

Cattle Ownership and Meat Consumption Shares in Rural Communities: The Case of the Omusati Region in Namibia

Selma Ndinelago Ingula*; Helmke Jens Sartorius von Bach and Kennedy Muzamai Kalundu

Department of Animal Production, Agribusiness and Economics, University of Namibia, Neudamm campus, Windhoek, Namibia

*Corresponding Author

DOI: <https://doi.org/10.51584/IJRIAS.2026.11060081>

Received: 02 June 2026; Accepted: 08 June 2026; Published: 24 June 2026

ABSTRACT

This study examines how cattle ownership influences meat consumption patterns among rural households in the Omusati region of Namibia. Rural households' own cattle; however, meat consumption is not necessarily influenced by access to cattle reared but rather by other drivers of meat availability within the immediate vicinity of the household and the status of cattle ownership. This study uses primary data from 160 participants in Outapi, Tsandi, Okahao, and Ruacana constituencies. Data were collected using a structured questionnaire that was pre-tested on 30 respondents prior to the main survey. The data were coded and analysed using descriptive statistics and a multiple linear regression model estimated through the Ordinary Least Squares (OLS) technique to identify factors influencing household beef consumption. Beef consumption was specified as the dependent variable, while selected household and market-related factors were included as explanatory variables. The OLS approach was adopted based on the assumptions of the Gauss–Markov theorem and Best Linear Unbiased Estimators (BLUE). The dynamics of meat consumption in rural Omusati show divergences. Households that do not own cattle rely on cheaper protein sources, which influence both their meat consumption and expenditure shares. In contrast, households that own cattle derive their meat consumption primarily from beef. Cattle farming and ownership continue to play a critical role in the rural economy through passive income and serve as the backbone of these communities. This paper shows that beef consumption is significantly influenced by prices, household income, and the availability of alternative protein sources, although cultural preferences continue to shape consumer behaviour. Furthermore, the dynamics of cattle ownership are not improving meat consumption among rural communities. Therefore, cattle ownership does not necessarily support meat consumption; rather, the share of expenditure on meat-based protein is influenced by the availability of substitutes such as fish, poultry, pork, and household income levels.

Keywords: Rural Households, Beef Consumption, Poverty, Price Elasticity, Household Income

INTRODUCTION

In rural Southern Africa, where cattle are culturally and economically central, poverty and unstable livestock markets sharply constrain meat-based protein consumption. Still, red meat (beef, mutton and chevon) remains one of the most culturally accepted sources of high-quality protein and micronutrients such as iron, zinc, and B12. Many low-income households, however, struggle with protein deficiency or malnutrition. Poor dietary diversity and limited access to nutritious foods thus constitute the primary constraints. For a healthy diet, meat-based protein should be consumed in moderation to about 70 g per day, while total lean meat, poultry, or fish intake should not exceed 150–180 g cooked per day. Meat consumption per capita in sub-Saharan Africa is approximately one-third of the global average; Falchetta et al. (2021) estimated it at 31 g/capita/day.

Trends in meat supply further contribute to the significant rise in global hunger. These trends thereby impede the achievement of the Sustainable Development Goal of eliminating hunger by 2030 (FAO, 2022). Such impediments are particularly evident in the barriers to achieving food security, including equitable access to food and a balanced availability of food types. Alonso et al. (2019) expressed that meat and animal products are major components in achieving food security. The analysis draws on the Engel curve framework to understand how income shapes meat consumption patterns and expenditure shares given the status of cattle ownership in rural Namibia. This paper argues that beef consumption and expenditure patterns in rural Namibia offer insights into improving marketing strategies and the valuation of cattle ownership. The study area is the Omusati region, which is characterised by diverse and dynamic socio-economic conditions. Data from the Namibia Statistics Agency (NSA) indicate that approximately 50.7% of the Omusati regional population experiences multidimensional poverty (NSA, 2021) while over 60% of households own cattle. However, meat consumption in the region remains low. The significance of cattle ownership and beef availability extends beyond local consumption; it generates export revenue and income for small farmers, contributing to economic development (Gleason & White, 2019). Therefore, this paper investigates the determinants of meat consumption patterns given the status of cattle ownership among rural households in Namibia.

Background on the status of the cattle sub-sector in northern Namibia

In rural Namibia, cattle ownership plays a critical role in the growth of the economy and is the backbone of these communities (Namibian Agricultural Policy, 2015). Northern Communal Areas (NCAs) are affected by recurring outbreaks of Foot and Mouth Disease (FMD). Therefore, due to the presence of FMD, livestock and its products are accessed through informal market channels, such as open markets and roadside stalls (Millennium Challenge Account-Namibia [MCA-N], 2013). However, the establishment of the Commodity Base Trade (CBT) Protocol enables livestock products to be sold to local slaughter abattoirs in Katima Mulilo or Rundu. Beef from these zones can therefore be exported to regional and other viable markets in Africa, the Middle East, and South-East Asia. The implementation of the CBT protocol enhances market access for cattle producers in regions north of the Veterinary Cordon Fence (NVCF). Under this CBT, deboned beef from the FMD Protection and Infected zones of Namibia complies with export rules for movement from north of the NVCF to markets south of the fence and beyond (Naziri, et al., 2015).

In the Omusati region, cattle represent by far the most important livestock commodity. For example, the 2024 livestock census from the Directorate of Veterinary Service (DVS, 2024) indicates that this region has 742,531 ha of rangeland under cattle farming. The region therefore holds substantial potential for enhancing beef availability and consumption; cattle farming is a prevalent agricultural activity in the region, with approximately 15,845 agricultural households involved in livestock rearing (NSA, 2021). The availability of beef and other meat products in the region at the household level remains constrained. This situation is compounded by limited access to formal markets, which restricts opportunities for farmers to receive profitable prices for marketed cattle. Most cattle owners in the NCAs do not consider their herds as a commercial asset capable of generating income. In northern Namibia, livestock is kept for insurance/security purposes, mainly for cultural events such as weddings, and funerals and as a store of wealth (MCA-N, 2013).

LITERATURE REVIEW AND CONTRIBUTIONS

Beef consumption in northern Namibia

Consumption patterns are shaped by numerous social, psychological, cultural, and personal factors. Due to financial limitations, rural consumers are expected to maximise their utility within budget constraints, as Nicholson and Snyder (2008) claimed. According to utility maximisation theory, households in the rural Omusati region make decisions on how to allocate their meagre income across food categories, including beef. Table 1 presents different sources of protein and provides an overview of their nutrient contents. Beef and chicken are the dominant sources in the animal-based category, while beans and wheat are the primary plant-based sources (WEF, 2019).

Table 1: Choices between protein sources for human consumption

Animal-sourced	Grams	Protein(g)
Beef	83	20.89
Pork	67	17.3
Chicken	140	24.39
Plant-sourced		
Wheat	60	5.79
Nuts	33	6.43
Bean	157	13.65
Non-traditional		
Insect	43	27.49
Algae	69	39.63
Cultured beef	83	20.89

Source: WEF (2019)

Household preferences and affordability determine the selection of protein sources and quantities consumed. Based on the Engel curve analyses, it is evident that richer households are expected to consume a wider variety of goods. In this study, goods refer to different meat-based proteins such as beef, poultry, pork, and fish. On the contrary, lower-income households rely on one or two more affordable protein sources (Ken & Si, 2016). The Food and Agriculture Organisation of the United Nations (FAO, 2020) published data on aggregate meat consumption per capita, revealing that figures fluctuate significantly across regions. However, the global average is about 12.5 kg for poultry consumption per annum, double that of beef and three-quarters that of pork. In addition to quantity consumed, cultural beliefs and habits contribute to the differences in preferences and geographical location. For example, households in Argentina spend half of meat expenditures on beef, while those in India spend about five per cent on it. In rural Southern Africa, beef accounts for roughly half of total meat consumption, reflecting the region's cattle-based economies and cultural traditions (Falchetta et al., 2021).

In rural Namibia, households prefer more affordable meat-based protein sources like fish and chicken for everyday consumption. Beef is consumed on rare occasions such as weddings and funerals, and cattle in the Omusati constituencies were previously kept as a store of wealth, for insurance and security, and for these same cultural purposes (MCA-N, 2013). The status for Omusati region exemplifies the status of Eswatini livestock farming Low (1982). However, the Omusati region status has multidimensional poverty of about 50.7% of the population (NSA, 2021). However, over the years, with accelerated poverty levels, structural changes among households, cattle farming and ownership have failed to be translated into welfare gains and access to protein rich foods. The Omusati data indicate an average daily beef consumption of 17 g/capita. Disaggregating by ownership status, beef consumption averaged 17.35 g/capita/day among cattle-owning households and 16.94 g/capita/day among non-owning households. These figures demonstrate that the expected nutritional and financial gains have not been realised. Cattle owners remain subject to multidimensional poverty and food insecurity. The sources of meat-based protein in household diets therefore need to be diversified to maintain a healthy diet. Furthermore, the socio-economic status of most households is influenced by the price of meat-based protein.

The research gap is that available updated literature on Namibia's beef sector, such as Madzingira et al. (2018) and Kalundu (2023), has not addressed the role of cattle ownership in shaping meat expenditure patterns. Nor does it explore the linkages between beef unavailability among rural households and the potential contribution of the beef sector to long-term regional food security. Moreover, there is limited information regarding Namibia's beef demand among households in rural communal areas and the linkages between its availability and multidimensional poverty. Therefore, the aim of this paper is to bridge the knowledge gap on cattle ownership and determinants of meat consumption expenditure patterns in rural communities to support evidence-based policy development.

The paper is structured as follows. Section 1 includes introduction, and section 2 offers the literature aligned to

this study. The next section presents the methods and econometric specification we used in the estimation. The empirical application of regression to Omusati region’s households’ beef consumption and empirical results of the study are presented in section 4, while section 5 covers the discussion. Section 6 covers conclusions.

DATA AND METHODS

Sample size and data

The research was conducted in the Omusati region in Northern Namibia, where the focus areas were Okahao, Outapi, Ruacana, and Tsandi constituencies. The constituencies were selected on account of their substantial cattle populations. The primary sources of income are crops and livestock farming. The region is home to a total of 122,756 cattle, with 61,226 concentrated in the Outapi, Tsandi, Ruacana, and Okahao constituencies (ASB, 2021). The region has been experiencing the effects of drought since 2019. As a result, Government of the Republic of Namibia, through the Office of Prime Minister has been providing drought relief assistance to households located in areas that are severely affected such as Outapi, Ruacana, Tsandi, Otamanzi, and Okahao (OPM, 2022). Primary data from 160 households were collected through a structured questionnaire administered through a face-to-face, direct interview. The sample size (n) was determined using the possibility-sampling method:

$$n = \frac{Nt^2.p.q}{d^2N+t^2.p.q} \tag{1}$$

where N is the number of households in each constituency, t is z number which is the required confidence interval (for 95 percent confidence interval $t = 1.96$), p is possibility for an event to occur (the rate of owning or not owning cattle, 0.5), q is the possibility for an event not to occur (the rate of not slaughter or not slaughter own cattle for consumption, 0.5), d is acceptable error rate during sampling (0.0564).

Using Equation 1 above data is formulated, and the sample size (number of people surveyed) was determined to be 160 according to the required confidence interval and the acceptable error rate. Omusati region is divided into four constituencies. In the 4 constituencies, about 32 villages were randomly selected from each. Then 5 households from each village were selected and interviewed. We asked households questions about their meat-based consumption patterns preferences and socio-economic information in the questionnaire form. Variables for analysis are summarized in Table 2.

Table 2: Description of explanatory variables on beef expenditure by households

Variable name	Description
AGE	Age (in years) of the respondents at the time of the interview
GENDER	Male and female headed household (Dummy, 1= Male, otherwise).
EXPB = Expenditure on Beef	Total monthly spend spent on beef
PENS = Pensioner	Household inclusive of a pensioner obtaining a monthly grant, 1 = Pensioner, 0 otherwise.
HHSZ = Household size	Number of household members (N)
HHINC = Household Income	Average household income measured in N\$ per household (N\$/)
BEXPS = Beef Expenditure Share	Share of beef expenditure as a share of total expenditure on meat per kg (N\$/kg per month) at household
FEXPS = Fish Expenditure Share	Share of fish expenditure as a share of total expenditure on meat per kg (N\$/kg per month) at household
PEXPS = Pork Expenditure Share	Share of pork expenditure as a share of total expenditure on meat per kg (N\$/kg per month) at household
CEXPS = Chicken Expenditure Share	Share of chicken expenditure as a share of total expenditure on meat per kg (N\$/kg per month) at household

Source: Author’s own elaboration based on survey questionnaire

Methods

In analysis, the study adopted the work of Sichilima et al (2015), who included household income, size of the household, share of expenditure on beef, share of expenditure on chicken, share of expenditure on fish and education level of the household head were considered important determinants, and have influence on the decision to purchase beef and the level of beef expenditure among households who own cattle or non-cattle owners.

A multiple linear regression was estimated where the share of beef expenditure of consumption is the dependent variable. The regression model is based on the Ordinary Least Squares (OLS) estimators and follows Gaussian standard classical assumptions of best linear unbiased estimators (BLUE) (Dougherty, 2011). For brevity the assumptions are not discussed in this paper. The generic equation for the Multiple Linear Regression Model was used as follows:

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_nx_n + \mu_i \quad (2)$$

where; Y is the dependent variable, $X_1 =$ Set of independent variables, $\beta_0 =$ Constant (autonomous) value of Y , if $X = 0$, $\beta_1 - \beta_n =$ are slope coefficients to be estimated, of X_i , and $\mu_i =$ Random error term, assumed to have a mean of 0. Equation 3 is the estimated econometric model, where $\beta_1 - \beta_n$ are slope coefficients that capture the partial impact of each independent variable.

$$BEXPS = \beta_0 + \beta_1AGE + \beta_2GEN + \beta_3PENS + \beta_4HHINC + \beta_5FEXPS + \beta_6PEXPS + \beta_7CEXPS + \mu_i \quad (3)$$

To further understand the share of beef consumption patterns in the study area, the own-price demand, cross-price and income elasticities of beef demand were calculated using the slope coefficients from equation 3. Therefore, the derivation of own-price, cross price and income elasticities of beef demand is presented equations 4 - 6, The calculation considers the theoretical expectations and average monthly expenditure on beef, fish and chicken and household income.

$$\varepsilon d = \frac{\Delta X}{\Delta Y} * \beta_6 \quad (4)$$

$$\varepsilon xy = \frac{\Delta X}{\Delta CP} * \beta_7 \quad (5)$$

$$\tau = \frac{\Delta X}{\Delta INC} * \beta_4 \quad (6)$$

where $\Delta X =$ Average monthly quantity of beef (N\$) and $\Delta Y =$ Average monthly price of beef consumed (kg), $\Delta CP =$ change in competing products and ΔINC denotes change in level of household income. Lastly, we determine the absolute relationships by using the Herfindahl index in equation 7. This approach provides a relative measure as the household meat expenditure diversity.

$$H = \sum_{i=1}^n x^2 / (\sum_{i=1}^n x)^2 \quad (7)$$

where $H = 1/n < H < 1$.

Post estimation diagnostics

Model adequacy and parameter diagnostic test statistics the Durbin-Watson test is a measure of serial autocorrelation on the residuals, the D-W value statistics were used and above 2. The adjusted-R-square values, a measure of the best fit of the model, Recursive estimates for stability, and Jarque-Bera testing for normality test were followed to ensure that results presented are robust.

RESULTS

Descriptive nature of the selected households in the constituencies in Omusati region

Demographic and socio-economic characteristics are important determinants of household beef consumption decisions in the study area. Table 3 summarises the characteristics of the 160 sampled households, of which 96 are headed by pensioners above the age of 60 years, accounting for 60.0% of the sampled population. The youth and middle-aged population account for 7.5% and 32.5% of household heads, respectively. All rural households in the region are involved in and depend on agriculture for their livelihood. However, only 42.5% of the population is engaged in both crops and cattle farming, while the majority (57.5%) farm crops exclusively.

Table 3: Descriptive statistics

Characteristics/Attributes	N = 160	Percentage (%)
Age:		
19 – 35	12	7.5
36-59	52	32.5
Over 60	96	60.0
Gender:		
Female	93	58.1
Male	67	41.9
Employment Status:		
Employed	10	6.3
Unemployed	54	33.8
Pensioner	96	60.0
Education Level:		
Primary	70	43.8
Secondary	51	31.9
Tertiary	12	7.5
No schooling	27	16.9
Average Household Monthly Income (NS**):		
<1,000	29	18.1
1,000-5,000	107	66.9
≥5,000	16	10.0
No Income	8	5.0
Farming Type:		
Crops	96	57.5
Crops & Cattle	68	42.5
Own Cattle:		
Yes	68	42.5
No	92	57.5
Reason for Keeping Cattle:		
Income/Sale	2	1.3
Store of Wealth/Social Status	12	7.5
Security/Insurance	49	30.6
Other (Milk, Manure)	5	3.1
	92	57.5

Characteristics/Attributes	N = 160	Percentage (%)
No Cattle	91	56.9
Preferred Proteins:	26	16.3
Fish	31	19.4
Chevon	1	0.6
Chicken	4	2.5
Pork	2	1.2
Donkey	5	3.1
Game		
Beef		

Note: ** Exchange rate applied: USD 1 = N\$18.20.

Source: Author’s own elaboration based on survey questionnaire

Household expenditures on beef and other sources of meat protein (mutton, chicken, pork, and fish) account for 31.6%; the share for beef is about 12.3%, while fish accounts for 12.8%. Expenditure on food and meat-based protein depends on income levels. High-income households spend between 5% and 15% on food, while lower-income households spend 30%–60%. The meat expenditure share is between 10% and 20% World Bank (2022). Omusati households show approximately tenfold higher expenditure on meat compared with the national average. Wiesli (2025) argues that when a household owns cattle, welfare improves and expenditure patterns adjust accordingly. Beef consumption is considered both a protein source and a proxy for rising household wealth and socio-economic advancement. Households that consume beef tend to be of higher wealth and socio-economic status.

Rural households’ food expenditure is about 60% of the total (NSA, 2020). Against this backdrop, Table 4 presents a comparison of meat expenditure patterns in the Omusati region against the national average. The table shows that more than double the household expenditure is allocated to beef and fish in rural Omusati. Rural households allocate almost a quarter of their protein expenditure to meat, exceeding the national average by more than nine percentage points, while the national value is approximately 14%. The expenditure pattern mirrors the data presented in Table 1 for World Economic Forum (2019). The pattern suggests that households with lower income levels in rural communities spend proportionally more on different meat-based proteins than urban households. However, the quality and variation of meat-based protein sources are not accounted for in this comparison. The result corresponds to the findings of Sichilima et al. (2015).

Table 4: A comparison between Omusati region and national household meat expenditure patterns.

Variable	Meat expenditure proportion of total household expenditure (%)					
	Beef	Fish	Chevon /mutton	Pork	Poultry	Total
Namibia total	3.50	2.50	3.50	1.00	3.50	14.00
Omusati region	8.76	8.72	4.20	0.35	2.91	24.94

Source: Authors' own elaboration (2024).

Table 5 shows that household income and shares of expenditure on fish, pork, and chicken are statistically significant determinants of beef consumption among cattle-owning households. The autonomous expenditure share for beef is 185.5437, implying that in the absence of other determinants, this share would stand at 185%. In addition, qualitative variables such as gender and pension status and demographic determinants (age and household size) are statistically insignificant. Beef exhibits the characteristics of a normal to luxury good, as evidenced by the positive household income coefficient. A unit increase in household income raises the share of beef consumption by 0.573%.

Table 5: Model result for beef consumption

Variables**	Coefficients	St. Error	P-vale
Constant	185.5437	39.1852	0.0000*
AGE	-0.3059	0.7298	-0.4200
GENDER	-9.2697	15.5411	-0.6000
PENS	14.2322	25.3038	0.5600
HHSZ	0.5731	1.6149	0.3500
HHINC	0.02409	0.0062	0.0000*
FEXPS	-133.7996	41.8014	0.0020*
PEXPS	-110.2516	43.8054	0.0130*
CEXPS	-46.1629	10.8136	0.0000*
R ²	29%		
F-statistic	4.97	F-prob.	0.0000

Note: **denotes that variables are as explained in Table 1 and * denotes significant at 0.05 level

Source: Author’s own elaboration based on estimated equation 3.

Price elasticity of Beef Price

To gain a deeper understanding of consumer behaviour and measure how sensitive households are to change in price meat-based, the price elasticity of beef was calculated in the study area. At the time of the survey, the average household beef consumption was 4.3 kg at N\$40.15 (2.21 USD) per kg. A supplementary log-linear model following Equation 3 and 4 was used to estimate cross-price elasticities among meat products (Bayu et al., 2021). Table 6 presents the estimated elasticities for beef, fish and chicken and their interpretation is based on economic theory are consistent with Hosu et al. (2012), Akerele et al (2015) and Ekwe (2019). For beef, a value of 0.10, indicates that beef consumption is relatively price inelastic. This suggests that changes in beef prices have a limited effect on consumption levels, attributed to the fact that because beef is considered a necessary or culturally preferred meat. The small elasticity implies that, even when beef prices increase, households that consume beef would continue to purchase beef, although possibly in smaller quantities of about 0.10kg for every increase in price of beef. Furthermore, the cross-price elasticity for fish is -0.03, implying that fish serves as a substitute for beef, while the cross-price elasticity for chicken is 0.02. Chicken thus also acts as a substitute protein source.

Table 6: Cross-price elasticities

Variable	Elasticity coefficient
Beef as share of expenditure	0.10
Fish as share of expenditure	-0.03
Chicken as share of expenditure	0.02

Source: Author’s own elaboration (2025).

Household meat expenditure diversity patterns

The Herfindahl index reveals considerable variation in meat expenditure diversity patterns among Omusati households. The calculated diversity values for beef and fish are equal to 0.35 each, while pork records the lowest concentration index value (0.01) (only three per cent of the households consume pork). Both poultry and chevon are consumed by only 10% of households (Herfindahl concentration indices of 0.12 and 0.17, respectively). This relative measure supports earlier findings that Omusati households are more focused on beef and fish consumption, and that in rural settings, household expenditure on poultry differs from that in urban areas.

Impact of cattle ownership on beef expenditure

The above findings are consistent with the Namibia National Farmers Union (NNFU, 2019) observation that household cattle ownership has been declining and that reliance on herds for non-commercial reasons has significantly changed in the past decade. Currently, only 10% of the sampled households have an average household monthly income level above N\$5,000, and about 42.5% of the rural respondents' own cattle in Omusati. Disaggregating the regional data, most rural households in Ruacana and Tsandi own cattle, while Outapi and Okahao record comparatively few cattle-owning households. Only about 1.3% of the region's households kept cattle for selling purposes, while the majority keep them for security reasons.

The current finding differs from that reported a decade ago, when cattle sales accounted for approximately 22.3% of total annual household income (IPA, 2012). Thirteen per cent of the cattle herd was sold, while 75% of the Omusati households owned cattle (MCA-N, 2013). Tables 7 and 8 show the dynamics of determinants of rural household beef consumption and how income variation affects expenditure patterns among cattle-owning and non-cattle-owning households. The region's income levels between cattle-owning and non-owning households are not significantly different, as shown by the t-test (two-tailed $p = 0.278$). The comparison of mean regional household incomes revealed that non-cattle owners earn a monthly income approximately 41% higher than those of cattle-owning households. The Okahao constituency households drive this difference. The gradual shift from a tradition of owning cattle to improve livelihood has an impact on household expenditure patterns in meat-based protein and substitutes.

Table 7: Model results for determinants of beef consumption among cattle owners

Variables**	Coefficients	St. Error	P-vale
Constant	259.2881	98.7095	0.0110*
AGE	-1.7382	1.6173	0.2870
PENS	31.0381	54.0462	0.5680
HHSZ	-0.8440	3.0212	0.7810
HHINC	0.0263	0.0075	0.0010*
FEXPS	-85.21436	81.5594	0.3010
PEXPS	-200.917	346.6946	0.5650
CEXPS	-128.4921	101.9752	0.2130
R ²	29%		
F-statistic	2.79	F-prob.	0.0149

Note: **denotes that variables are as explained in Table 1 and * denotes significant at 0.05 level

Both different protein alternatives confirm the status quo. However, for the cattle owners both fish, pork and chicken are statistically insignificant. This is nullified by a higher autonomous beef consumption which is relatively high for cattle owners 259.288 share of expenditure in comparison to non-cattle owners, whose share of expenditure on beef is about 148.144. The difference of about 111.144 in share is due to income differential which creates the ability to spend more beef for household consumption. The share of expenditure on beef is low for non-cattle owners because of the ability of the household to substitute beef for other meat-based products such chicken and fish.

Table 8: Model results for determinants of beef consumption among non-cattle owners

Variables**	Coefficients	St. Error	P-vale
Constant	148.1441	46.3923	0.0020*
AGE	0.6417	0.7611	0.4020
GENDER	7.2129	17.3877	0.6790
PENS	0.7656	24.4862	0.9750
HHSZ	2.9987	1.8698	0.1130
HHINC	0.0209	0.0067	0.0030*

FEXPS	-202.2341	37.0073	0.0000*
PEXPS	-129.5175	41.1041	0.0020*
CEXPS	-50.7299	9.4383	0.0000*
R ²	40.56%		
F-statistic	8.84	F-prob.	0.0000

Note: **denotes that variables are as explained in Table 1 and * denotes significant at 0.05 level.

The model adequacy indicates that 29% of variation in the share of beef expenditure / consumption is explained by the variation in the household income, importance of substitute meat-based protein such as chicken and fish for household who own cattle and 41% for households who do not own cattle. and overall performance is satisfactory, F-value probability for both models were less than the p-value of 0.05 and parameter diagnostic test statistics the Durbin-Watson test is a measure of serial autocorrelation on the residuals are above the value of 2, implying that serial correlation is not a concern. Recursive estimates for stability and Jarque-Bera testing for normality test are robust and significant.

DISCUSSION

The findings of this study are aligned with the work of Akerele et al. (2015), whose analysis of beef consumption patterns in rural households in the Yewa communities of the Nigerian Ogun state, found a consistent inverse relationship between price and consumption. When other variables are held constant, higher expenditure on meat-based protein relative to beef results in higher consumption. If beef remains expensive, its consumption becomes concentrated among a smaller group who can afford it; for the majority, consumption levels fall relative to income and the availability of substitute proteins.

The analysis shows that a significant proportion of respondents (56.9%) indicate a revealed preference for fish. It is the primary protein source, followed by chicken (19.4%). Affordability and constant availability in local markets driven by promotional campaigns conducted by the National Fish Consumption Commission throughout the country, explain this preference. According to Ekwe (2019), rural households in Nigeria prefer fish to beef as their primary protein source.

This paper argues that household income and the availability of substitutes play a more significant role in determining beef consumption levels. The results are not unique but correspond to those of Hosu et al. (2012), who explored meat-based protein consumption in South Africa and found that price changes have a lesser effect on meat demand than income changes (Hosu et al., 2012). Similarly, the case of the Omusati region has broader implications for other regions in Namibia with similar characteristics.

CONCLUSION

This paper identifies key determinants of beef consumption and expenditure patterns among rural households in the Omusati region of Namibia. The determinants identified include the allocation of expenditure to meat-based protein and the price elasticity of beef consumption, as shaped by various socio-economic and demographic factors. The paper illustrates how cattle-owning and non-cattle-owning rural households make decisions and respond to changes in the beef supply and demand, given prevailing household income constraints. Demand for beef is price-inelastic, implying that consumers in the rural Omusati region are not highly sensitive to price changes, given their income status; however, income elasticity is positive for non-cattle-owning households. Households are able to decide how income is allocated across competing protein sources that are readily available and more affordable, such as fish and chicken. The results are in conformity with the theory of demand, indicating an inverse relationship between quantity of beef consumed and price; however, the response is highly inelastic (-0.01).

The analysis shows that when the price of beef increases or decreases, household income has a significant impact on consumption levels. Expenditure on meat is dependent on income and the availability of alternative protein sources. However, consumer behaviour is still influenced by cultural attributes. Results show that increases in

beef prices and declining cattle ownership lead rural households to shift to the best available sources of meat-based protein, particularly chicken and fish. The evidence shows that the dynamics of cattle ownership are not improving meat consumption among rural communities. Therefore, cattle ownership does not support the consumption of meat; rather, the share of expenditure on meat-based protein sources is influenced by the availability of other substitutes at household level. The findings point to barriers that continue to constrain the efficiency of meat supply and demand in northern Namibia. The findings echo the persistent concerns that have emerged from decades of debate surrounding the dynamics of the veterinary cordon fence.

STATEMENTS

Ethical approval: To comply with ethical considerations in conducting research, ethical clearance was sought from the University research ethics committee before administering the research instrument, a questionnaire.

Conflict of interests: On behalf of all authors, the corresponding author states that there is no conflict of interest

Data Availability: The data are not available for other studies or purposes, as informed consent for data sharing was not obtained from study participants.

Funding: The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

Acknowledgements: The authors gratefully acknowledge the participating households of the Omusati region particularly those from Outapi, Tsandi, Okahao, and Ruacana constituencies, whose cooperation and willingness to participate made this research possible.

REFERENCES

1. Agricultural Statistics Bulletin (ASB). (2021). Ministry of Agriculture, Water and Forestry. Directorate of Planning, and Business Development. Windhoek, Republic of Namibia.
2. Akerele, E. O., Ologbon, O. A. C., Otunaiya, A. O., & Ambali, I. O. (2015). Analysis of beef consumption pattern among rural households in Yewa South Local Government Area of Ogun State, Nigeria. *Journal of Sustainable Development in Africa*, 17(8), 152–160. Clarion University of Pennsylvania, Clarion, Pennsylvania.
3. Alonso, S., Dominguez-Salas, P., & Grace, D. (2019). The role of livestock products for nutrition in the first 1,000 days of life. *Animal Frontiers*, 9(4), 24–31. <https://doi.org/10.1093/af/vfz033>.
4. Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Sage.
5. Dougherty, C. (2011). *Introduction to Econometrics*, 4th ed. Oxford University Press. New York.
6. DVS (2024) Livestock census, MAFWLR, Windhoek
7. Ekwe, K.C. (2019). Consumption frequency of selected Animal protein sources among rural households in Enugu State, Nigeria. *Journal of Community and Communication Research*. 4(2), 53- 61.
8. Falchetta, G., Golinucci, N., & Rocco, M. V. (2021). Environmental and Energy Implications of Meat Consumption Pathways in Sub-Saharan Africa. *Sustainability*, 13(13), 7075. <https://doi.org/10.3390/su13137075>
9. FAO, IFAD, UNICEF, WFP, & WHO. (2022). *The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable*. FAO. <https://doi.org/10.4060/cc0639en>.
10. Food and Agriculture Organization of the United Nations (FAO). (2024). *Per capita meat consumption by type, 2022*. Retrieved from <https://ourworldindata.org/meat-production>.
11. Gleason, C. B., & White, R. R. (2019). Beef species-ruminant nutrition cactus beef symposium: A role for beef cattle in sustainable U.S. food production. Department of Animal and Poultry Sciences, Virginia Tech, Blacksburg, VA 24061.
12. Office of the Prime Minister. (2022). *Namibia 2021 Vulnerability Assessment and Analysis Report*. Government of the Republic of Namibia
13. Hosu, S., Mushunje, A., & Taruvinga, A. (2012). "Factors affecting meat consumption patterns in rural

- households in South Africa." *Journal of Agricultural Economics and Development*, 1(1), 36-42.
14. Research gate (2024) https://www.researchgate.net/publication/290078404_Pattern_and_determinants_of_meat_consumption_in_urban_and_rural_Ethiopia
 15. Kalundu, K. S. M. (2023). *The development of an integrated modelling framework for the dualistic beef sector in Namibia* (Doctoral dissertation). Department of Agricultural Economics, Extension and Rural Development, Faculty of Natural and Agricultural Sciences, University of Pretoria.
 16. Low, A. R. C. (1982). The Economics of Cattle and Meat Marketing in Africa. *South African Journal of Economics*, 50(2), 136–157.
 17. Madzingira O., Chinyoka S., Yule J., Mwenda E.N., Kandiwa E., Samkange A., & Mushonga B. (2018). A retrospective study of carcass and organ condemnations at a beef abattoir in Namibia. *Alexandria Journal of Veterinary Sciences*. 59: 34-42. [DOI: 10.5455/ajvs.277323].
 18. Ministry of Agriculture, Water, and Forestry. (2019). Revised Namibia Rangeland Management Policy: *Regenerative livestock production – Trends, key profit drivers, case studies, and recommendations*. Retrieved from <http://www.agrinamibia.com.na/wp-content/uploads/2019/10/NRMPS-Revised-Strategy-2019-Rangeland-Best-Practices-final.pdf>.
 19. Millennium Challenge Account Namibia. (2013). *Study on Informal Trade of Beef/Cattle in the Northern Communal Areas*, from 2012-2013. Retrieved from [MCAN/COM/RFP/3B05008](http://www.mca.com.na/MCAN/COM/RFP/3B05008).
 20. Namibia Agriculture Policy. (2015). Ministry of Agriculture, Water and Forestry. Republic of Namibia.
 21. Namibia Statistics Agency. (2019). Namibia Census Mapping Basic Report. <https://nsa.org.na/publications/>
 22. Nayik, G. A., Tufail, T., Anjum, F. M., & Ansari, M. J. (2023). *Cereal grains: composition, nutritional attributes, and potential applications*. CRC Press.
 23. Naziri, D., Rich, K. M., & Bennett, B. (2015). Would a commodity-based trade approach improve market access for Africa? A case study of the potential of beef exports from communal areas of Namibia. *Development Policy Review*, 33(2), 195-219.
 24. Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Pearson.
 25. Nicholson, W., & Snyder, C. (2008). *Microeconomic theory: Basic principles and extensions* (10th ed.). South-Western Cengage Learning.
 26. Suresh, N. (2025) Meat consumption in India, <https://www.dataforindia.com/meat-consumption>.
 27. Sichilima, T., Mapemba, L. and Tembo, G. (2015) What Determines Expenditure Allocation to Beef among Lusaka Residents in Zambia? Evidence from Household Survey. *Modern Economy*, 6, 411-422. doi:10.4236/me.2015.63039.
 28. Yong Kang Cheah¹, Azira Abdul Adzis², Rabiul Islam³ (2022) Factors Associated with Household Expenditure on Meat: Evidence from Malaysia. *Journal of International Business, Economics and Entrepreneurship*, e-ISSN :2550-1429 7, (1)
 29. WEF (2029) https://www.weforum.org/publications/global-competitiveness-report-2019/?gad_source=1&gad_campaignid=22228224717&gbraid=0AAAAAoVy5F4kVu4QqcxxuYKN_D_Ta3wGMb&gclid=Cj0KCQjw2_TQBhCnARIsAF3-XhxDs6HeeIik-kDmDmec2YIZFhvFgr6hKg5RpHiKERRFkuP9fihLeEoaArRWEALw_wcB
 30. World Bank (2022) <https://www.worldbank.org/en/about/annual-report-2020>
 31. Wiesli, T.X. (2025) Meat consumption among different social groups and specific options for reducing it: a literature review of empirical research. *Front. Sociol.* 10:1547663. doi: 10.3389/fsoc.2025.1547663