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DETERMINANTS OF DEMAND FOR MEAT PRODUCTS IN DAMATURU, YOBE STATE, NIGERIA

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ABSTRACT

This paper investigates the determinants of demand for meat products in Damaturu, Yobe State in Nigeria utilizing primary data. A combination of multi-stage and purposive sampling methods were implemented to select 150 participants using a structured questionnaire. The results were analyzed using descriptive statistics and the Ordinary Least Squares (OLS) regression model.The study revealed that beef was the most preferred type of meat, garnering a preference rate of 73.3%. Interestingly, mutton registered the highest average monthly expenditure among households, amounting to ₦22,986. All the three meat products were found to be negative (elastic) and statistically significant at 1%. Notably, the elasticity coefficient for beef was the most sensitive to its price with the coefficient of -23.78. Similarly, the cross-price elasticity suggested complementarity among all the meat products. Income on the other hand,had a positive correlation with meat products expenditure across all types and statistically significant at the 1% level respectively. The coefficient of Beef showed the strongest positive relationship with its expenditure although the magnitude of coefficients for all meat types confirmed that they were all luxury products. Lastly, family size was inversely related to expenditure on all meat types, though this relationship was only statistically significant in the case of beef expenditure. The study concludes that there is a positive outlook for small ruminant farming in the state. Consequently, the study recommends support for livestock farmers through subsidies, training, and improved access to markets, consumer income enhancement programs and nutrition education campaigns to raise awareness about the nutritional value of various meats, including more cost-effective options.

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Key Words: Elasticity, Demand, Determinants, Meat, Products

1.0 Introduction

Animal husbandry could be seen as a fundamental pillar within Nigeria's agricultural sector, offering essential resources for industries, generating employment opportunities, and playing a crucial role in earning foreign exchange. It holds significant importance in providing meat products as a vital source of protein for human nutrition. Recognizing this, the Food and Agricultural Organization (FAO, 2000) advised a daily intake of 200 grams of animal protein to maintain health.

According to FAO, (2022) the global demend for meat products has indeed seen a significant surge due to changing dietary

preferences and economic prosperity especially in developing countries. This increase could be primarily attributed to several factors including population growth, technological advancements in agriculture and animal husbandry, and rising incomes in many parts of the country. A significant uptick in meat consumption in developing countries was documented by FAO in 2016, the annual per capita average of 10kg in the 1960s to 26kg by 2000, with projections pointing to 35kg by 2030. This trend suggests that developing nations' meat consumption patterns will soon align with those of developed countries, where consumption levels are expected to plateau but remain high.

Nigeria's demand for meat has evolved over time as well. Economic fluctuations, such as the decline in oil and agriculture commodity prices during 1987, had a pronounced effect on the country's economic growth and the average income, influencing meat consumption patterns. The imposition of a tax on meat imports by the federal government in 1990 aimed to boost revenue and promote local meat production. The policy successfully reduced the imports by 30% between 2010 to 2022. The desired boost in domestic production remained largely unfulfilled, (FAO, 2023). According to (FAO, 2023), domestic meat production only increased by 10% during the same period, failing to meet shortfalls created by reduced imports. The mismatch in supply and demand resulted in persistent price increases, with the average price of meat rising by 50% between 2010 and 2022 (NBS, 2023). Consequently, per capita meat consumption continued to decline, falling from 9.4 kilograms in 1999 to 8.2 kilograms in 2022 (FAO, 2023).

Despite fluctuations, the demand for meat and meat products in Nigeria is expected to continue its upward trajectory with rising incomes. Similarly, beef is also seen as a staple and a 'normal good' in Nigeria, with its demand increasing alongside income, yet it remains highly price-sensitive (Ojogho & Ojo, 2018). In Damaturu, this pattern holds, with beef demand being strongly linked to socioeconomic household factors (Maina,*et al*, 2011).However, there is a noticeable gap in micro-level data studies on meat demand determinants especially in the study area, although extensive macro-level data research has been conducted, often using the FAO's database. Such research includes Okoruwa et al. (1999), which focused on the demand for ruminant meats in Nigeria, and Alimi (2013),

which concentrated specifically on meat demand.

Yobe state just like other states in the Northeast region is renowned for its meat production. The livestock sector plays a significant role in the Yobe economy, providing employment and income for many people, and contributes to the state's food security and nutrition (Babagana, Usmanu, & Usman 2018) To emphasise the importance of the livestock sector, the state government developed a plan which outlines its strategy for developing the livestock sector over the next five years. the plan sets out a number of goals and objectives for the livestock sector, including increasing livestock production, improving the quality of livestock products, creating jobs and generating income for livestock herders, promoting sustainable livestock production practices and improving food security and nutrition. Hence, changes in meat distribution patterns are economically consequential. Factors such as gender, age, education level of the household head, household size, and income level are known to affect meat demand. Understanding these variables is crucial for market assessment and highlights the need for further exploration into this issue.Previous research, such as the work of Zongoma (2003); Maina et al (2011 and 2012) focused exclusively on beef or meat products demand within households and the socio-economic factors influencing them in Borno, while studies like that of Iheanacho (1997) investigated the demand and supply dynamics of hides and skins in Borno State, among other aspects. However, not much of such studies has been done in Yobe state and recognizing the limitation of past studies in addressing the variety of meats that are in high demand in the study area, this research aims to evaluate the determinants affecting of the demand for different types of meat products namely beef, mutton, and chevron (goat meat) in Damaturu Yobe State, Nigeria.

2.0 Literatue Review

The literature offers various insights into the determinants of demand. Iheanacho (1997) explored demand factors for hides and skins in Borno State, Nigeria, identifying seasonality, alternative protein prices, and product quality as key influences. Most hides produced in the state were sold as meat, with a small portion going to leather companies and exporters, underscoring the interconnectedness of the hides and meat markets.Okoruwa, Chebe, and Amaza (1999)

conducted a broader analysis of demand for ruminant meat in Nigeria. The finding reveals significant socioeconomic factors influenced demand for beef, chevron, and mutton, with education level impacted chevron demand.Obasi (2003) examined the demand for protein foods in Imo State, Nigeria, identifying income, meat and fish prices, occupation, and education as primary determinants. Meat demand proved income-elastic and inversely related to fish prices among urban consumers, highlighting how different socioeconomic groups prioritize food choices.Taljaard, Alemu, and Van Schalkwyk (2006) compared the AIDS and Rotterdam models to analyze meat demand in South Africa, The finding reveals that consumer income growth led to diversified meat consumption patterns.Igwe and Onyekwere (2007) used the AIDS model to assess meat demand in Umuahia, Nigeria. The findings reveal that daily beef consumption across households, with age and income influence choices. Chicken emerged as a luxury good, while other meats were categorized as normal goods, indicating a high price sensitivity for meat demand.Malaga, Pan, and Duch-Carvallo (2009) discovered in Mexico that household size consistently affected meat purchases, while income's influence varied across meat types and years, suggesting changing economic conditions can shift consumer behavior.

In Maiduguri, Zongoma (2003) found that socioeconomic factors had a significant impact on beef consumption. However, the focus was solely on beef, neglecting other meats. Simlarly, Maina, Iheanacho and Kyari (2011) employed the Almost Ideal Demand System (AIDS) model to assess the consumer preferences for ruminant meat products based on a random sampling of 168 households. The results indicated a monthly household demand distribution of 49% for beef, followed by mutton at 24%, chevon at 7.4%, cattle head and legs also at 7.4%, and sheep offal at 7.0%. Additionally, the expenditure elasticities suggest that all the meat products in question are considered are luxury items and have elastic demand with beef as the most desired meat item by consumers. The own-price elasticity revealed that chevon is the most responsive to its price. Furthermore, that all three ruminant meat items show dominance of complementarity.

In a related analysis by Maina et al. (2012) on meat consumption across varying income levels in Borno state, the Almost Ideal Demand System (AIDS) model was utilized.

Data were gathered from 180 households, which were stratified into three distinct income categories: low earners (≤ ₦15,000), middle earners (₦ 15,001 - ₦ 30,000), and high earners (≥ ₦ 30,001). The study revealed that the proportion of the budget allocated to ruminant meats is higher within the middle-income bracket, particularly for beef and mutton purchases. Notably, mutton's expenditure elasticity is highest among the middle-income group. The own-price impact is most pronounced on chevon for the middle-income consumers. With regards to the cross-price elasticity, the study finds that all meat types are considered luxury goods. Furthermore, the results suggest a complementary relationship among various meats, with substitutability between beef and mutton among both low and high-income groups.

In another study by Alhassan, Maina & Kyari (2019) examined the determinants for major meat types in Bauchi State, Nigeria. The study employed a multi-stage sampling techniqueto select a sample of 200 respondents. The findings revealed that the demand for beef, mutton, chevon, and chicken were positively and significantly correlated with income elasticity at the 1%, 5%, and 10% levels, respectively. Moreover, the own-price elasticity of demand for beef, mutton, and chicken negatively correlates with demand and is statistically significant at the 5% and 1% levels, while the demand for chevon shows a positive correlation with its own-price elasticity at the 1% significance level.

Similarly, on preference of meat demand in Bauchi, Alhassan, Maina & Kyari (2020) further revealed that that mutton is the most preferred choice of meat for approximately 34% of the population in the region, ranking above beef at 30%, chicken at 25%, and chevon at 11%. Consequently, the study suggests the implementation of policies aimed at enhancing income levels and increasing public awareness of meat's nutritional benefits for health and personal well-being.

The general trend indicates that meat demand is positively associated with the income levels of household heads. In light of these insights, it is advised that the government and involved stakeholders prioritize policy measures aimed at boosting household incomes. Such economic growth could potentially enhance the purchasing power of individuals, thereby increasing the consumption of meat products, which are essential for health and personal well-being.

These studies highlight the multifaceted nature of determinants of meat demand dynamics within Damaturu, unique preferences, affordability and the importance of context-specific analysis in understanding consumer behavior.

3.0 Methodology

3.1 Study Area

Damaturu which is the state capital of yobe state hosts administrative structures and government institutions. Its political landscape is intertwines with traditional leadership. Geographically, the state lies between latitudes 11.0943° N and 13.0935° N, and between longitude 10.9625° E and 13.3268° east of the Greenwich meridian. It has a total land area of about 45,502 square kilometers. The state shares boarders with Borno state to the east,Gombe State to the south, Bauchi State to the southwest, Jigawa State to the west, Niger State to the northwest and Diffa Region in Niger Republic to the north. The combined population were approximately 2,321,591 as at the end of 2006 (NPC, 2006), which was projected to rise to 3,649,600, by the end of 2022. With 2.9% annual population change. The state economy primarily revolves around agriculture, trade and government servces.

3.2 Sample and Sampling Techniques

The population for the study included all the households in Damaturu. The method of data collection encompassed both multi-stage and purposive random sampling techniques. From the 11 wards in Damaturu, which include Bindigari/Pawari, Damakasu, Damaturu Central, Gambir/Maduri, Kalallawa/Gabai, Kukareta/Warsala, Maisandari/Waziri Ibrahim Estate, Murfa Kalam, Nayinawa, Njiwaji/Gwange and Sasawa/Kabaru. The researcher employed the two sampling techniques to ensure a representative and accurate sample. Firstly, statefied random sampling was used to select six (6) wards out of the eleven (11) within Damaturu local government. This ensures representations of the study area's diverse demographics across the chosen wards. Secondly, purposive sampling was implemented within each ward. With 25 households deliberately chosen as respondents. This purposeful selection techinique allows for the inclusion of households with diverse meat consumption habits and socioeconomic backgrounds in the study area totaling 150 households. The primary instrument for data acquisition was a structured questionnaire, which gathered detailed information on various socio-

economic attributes of the households. Key variables included the educational level of the household head, household size, and the household's monthly income. Additionally, the study paid particular attention to the monthly expenditure on the three most consumed types of meat in the areabeef, mutton, and chevron (goat's meat) along with their prevailing market prices. These variables are comprehensively defined and quantified in Table 1 of the study

Table 1: Variables used in the Study and their Measurement

Variables	Measurement
Quantity of a given meat type	Value of meat products demanded by households measured in Naira (Kg) per month
Household monthly income	Monthly nominal income of householdhead, measured in Naira (₦)
Household size	The variable is measured as the total number of individuals dwelling in the same house and sharing meals together.
Own-price	The average price of the particular meat in question measured in Naira (₦).
Price of other related meat items	The average prices of other related meat items measured in Naira (₦)
Educational level	Level of education measured in number of years spent in formal school

Source: Authors' compilation 2023

3.3 Model Specification

The study utilized descriptive statistics, including percentages and frequency counts, to illustrate the expenditure patterns for different meat items. Furthermore, it employed the Ordinary Least Squares (OLS) regression model, as adopted by Okoruwa et al. (1999), to ascertain the socio-economic variables influencing household expenditure on these meat products.

The specified model for the analysis is as follows:

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$Qd_i = f(P_i, P_{ij}, Y_{it}, L_{ie}, H_{is}, U)$.

Where,

$_i$= Three response variables$Qd_i, Qd_{ii}, Qd_{iii})$

Qd_i=beef demandin kg, per month

Qd_{ii}=mutton demand in kg,per month

Qd_{iii}= chevron demand in kg,per month

P_i = Price of meat product under consideration ₦ (beef, mutton, chevron)

P_{ij}= Price of substitute of meat ₦

Y_{it}= Income level measured in ₦

L_{ie} = Level of education measured in number of years spent in formal school

H_{is} = Household size measured in number of people in the house

e = Error term.

4.0 Results and Discussions

Descriptive statistics was used to present the meat products preferences in the study area and the frequency of their choices. In addition, household mean monthly expenditure is presented in table 2

Table 2: The Pattern of Meat Products and Their Monthly Expenditure (n = 150)

Meat Type	Meat Choices (%)	Mean Monthly Quantity of Meat Demanded in Kilogram	Mean Monthly Expenditure
Beef	73.3	10.684	₦21,368
Mutton	20	11.493	₦22,986
Chevron	6.7	11.300	₦22,600

Source: Field Survey, 2023

From Table 2, the meat choices and mean monthly quantity demanded in kilogram and expenditure showed that beef was the most predominant meat item in the study area with 73.3% preference this agrees with the findings of Solomon and Nazemzadeh (2005).The reason for this could be because it stays in a stew for longer period without "dissociating". Other reason could be because of quantity; a given quantity of "hind or thigh" of cattle could give a greater satisfaction more than that of sheep or goat.However, beef's mean monthly expenditure was the lowest this could be becauseof its health implication of having high cholesterol.On the contrary, mutton had the highest mean monthly expenditure followed by chevron with₦22,986 and ₦22,600 respectively. Although they had less demand compared to beef. This could still be attributed to the fact that an equal kg of beef would give more quantity of meat when cooked compared to that of mutton and chevron. In addition, these meat products when overcooked theydissociate. To make up for a higher quantity a higher expenditure shareallocation was necessitated.

4.1 Determinants of Meat Products in Damaturu, Yobe State

OLS regression was used to determine the socio-economic factors that influence meat products demand in Damaturu. Linear regression analysis was employed and presented in Table 3

Table 3: Determinants of Meat Products in Damaturu, Yobe State

Variable	Constant	x^1 Pb	x^2 Pm	x^3 Pc	x^4 Hy	x^5 Le	x^6 Hs	R^2
Beef								
p>[t]	7.619	0.000**	0.511	.061	.000**	0.763	.007**	0.98
T- value		(-23.78)	(-.659)	(-1.893)	67.67	(-.303)	(-2.738)	
Mutton								
P>[t]	30.08	0.929	.000**	0.931	0.009**	0.929	0.266	0.98
T-value		(-.488)	-8.203	-0.088	10.26	-0.09	(-1.144)	
Chevron								
P>[t]	12.221	2.47	.004**	.004**	0.003**	0.603	.079	0.99
T-value		(-1.619)	(-5.254)	-15.253	(11.05)	(-.613)	(-3.333)	

Source: field survey, 2023.

From Table 3, the results show that the coefficients of own price for all the three meat products were significant at 1% but have negative coefficients (elastic). This is in line with the *a priori* expectation which assumed that the meat products would be negatively related to their own prices or elastic in accordance with the law of demand which states that the higher the price the lower the quantity demanded. Moreover, the concavity or negativity theory implies that own price or uncompensated demand elasticity is negative only. However, the coefficient for the price of beef was the highest(-23.78) and negatively related. This implies that a 1% increase in its price would result to a 23.78% decrease in its expenditure. The next meat item that had the second highest coefficient was chevron with (-15.253). Indicating that a 1% increase in its price would result to a 15.253% decrease in its expenditure. On the other hand, the coefficient of the price of mutton was the least for all the meat products in terms of the magnitude of the size of price coefficient with (-5.254). Implying that 1% increase in its price would result to a 5.254% decrease in its expenditure. Thus, of all the three meat products, beef is the most sensitive to its own price and any slight increase in its price would result to a greater decrease in its expenditure. Already it was observed from table 3 that it expenditure was the least, although it had the highest proportion of consumers of (73%), however, any change in its own price would reduce its expenditure drastically.

The results for cross price elasticity i.e. (price of other related meat on the expenditure of

the particular meat in question) showed that all the coefficients were not statistically significant except for cross price elasticity between mutton and chevron. Moreover, all the coefficients were negatively correlated. This implies that there exists a complementary relationship among all the meatproducts; this is contrary to the findings of Taljaard, *et al.* (2003). The authors revealed that for all four meat products analyzed namely, beef, mutton, chicken and chevron they carry positive signs as substitute products. The reason for the conflicting results could be because theygrouped the meat productsinto red and white. Furthermore, the result is also contrary to the *a priori* expectation that assumed that the coefficients would be positive indicating substitutability among the meat products. The coefficients for cross-price of beef in relation to mutton and chevron were(-0.488) and (-1.619) respectively, for mutton it relation to beef and chevron were(-.659) and (-.5254) while the cross-price elasticity of chevron in relation to beef and mutton were (-1.893) and(-0.088). The cross-price elasticity estimates were lower than it own price elasticity estimates. This suggests that it own price effects were higher and more elastic, indicating that a change in price of a commodity with respect to its own price is elastic. The complementarity of the meat items implies that the quantities of these meat items are highly correlated. This is due to the fact that producers of both types of ruminant animals rely on the same type of animal feeds, natural grass and forage legumes for subsistence. A higher price of animal feeds or shortage in the above-mentioned sources may lead to a decrease in the supply of both meats and hence, an increase in both their prices. The fact that these meat products are highly correlated means there is a tendency that as the own-prices or cross-prices rise the expenditure for other meat products not considered in this study could rise such as chicken, fish, beans etc. thus, serve as substitute.

The coefficients forhousehold monthly Income for all the meat products were positively correlated with the expenditure for the meat products at 1% level of significance. This implies that the higher the income the higher the expenditurefor all the three meat products, this finding is inconsonance with the finding of Igwe and Onyekwere (2007) which reveal that income affects demand of the respondents positively at 5% level of significance. This result agrees with the *a priori* expectation for mutton and chevron

while it is contrary to the*a priori* expectationfor beef expenditure. The *a priori* expectation assumed that income would be positive for mutton and chevron and negative for beef.The implication of the positive relationship between household income and expenditure for meat products demand could be justified by the fact that ruminant meat is a normal good; therefore, the positivity of the coefficients means consumers will increase their expenditure on ruminant meat so long as incomes increase.Furthermore, the coefficient of income in relation to expenditure on beef was the highest indicating that a 1% increase in income would have a greater positive effect on beef's expenditure. However, an opposite reaction was observed under its own-price. This satisfies the theoretical assumption that the higher the percentage of a consumer's income used to pay for a product, the higher the elasticity tends to be or the higher responsive it is to its own-price. Implying that people will pay more attention on what they dedicate their greater share of income on, hence, the higher its price the less the demand.

The second observation is with regards to chevron expenditure and household income. Although, the effect was not as much as that of beef but still the positive correlation signifies that a 1% increase in income would increase its expenditure. On the other hand, mutton expenditure would have less effect compared to the others meat items. The magnitude of the coefficients indicates that all the meat types are luxury goods with an elasticity more than one, implying that the demand for these meats increases by a higher percentage than the increase in consumers' income. This means that as households earn more money, they disproportionately increase their spending on these types of meat. They are not just buying more meat because they have more money in absolute terms, but they are allocating a larger share of their increased income to purchasing these meats, reflecting a luxury rather than a necessity. This characteristic of luxury goods suggests that demand for them is highly sensitive to changes in income. During times of economic prosperity, when consumer incomes rise, demand for luxury meats like beef, mutton, and chevon can be expected to grow significantly. Conversely, if there is an economic downturn and incomes fall, demand for these items might decline more drastically compared to staple goods or necessities.

Analysis of the results showed that educational level of household heads was not a good determinant of expenditure for all the three meat products and was negatively related to their expenditure. This is in line with the *a priori* expectation for beef expenditure and agrees with the finding of Zongoma (2003) but contrary to the *a priori* expectationfor mutton and chevron expenditure which assumed that there would be negative relationship between expenditure for beef and a positively relationship with the expenditure for mutton and Chevron. The negative relationship could be attributed to health implication or other reasons. However, the coefficient for mutton was the least (-0.09). This implies that *Ceteris paribus*, a literate consumer would decrease his mutton expenditure by less than proportional when compared to beef and chevron.This implies that, it is more desirable by a literate consumer than the other meat items.

The coefficients for family size on expenditure for all the meat products were negatively correlated but was significant with beef's expenditure only.The *a priori* expectation for this variable assumed that the coefficient of household size would have positive effect on expenditure for beef a negative effect on the expenditure for mutton and chevron. The findings howeverare contrary to the *a priori* expectation for beef expenditure but in agreement with the *a priori* expectation for mutton and chevron's expenditure. The negativity of the coefficients implies that the more household size increasesthe less their expenditure on meat products, this is contrary to the findings of Zongoma (2003). The conflicting result couldbe justified by the differences in the time the two studies were conducted andthe current economic recession of the country. An increase in family size without a corresponding increase in real income or a fall in the price of the various meat products would not increase their expenditure rather they would go for other less expensive substitute items that are not considered by this study.

5.0 Conclusions

The study revealed that beef was the most preferred type of meat, garnering a preference rate of 73.3%. Interestingly, mutton registered the highest average monthly expenditure among households, amounting to ₦22,986. With regards to price elasticity, all the three meat products were found to be negative (elastic) and significant at 1%. Notably, the elasticity coefficient for

beef was the most pronounced at -23.78, indicating that beef demand is particularly sensitive to price changes among the three meat types. Similarly, the cross-price elasticity suggested complementarity among all the meat products. Income had a positive correlation with meat product expenditure across all types and the magnitude of the coefficients confirmed them as luxury goods. Lastly, family size was inversely related to expenditure on all meat types. therefore, the paper concudes based on the findings that there is a positive prospect for small ruminant farming in Damaturu, Yobe state, Nigeria.

Recommendations

- Government should develop a policy that would encourage investments in livestock production so as to increase the supply of beef to meet the high demand, thus mitigating the impact of price fluctuations on demand.
- Policies aimed at increasing the disposable income of households, such as job creation initiatives and economic stimulus packages should be implemted. this could lead to an increase in the consumption of meat products since it a luxery goods in the study area.
- Nutrition Education Campaigns: Considering the negative correlation between family size and meat expenditure, it is vital to implement nutrition education campaigns to raise awareness about the nutritional value of various meats, including more cost-effective options.

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