

## DEMAND ELASTICITIES FOR FOOD IN NIGERIA THE CASE OF MEAT IN IMO STATE

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### ABSTRACT

This paper reports the results of budget survey of urban and rural household meat consumption in selected urban and rural areas of Imo State, Nigeria conducted between November 1984 and January 1986. The primary objective was to describe household meat consumption pattern and determine the nature, magnitudes and direction of income, own price and cross price elasticities of demand for meat. A total of 50 households were interviewed repeatedly on bi-weekly basis for the 14 months duration of data collection using structured questionnaires. Wide disparities were found to exist between urban and rural household meat consumption due primarily to wide disparities between urban and rural household incomes. Expenditure(income) elasticities of demand were positive and greater than unity for all households and for low and medium income households, indicating that for these households demand for meat was elastic with respect to income. For the high income households, expenditure elasticity was below unity, indicating inelastic demand with respect to income. Household income was the most significant determinant of meat consumption. The policy implications of these findings are discussed.

### 1. Introduction

Nigeria's food shortage problem has persisted for over two decades, leading to widespread hunger, malnutrition and disease for a large segment of the population. Although over this period, there has been a

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multiplicity of programmes designed to increase food production, most of these have been in the food crop area (FMED, 1975 ; FSM, 1980). Little attention has been given to livestock and meat production (Taylor, 1981). An unhealthy imbalance has, therefore, been created in the food intake of most Nigerians, such that there is limited animal protein intake, while starchy staples dominate the diet (Adeyokunnu, 1975). This situation assumes more dangerous proportions in the rural areas where a greater majority of the population live and where incomes are also lowest. In general, therefore, meat consumption (a major source of protein intake) is abnormally low because it is expensive.

Despite the inadequacy of meat consumption and the consequent adverse effect of this on the nutritional well-being of most Nigerian (FAO, 1966 ; Anthonio and Adeyokunnu, 1973 ; FMNP, 1981), research into meat consumption and its determinants are extremely limited. Few consumption studies on a component of meat (beef) have been reported for Southwestern Nigeria (Olayid and Oni, 1969 ; Olayide and Oni, 1972 ; Adegaye, 1975 ; Olufokunbi, 1982). None has been reported for Southeastern Nigeria in which Imo State is located. Meat consumption studies are needed for Southeastern and other areas of Nigeria to provide data needed for designing appropriate food policies and programmes aimed at improving the nutritional well-being of the people.

This paper describes household meat consumption pattern and discusses the nature, magnitude and direction of income, price and cross price elasticities of demand for meat in Imo State, Nigeria. Factors which influence household meat consumption expenditure are also examined and the implications of the findings for meat production and food policy formulation are discussed.

## **II. Methodology**

### **1. Data Collection**

A household budget survey of urban and rural households was conducted in selected urban and rural areas of Imo State, Nigeria between November 1984 and January 1986. A random sample of 50 households was involved. Each household, defined as all those who feed from the same pot and make joint consumption decisions (FOS, 1966 ; Simmons, 1976), was interviewed repeatedly on bi-weekly basis for the entire 14 months period of data collection using pre-coded questionnaires. In addition to household characteristics such as age, sex, education and occupation of household head and his first wife, as well as household size and composition, data were also collected on meat consumption and

expenditure, and expenditure on non-food items. Meat consumption data are aggregates of various meat types, namely, beef, pork, mutton, goat and bush (game) meat. Expenditure data on other food (160 of them) and non-food items were used to estimate total household expenditure which was used as a proxy for household income. This is because under Nigerian conditions it is difficult to secure accurate estimates of household income by direct methods (Nweke, 1988). Most people are reluctant to disclose their personal earnings, and most self-employed people are unable to estimate their personal incomes partly because no records are usually kept. Moreover, expenditure is estimated more accurately than income (Freidman, 1957; Adeyokunnu, 1972).

In addition to meat consumption data, meat retail prices were collected for 14 months in both urban and rural markets. Prices of other major food items were also collected for the same period and used to estimate cross price elasticities of demand for meat. Price data collection involved extensive bargaining with many sellers, outright purchase and weighing of representative samples.

## 2. Analysis of Data

### *The Model*

In this study, the new Working-Leser demand model for food consumption analysis which is a variant of the Ordinary Least Squares (OLS) regression model, and relates the value of shares to the logarithm of total expenditure (Deaton and Muellbauer, 1980) is used. In general, this model is specified as follows.

$$(1) \quad W_{it} = A_{it} + B_{1it} \log M_T + B_{2it} (\log M_T)^2 + B_3 t C_t + B_4 t AM_t + B_5 t AF_t + B_6 t AGEHD + B_7 t SEXHD + B_8 t EDUCHD + B_9 t EDWF_t + \sum_{i=1}^M B_i MTH_t + \sum_{i=1}^M B_i \log P_t$$

Where  $W_{it}$  = budget share of commodity  $i$  at time  $t$

$A_{it}$  = intercept

$\log M_T$  = log of total expenditure

$(\log M_T)^2$  = log of total expenditure squared.

$C_t$  = number of children who were members of the household at time  $t$

$AM_t$  = number of adult male members of household at time  $t$

$AF_t$  = number of adult female members of household at time  $t$

$AGEHE$  = age of household head in number of years

$SEXHD$  = sex of household head (dummy)

$EDWF_t$  = education of first wife of the household head in number of years

$MTH_M$  = dummy for months as proxy for seasonality

$\log P_{it}$  = log of price of commodity  $i$  at time  $t$

$C$  = number of children,

$B_1 \dots \dots \dots B_9$  are parameters to be estimated

Education of household head and his wife measure taste and are also proxy for permanent income, since estimates of total expenditure may not very accurate. Age of household head also measures taste.

The model does not yield direct price and income (expenditure) elasticities. Own Price elasticity is, therefore, computed from

$$(2) \quad \ln W_{it} B_j - dij$$

Where  $\ln \bar{W}_{it}$  = mean of log of budget share of commodity  $i$  at time  $t$ ;

$B_j$  = coefficient of the price of commodity  $j$  ;

$dij = 1$  if  $i = j$  and  
if  $i \neq j$

Thus Cross price elasticity is computed from

$$(3) \quad \ln \bar{W} B_j - 0$$

Where other variables are as defined in (2) above.

Expenditure elasticity is computed from

$$(4) \quad \frac{I}{\bar{W}} (B_1 + 2B_2 \ln M) + 1$$

Where  $\bar{W}$  = mean of log of dependent variable

$B_1$  = coefficient of income

$B_2$  = coefficient of income<sup>2</sup>

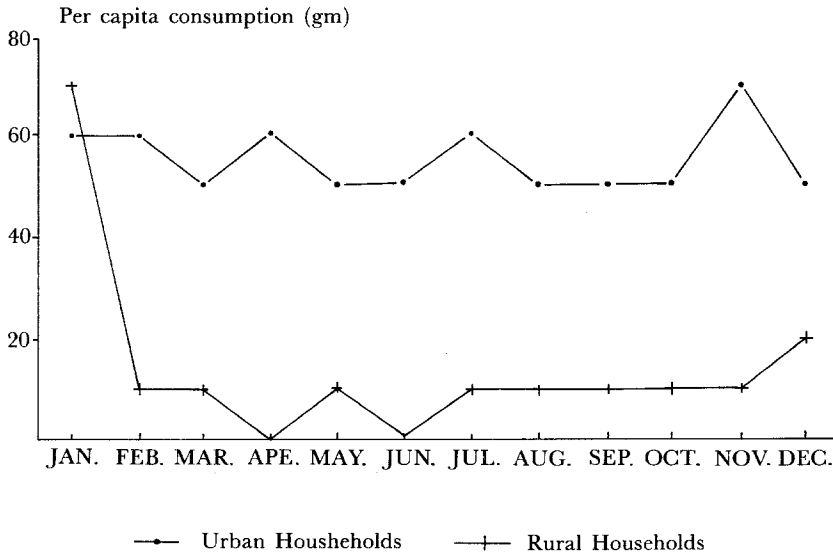
$\ln M$  = mean of log income

### III. Consumption Patterns

Estimates of per capita daily meat consumption showed that urban households consumed more meat than rural households. While per capita daily urban household meat consumption was 90gm, it was only 10gm for the rural households. The wide disparity in urban-rural meat consumption is primarily due to urban-rural household income differentials which weigh heavily against rural households.

As shown in Figure 1, there was also marked disparity between the per capita monthly meat consumption of urban and rural households. With the exception of the month of January, urban consumption everywhere exceeded rural consumption. In Imo State, urban households move to their rural villages to celebrate Christmas with their kids and kins. So much livestock is slaughtered during Christmas that there are leftovers which the urban dwellers leave for their low income relatives as they return back to the urban areas in January. This accounts for

**FIGURE 1** Per Capita Monthly Consumption of Meat by Households in the Minor Food Producing Areas of Southeastern Nigeria, 1984–86.



the relatively high rural household meat consumption in January. The generally low meat consumption in the rural areas is mainly because most rural households are poor and unable to consume meat on a regular basis since meat is expensive. Households ensure that their basic food consumption requirements are first met by consuming more of the starchy staples (yam, cassava and gari) before luxuries such as meat are consumed. Both rural and urban household meat consumption were highest between November and January because of the Christmas effect. Over the year meat consumption is generally stable and monthly variations are reduced because consumption depends essentially on income which does not vary significantly from month to month.

### 1. Expenditure Elasticities

Estimates of expenditure elasticities for meat by income groups are presented in Table 1. For all income groups expenditure elasticity coefficient is 1.33. This is positive and greater than unity, indicating that demand for meat is elastic with respect to household incomes. This is consistent with *a priori* expectations because meat is a high-income food and a luxury for most households. If household income increases by 1%, meat consumption will increase by more than in proportion to the

**TABLE 1** Expenditure Elasticities of Demand for Meat by Income Groups in Southeastern Nigeria, 1984–86.

Income group	Expenditure Elasticities
All	1.33
Low	1.50
Medium	1.14
High	0.88

increase in income by 1.33%. Most low and medium income households cannot afford meat consumption on a regular basis because it is expensive. Thus, expenditure elasticities are 1.50, 1.14 and 0.88 for low, medium and high income households respectively (Table 1). The decrease in magnitude of expenditure elasticities as income increases is also as expected. It shows that for low and medium income households demand is elastic with respect to income, and a unit increase in income leads to a more than proportionate increase in income. For high income households, demand is inelastic with respect to income and a unit rise in income leads to a less than proportionate increase in meat consumption. Meat is, therefore, a luxury for low and medium income households but a necessity for the high income households. The positive signs associated with meat expenditure elasticities (Table 1) indicate that meat is a normal good and consumption increases as income increases.

## 2. Price Elasticities

Price elasticities of demand for meat are presented in Table 2. Own price elasticity for meat is low ( $-0.02$ ) and negative, suggesting that meat consumption is relatively unresponsive to meat price changes and would decrease only by 0.02% if price increased by 1%. The negative value of the own price elasticity coefficient is as expected since for a normal good consumption is expected to decline as price increases.

Cross price elasticities of demand for meat with respect to yam, coarsegrain and fish are  $-0.26$ ,  $-0.37$  and  $-0.45$  respectively, suggesting complementarity between meat and yam, coarsegrain and fish consumption. Complementarity is possible between meat and yam because most high income households eat yam with meat. Complementarity between meat and coarsegrain (maize) may be possible as a result of the income (profit) effect outweighing the price effect of a price change (Strause, 1982).

Cross price elasticities of demand for meat with respect to cassava, oil, cowpea and rice prices are positive suggesting substitution. In these cases, substitution is possible mainly because the income effect outweighs the price effect of a price change. Cassava and palm oil are locally produced. Most of what is produced is sold. Extra incomes

TABLE 2 Price Elasticities of Demand for Meat in Southeastern Nigeria, 1984-86

With Respect to the Price of	Elasticities for Meat
Meat	-0.02
Yam	-0.26
Cassava	0.57
Coarsegrain	-0.37
Fish	-0.45
Oils	0.84
Cowpeas	0.50
Rice	1.16

earned from cassava and oil sales are used for increased meat consumption among rural households.

Similarly, if the price of cowpeas rises relative to the price of meat, most medium and high income households would reduce cowpea consumption and increase meat consumption since meat is more preferred to cowpeas, hence the complementarity between meat and cowpea consumption. Increased price of rice could lead to a transfer of expenditure from rice to meat consumption leading to substitution of meat for rice as in Table 2. Demand for meat is elastic with respect to the price of rice.

### 3. Determinants of Demand for Meat

Household income, number of children in the household and the season of August are the only three factors which significantly influence the demand for meat. Household income is, as expected, the most significant determinant of meat consumption. The positive relationship between income and meat consumption indicates that the demand for meat increases as household income increases. There is also a positive and significant relationship between meat consumption and the number of children in the household, indicating that the demand for meat increases as the number of children members of the household increases. It is likely that households with many children spend less on non-food items such as school fees and more on food and meat. The positive and significant coefficient for the monthly variable for August suggests that there is a significant increase in meat consumption in the month of August although this is not clear from Figure 1. That most of the other monthly variables are not significant is an indication that meat consumption is not strongly influenced by seasonal factors, since meat can be consumed continuously at any time of the year. The most important determining factor may be the level of household income.

**TABLE 3** Parameter Estimates and T-ratios of Budget Share Regressions of the Determinants of Demand for Meat in IMO State, Nigeria.

Variable	Parameter Estimates	T-ratios
Intercep	-0.7144	-3.225
LMEXP	0.2254	3.270*
M20-	0.0045	0.930
F20	0.0047	0.923
M13-19	-0.0054	-0.941
F13-19	0.0034	0.831
C-12	0.0043	2.832*
Feb	0.0093	0.576
March	0.0019	0.113
April	0.0196	1.188
May	0.0181	1.099
June	0.0062	0.373
July	0.0097	0.576
Aug.	0.0356	2.083*
Sept.	0.0251	1.473
Oct.	0.0087	0.515
Nov.	0.0033	0.188
Dec.	0.0206	1.187
Urban	0.0029	0.308
R <sup>2</sup>	0.124	—
R <sup>-2</sup>	0.086	—
F-Value	3.267	—

\*Significant at 1%.

#### IV. Policy Implication

Urban household meat consumption was higher than rural consumption mainly because incomes are higher in the urban than in the rural areas. Low income rural households are unable to consume enough meat because it is generally expensive. The high cost of meat is associated with high transportation and handling costs involved in the movement of livestock, particularly beef cattle, goat and sheep from the northern to the eastern states of Nigeria. Some of the mutton and goat meat consumed in Southeastern Nigeria are from locally produced sheep and goat. Some hogs produced locally also provide the limited amount of port consumed, while poultry meat is almost entirely supplied from locally produced chicken. Given existing technology, there are remote possibilities of producing beef locally. If beef supply has to



depend on cattle imported from the North, then meat consumption can be increased through improvements in the marketing, transportation and storage of livestock and meat product which reduce marketing costs and hence consumer prices. The design of livestock and meat marketing improvement programmes can be facilitated by research into the marketing, transportation and storage of livestock and meat.

An alternative to importation of livestock and meat from the North is to increase local production of poultry, goats, sheep, hogs and other unconventional meat sources such as rabbits which are known to do well under Southeastern Nigerian conditions. Wells(1974) has suggested that meat supply in Southeastern Nigeria can be increased through increased poultry production. But increased poultry production has been seriously hampered since the 1980's by high feed costs following the ban on maize importation. Raising poultry production requires research into alternative feed sources derived from cheap locally available raw materials. Given the high productivity and low maintenance costs associated with hog production, it constitutes another source of diversifying meat supplies. Moreover, there are no taboos associated with pork consumption in Southeastern Nigeria as it is in parts of the North. Research is needed into improved methods of production of hogs, goat, sheep and other livestock for supplementing available meat supply through, for instance, rabbit and turkey production. Since knowledge of the need to produce these relatively new livestock types is limited increased production resulting from research findings need to be popularised through vigorous livestock extension efforts.

The fact that income is the most important determinant of meat consumption calls for policies that ensure both growth and reduction in income inequalities particularly between urban and rural households. For a largely agricultural economy such as Nigeria, this implies measures to increase agricultural productivity and incomes so that the welfare of the rural majority of farmers can be improved. Policies that enhance the prices of agricultural products without necessarily increasing the prices that consumers pay to intolerable levels would be quite appropriate. Both input and output price subsidies are relevant in this respect, but they must be targeted to the most vulnerable group — the rural poor in Nigeria. Moreover, the present Nigerian Government Policy of phasing out all forms of subsidies needs to be implemented with caution if it is not to exacerbate the food shortage problem. Subsidies should be phased out gradually and in the long run, particularly as they affect food consumption of the largely poor rural population in Nigeria.

## V. Conclusion

Meat consumption was higher in the urban than in the rural areas due mainly to differences in urban-rural incomes. Expenditure elasticity of demand is greater than unity indicating that demand is elastic with respect to income for low and medium income households. For these groups meat consumption will increase substantially if incomes are increased, while there is limited change in consumption for the high income households whose demand is inelastic. Own price elasticity of demand for meat is negative, as expected. Household income is a major determinant of meat consumption. To increase meat consumption research is needed into methods of increasing the production of locally produced livestock. Income redistribution policies are needed to transfer income from high to low income households for increased meat consumption.

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