Above 15	08	2.4		
Total	335	100		
Educational Status				
Non-formal education (0 years)	66	19.7		
Primary education (1 – 6 years)	53	15.8		
Secondary education (7 – 12 years)	180	53.7		
Tertiary education (Above 12 years)	36	19.8		
Total	335	100	11 years	3.2
Major Occupation				
Civil Service	03	0.9		
Food Processing	67	20.0		
Farming	135	40.3		
Trading	119	35.5		
Artisanship	16	3.3		
Total	335	100		
Monthly Income				
20,000 and below	138	41.2		
21,000 – 40,000	109	32.5		
41,000 – 60,000	45	13.4		
61,000 – 80,000	42	12.5	23, 575	14,876.89
Above 80,000	01	0.3		
Total	335	100		
Monthly Expenditure				
20,000 and below	136	40.6		
21,000 – 40,000	124	37.0		
41,000 – 80,000	44	13.1	24,416.17	18,082.95
Above 80,000	31	9.3		
Total	335	100		

Source: Field Survey, 2020

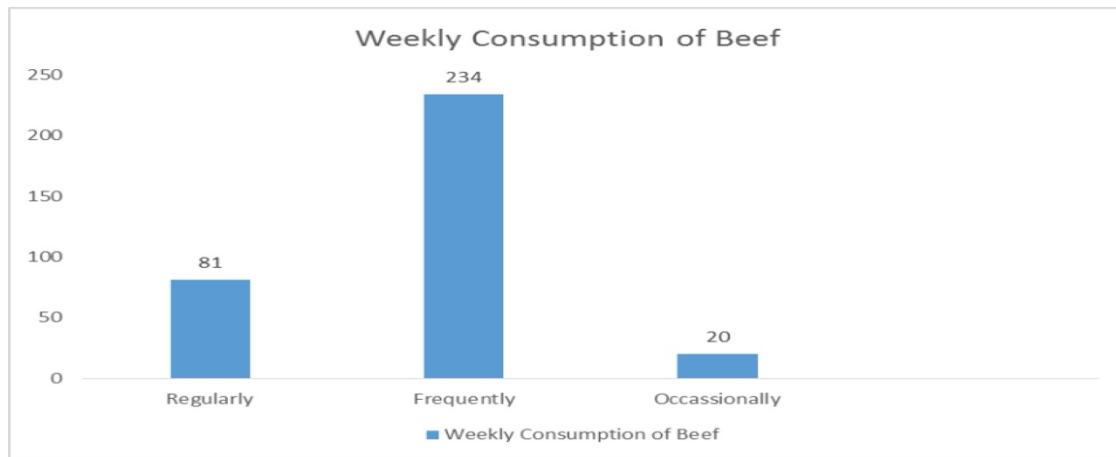


Figure 1: Frequency of weekly beef consumption among households in the study area

Table 2: Distribution of respondents according to preference for beef, fish and egg

Food Items	Level of Preference		
	High	Moderate	Low
Beef	226 (67.5)	101 (30.1)	08 (2.4)
Fish	88 (26.3)	122 (36.4)	125 (37.3)
Egg	118 (35.2)	179 (53.4)	38 (11.3)

Source: Field Survey, 2020

NOTE: Figures in parentheses are in percentages

Table 2 shows a high level of preference for beef among sampled respondents (67.5%). This was followed by a preference for egg (35.2%) and fish (26.3%). Also, egg was moderately preferred by 53.4% of respondents, while 36.4% and 30.1% moderately preferred fish and beef, respectively. Furthermore, the level of preference was low (37.3%) for fish. This was followed by egg (11.3%) and beef (2.4%). Generally, households in the study area preferred beef to egg and fish in that order. The high level of preference for beef among households could be attributed to its availability and affordability. Beef is most commonly found in rural areas where sheep and goat meat are not readily available. Aside from its affordability and availability, the respondents also perceived beef as having better taste and greater nutritional value than fish and eggs. Further analysis also revealed that mutton was a highly desirable commodity (nutrition-wise) among the respondents; however, it was on the high side in terms of cost. This, however, contradicts the views of Grunert *et al.* (2000) and Verbeke and Vackier (2004) that few people eat foods they dislike the taste of. The result indicated that beef and egg were more preferred by the households. This finding also agrees with Tsegay (2012), who reported that egg and beef were the most preferred among beef, fish and egg in Ethiopia. The study, however, disagrees with Adeniyi *et al.* (2012), who reported a high preference for fish among households in Ibadan, Oyo State. They attributed this preference to its lower price compared with beef, mutton, poultry, pork, offal, and bushmeat, and to the high protein content of fish. Brunso (2003) also reported similar results among European households.

Temporal Price Variability of Beef

Price trends help predict a stock's future movement based on past data. It is based on the idea that what has happened in recent years gives sellers an idea of what will happen in the future. The price trend showed the pattern of price variability of beef across the markets selected in the study area, as shown in Figure 2.

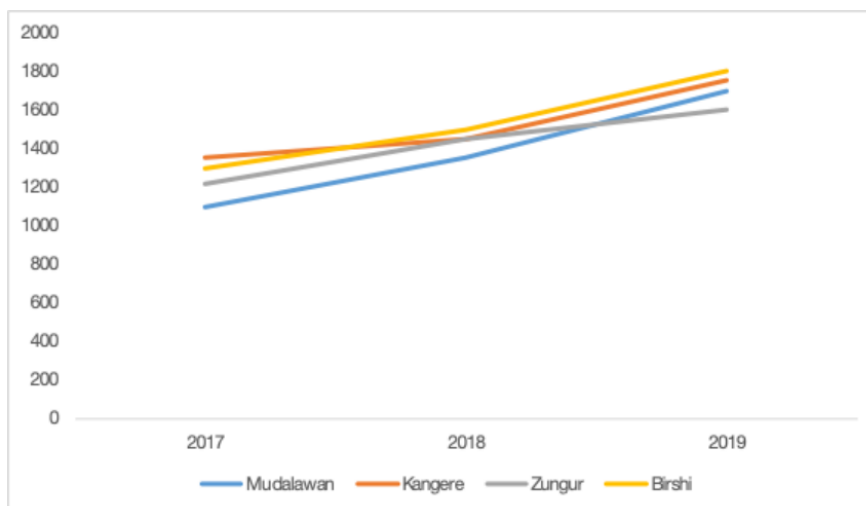


Figure 2: Spatial and temporal price variability for beef

Trend analysis of beef prices in the study area, as presented in Figure 2, shows the annual average prices for 2017 to 2019 across all selected markets. The prices were characterized by a fair level of fluctuation, with beef prices rising in 2019, which could be associated with the general rise in food prices and post-election violence that occurred during the period. Also, there was a considerable change in 2018, prior to the general elections, due to high expectations of political instability and the heightened insecurity observed across the area studied. Prices were volatile, especially in the Birshi market, which had the highest beef price at ₦1800 per kilo, driven by its location and high demand.

The maximum price across the selected beef markets in the study area was ₦1,800, and the minimum was ₦1,200. However, on average, both rural and urban beef prices exhibited similar patterns of fluctuation throughout the study period. The result implies that both the rural and urban beef prices moved together during the period of investigation. This indicates the possibility of market integration between rural and urban beef prices across the markets studied. Dahiru (2013) observed similar behaviour in their study of food price variability and agricultural sector response to random oil price shocks in Nigeria (1974-2010).

CONCLUSION AND RECOMMENDATIONS

The study examined consumer preferences and temporal price variability of beef in the Western Zone of Bauchi State, Nigeria. The findings revealed that beef is the most preferred animal protein among households, surpassing fish and eggs. This preference is driven by perceived taste, nutritional value, availability, and relative affordability. The majority of households consumed beef frequently (69.9%), with 67.5% expressing a high preference.

Socioeconomic characteristics significantly associated with beef demand included male headship (86.9%), a mean household size of 9 members (exceeding the national average), and low-to-middle income status (mean monthly income ₦23,575). These factors influence both the frequency and quantity of beef consumption.

Temporal price analysis over 24 months (2017–2019) showed notable fluctuations, with prices rising in 2019 due to post-election violence and general food price inflation. The Birshi market recorded the highest price (₦1,800/kg), while the lowest was ₦1,200/kg. Importantly, rural and urban beef prices exhibited similar patterns of movement, indicating potential market integration across the study area.

The study concludes that while beef demand remains strong, price instability and household income constraints affect consumption patterns. The spatial price spread analysis suggests that transport and handling costs, as well as assemblers' charges, contribute to price differentials between markets.

Based on the findings, the following recommendations are made:

1. Improve market infrastructure and reduce transaction costs: Governments and development partners should invest in feeder roads, storage facilities, and market information systems to lower transport and handling costs, thereby reducing price spreads between rural and urban markets.
2. Strengthen price stabilization mechanisms: Establish a beef price monitoring and early warning system to help consumers, producers, and marketers anticipate seasonal and shock-related price changes. Strategic buffer stocks or price band policies could mitigate extreme volatility.
3. Enhance household income and access to credit: Given that most households are low-income (mean ₦23,575/month), targeted credit schemes and livelihood diversification programs would increase purchasing power and stabilize beef demand.
4. Promote education on animal protein nutrition: With 19.7% of household heads lacking formal education, public health campaigns should emphasize the nutritional benefits of balanced animal protein consumption, including beef, to improve dietary quality.
5. Address security challenges affecting cattle supply: The study identified banditry, Boko Haram insurgency, and herder–farmer conflicts as supply-side shocks. The government should strengthen security in cattle-producing areas and support conflict-resolution mechanisms to ensure a stable beef supply.
6. Further research on market integration: While price co-movement was observed, a full market integration study using co-integration and error correction models is recommended to quantify the speed of price transmission across beef markets in Bauchi State.

References

- Adebusuyi, B. S. (2004). Stabilization of commodity market of interest to Africa. In *Proceedings of the workshop on constraints to growth in sub-Saharan Africa* (pp. 146–155). Pretoria, South Africa.
- Adejobi, A. O. (2010). *Food production and demand in Kebbi State, Nigeria* (Unpublished doctoral dissertation). University of Ibadan, Ibadan, Nigeria.
- Adeniyi, J. P. (2008). Fish consumption in Nigeria: Implication for fisheries development policies. *Journal of West African Fisheries Society of Nigeria*.
- Adeniyi, O. R., Omitoyin, S. A., & Ojo, O. O. (2012). Socio-economic determinants of consumption pattern of fish among households in Ibadan North Local Government Area of Oyo State, Nigeria. *African Journal of Agriculture, Food, Nutrition and Development*, 12(5), 6537–6552.
- Adetunji, M. O., & Rauf, M. O. (2012). Analysis of household demand for meat in southwest Nigeria. *Global Journal of Science Frontier Research Agriculture and Biology*, 12(1), 15–22.
- Ajani, E. K. (2011). Best management practices in catfish farming in Nigeria. In B. O. Omitoyin & A. O. Abobakin (Eds.), *Catfish health management in Nigeria* (pp. 20–24). Federal Department of Fisheries.
- Akpan, S. B. (2002). *Analysis of gross margin and efficiency of rice, beans and garri in selected markets in Cross River State* (Unpublished undergraduate project). University of Calabar, Nigeria.
- Akpan, S. B. (2007). *Relative price variability and inflation: A case study of grain subsector in Nigeria* (Unpublished master's thesis). University of Uyo, Nigeria.
- Akpan, S. B., & 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.
- Akolisa, O., & Okonji, V. A. (2005). Increase fish supply through genetically modified fish: Need for caution in Nigeria. In *Proceedings of the 39th annual conference of the Agricultural Society of Nigeria* (pp. 64–67).
- Arndt, J., Greenberg, J., Simon, L., Pyszczynski, T., & Solomon, S. (1998). Terror management and self-awareness: Evidence that mortality salience provokes avoidance of the self-focused state. *Personality and Social Psychological Bulletin*, 24, 1216–1227.
- Aromolaran, A. B. (2004). Intra-household redistribution of income and calorie consumption in south-western Nigeria. *Food Policy*, 29(5), 507–530.

- Dahiru, S. (2013). *An empirical analysis of staple food price variability and agricultural sector response to random oil price shocks in Nigeria (1974–2010)* (Unpublished doctoral dissertation). Ahmadu Bello University, Zaria, Nigeria.
- 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.
- Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., & Courbois, C. (2005). *Livestock to 2020: The next food revolution* (Food, Agriculture and the Environment Discussion Paper No. 28). International Food Policy Research Institute, FAO, and International Livestock Research Institute.
- Emokaro, C. O., & 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.
- Goetz, K. H. (1995). National governance and European integration: Intergovernmental relations in Germany. *Journal of Common Market Studies*, 33(1), 91–116.
- Grunert, K. G., Brunso, K., & Bisp, S. (2000). *Food-related life style: Development of a cross-culturally valid instrument for market surveillance* (MAPP Working Paper No. 12).
- Hays, H. M., & McCoy, J. H. (1977). Food grain marketing in northern Nigeria: Spatial and temporal performance. *The Journal of Development Studies*, 14(1), 182–192.
- Jamison, D. T., & Leslie, J. (2001). Evidence from China and comparison. *Food and Nutrition Bulletin*, 24(2), 145–154.
- Lichter, D. T. (1993). Human capital, labour supply and poverty in rural America. In G. F. Summers (Ed.), *Persistent poverty in rural America: Rural Sociology Task Force on Persistent Rural Poverty*. Westview Press.
- Maurizio, P. (2006). *An economic mechanism of industrial ecology: Theory and evidence* (pp. 14–22).
- Moses, J. D., Daniel, A., Dwana, A., Giroh, D. Y., Zalkuwi, J., & Akindele, O. (2015). The influence of socio-economic characteristics on consumers' preference on fish purchase in Yola North Local Government Area, Adamawa State. *International Journal of Environmental & Agriculture Research*, 1(7), 1–11.
- Neolithic, M. (2008). *Late Neolithic megalithic structure at Nabta Playa*. Retrieved from www.comp.archacology.org
- NPC (National Population Commission). (2018). *Population and housing census enumerators' manual*. Federal Republic of Nigeria.

- Okediji, A. A. (2002). *Analysis of household food consumption pattern in Abeokuta Local Government Area of Ogun State* (Unpublished master's project). University of Ibadan, Nigeria.
- Oladapo, M. O., Siaka, S., & Awoyinka, Y. (2007). Marketing margin and spatial pricing efficiency of pineapple in Nigeria. *Asian Journal of Marketing*, 1(1), 14–22.
- Olayemi, J. K., Titilola, T. K., & Igben, M. O. (2007). An investigation of production efficiency in food crop enterprises in Gombe State, Nigeria. *Journal of Rural Development*, 13(2), 111–222.
- Olukosi, J. O., & Isitor, S. N. (1990). *An introduction to agricultural marketing and prices: Principles and application*. GM Publications.
- Pattillo, C., & Cashin, P. (2000). *Terms of trade shocks in Africa: Are they short-lived or long-lived?*(IMF Working Paper). International Monetary Fund.
- Peterson, E. B. (2004). *A comparison of marketing margins across sectors, users, and regions*[Conference presentation]. 7th Annual Conference on Global Economic Analysis, Washington, DC.
- Rosegrant, M. W., Cline, S. A., Li, W., & Valmonte-Santos, R. (2005). *Looking ahead: Long-term prospects for Africa's agricultural development and food security*. International Food Policy Research Institute.
- Shaibu, U. M., Ibitoye, S. J., Oyibo, F. O., Emeje, C. A., & Shaibu, D. O. (2020). Assessment of crop farmers' willingness to take (WTT) agricultural insurance scheme in Kogi State, Nigeria: Application of Turnbull estimator. *Journal of Agricultural Extension*, 6(1), 8–9.
- Thornton, P. K. (2010). Review of livestock production: Recent trends, future prospects. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365, 2853–2867.
- Tsegay, H. (2012). Consumer perception and preferences of meat types in Harare and Haramaya province, Ethiopia. *Journal of Microbiology, Biotechnology and Food Sciences*, 2(3), 959–964.
- Udoh, E. J., & Sunday, B. A. (2007). Estimating exportable tree crop relative price variability and inflation movement under different policy regimes in Nigeria. *European Journal of Social Science*, 52, 17–26.
- Ugwumba, C. O. A., & Okoh, R. N. (2010). Price transmission and market integration for cowpea and maize in Anambra State, Nigeria. *Journal of Agricultural Extension*, 14(1), 45–56. (Note: cited as Ugwumba & Okoh, 2010 in text; corrected to Ugwumba)
- Verbeke, W., & Vackier, I. (2004). Profile and effects of consumer involvement in fresh meat. *Meat Science*, 67, 159–168.
- World Bank. (2016). *The World Bank annual report*. Retrieved from <https://www.worldbank.org/annualreport>
- Yakaka, B. M. (2012). Analysis of meat demand in Maiduguri metropolis, Borno State, Nigeria. *The Empirical Economics Letters*, 10(11), 50–56.
- Yakubu, A. A., Garba, S., Jibir, M., & Zubairu, N. (2013). Factors influencing consumer preference for fresh beef in Sokoto metropolis, Nigeria. *International Journal of Applied Agricultural and Apicultural Research*, 9(1&2), 106–112.