



ANALYSIS OF FACTORS AFFECTING DEMAND AND SUPPLY OF TURKEY MEAT IN OSUN STATE, NIGERIA

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ABSTRACT

The study examined the factors affecting the demand and supply of turkey meat in Osun State. Multi-stage sampling procedure was used to obtain data from 39 turkey farmers and 95 consumers. Data were analyzed with the aid of descriptive statistics and two stage least squares model. The results of the descriptive statistics showed that majority of the turkey producers were male, married with an average age of 39 years. They operate on a small scale of production with an average of 73.21 flock size and have an average of 5.31 years of farming experience. The results also revealed that majority of the turkey consumers were married with a mean age of 41 years and have formal education. The two stage least squares estimates showed that the significant determinants of supply of turkey meat are flock size, diseases outbreak, return on investment, educational level and cost of production. On the other hand, significant determinants of demand of turkey meat are income and educational status. It is therefore recommend that farmers should be sensitized on good management practices to prevent and control diseases by making available extension and veterinary services in order to increase turkey meat supply. Also, consumers should be sensitized on the nutritional benefits of poultry meat through advertisement. This will in turn help consumers in meeting the FAO recommendation for daily animal protein intake.

Keywords: Demand, Supply, Turkey meat, Two Stage Least Square, Osun State

INTRODUCTION

Proteins are the major structural components of all cells of the body. Protein is required for the growth, maintenance and repair of all body tissues. They form the major constituents of enzymes, hormones, antibodies, muscles and many important chemicals of the body. Animal protein is essential in human nutrition because of its biological significance over plant protein. It is generally referred to as complete protein because it contains all the essential amino acids needed in the body as opposed to plant protein in which one or more of these essential amino acids are lacking. Animal products provide about 5% of daily energy supply in Nigeria, considerably lower than the West African average of 9.5% (Omorodion, Odu and Njoku 2016).

As a result of human population growth, increasing urbanization, income and emerging economies, the demand for animal protein in the developing countries has been on the increase (Abdullah *et al.*, 2011; Thornton, 2010). Based on this, there has been a rise in the production of animal protein, particularly from poultry (Mengesha, 2011). According to the Food and Agriculture Organization (FAO)(2010), the contribution of poultry meat globally is around 33% of the total meat production. However, this is not true

for developing countries in Africa including Nigeria (FAO, 2011b; Kearney, 2010).

Poultry meat is the fastest growing component of the global meat production, consumption, and trade, with developing and transition economies playing a leading role in the expansion. Kryger *et al.* (2010) reported that approximately 80% of rural households engage in smallholder poultry farming. About 85% of the poultry sector is managed under village production systems (Sonaiya and Swan, 2004) and the sector represents an appropriate system to feed the fast growing population as it plays an important role in household and consequently the nation's food security. Poultry is so important in Nigeria because it has become an industry that provides animal protein and employment opportunities for many Nigerians.

The supply of edible animal protein is grossly inadequate in Nigeria. Poultry refers to chickens, ducks, turkeys, guinea fowls, geese, etc., unfortunately, much emphasis is placed on chicken production at the expense of other poultry birds which are better in terms of feed conversion, and meat. Turkey production is an aspect of the poultry industry which although not popular in Nigeria, but plays an important role in the supply of meat and eggs (Dale, 2000). Therefore, turkey production,

consumption and trade are much lower than for chicken, though they are affected by many of the same trends that have dominated the chicken industry.

While the production of other types of poultry meat has rapidly increased in recent years in Nigeria, very little has been achieved in turkey production. Consumers continue to pay high prices for imported turkeys and even for local turkeys. The reason for apparent inertia in turkey production appears to be lack of appreciation of its potential in contributing to the protein needs of the consuming public or lack of understanding of its management and production requirement (Nwagu, 2002).

Also, low consumption of turkey could be traced to its production. Turkey production is based on poor management practices, lack of improved technologies, high cost of feed and vaccination and diseases outbreak. In West Africa, Nigeria inclusive, poultry sector faces problems of high costs of inputs, inadequate sanitation measures, and technical constraints in processing and marketing (Killebrew *et al.*, 2010). The persistence of animal disease outbreaks continues to limit domestic and export production potential. This has led to low per capita consumption of poultry meat and eggs, which provide 0.82 percent of total daily needed calorie. However, Nigerian diets are deficient in animal protein, which have resulted in retarded growth, increased in diseases spread and consequently, high mortality rate (Apantaku *et al.*, 1998; Maziya-Dixon *et al.*, 2004, Nkwocha, 2010). This is due to lack of attainment of FAO recommendation of 35g/input of animal protein per day, which poses a challenge to the fulfillment of the Sustainable Development Goals of improving health status of the populace. In view of this, investigating the factors affecting the demand and supply of turkey meat becomes imperative.

Specifically, the study described the socio economic characteristics of turkey producers and consumers; determined the factors affecting turkey supply; and also determined the factors affecting turkey demand in the study area.

MATERIALS AND METHODS

The study was conducted in Osun State. Multi-stage sampling technique was used to obtain data for the study. The first stage involved purposive selection of Ife East and Ife Central Local Government Areas (LGAs) because of the predominance of turkey producers in the area. At the second stage, stratified random sampling technique was used to group the wards (10) and (11) in Ife East LGA and Ife Central LGA respectively into five (5) clusters in each of the

LGAs. Households were selected from each LGA based on a systematic probability proportionate to size approach. Snow balling sampling technique was used in selecting between 5 and 10 from each cluster. A total of 95 turkey consumers and 39 turkey producers were used for the study

Analytical tools

Descriptive statistics was used to describe the socio-economic characteristics of the respondents.

Model specification: the two-stage least squares

The demand and supply functions are models describing the market of a product. In a demand-supply model, the jointly determined variables are market price ‘P’ and quantity ‘Q’. The Two-Stage Least Squares is an equation-by-equation technique which involves estimation in two steps. The technique involves the application of Ordinary Least Squares in two stages. In the first stage, ordinary least squares is applied to the reduced-form equations in order to obtain an estimate of the exact and random components of the endogenous variables. In the second stage, the endogenous variables appearing on the right-hand side of the equation are replaced with their estimated value, and then apply ordinary least squares to the transformed original equation to obtain estimates of the structural parameters. Equation (1) regresses quantity demanded on retail price, price of substitutes, real income, taste, household size, level of education, and age of household head. Equation (2) regresses quantity supplied on price, diseases outbreak, access to credit, flock size, cost of production, return on investment, experience, educational level, and the random error term (v).

Equilibrium function;

$$Q_d = Q_s = Q \dots \dots \dots (i)$$

Where Q_d is quantity of turkey demanded, Q_s is quantity of turkey supplied while Q is equilibrium quantity which quantity of turkey sold

Demand function

$$Q_d = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + u \dots \dots \dots (ii)$$

Where;

- X_1 = Retail Price (₦/Kg)
- X_2 = Price of substitutes (₦/ Kg)
- X_3 = Real income (₦/annum)
- X_4 = Taste (Likert scale)
- X_5 = Household size (number)
- X_6 = Level of education
- X_7 = Age of household head (years)

u = Error term
 Supply function;
 $Q_s = a_0 + a_1Y_1 + a_2Y_2 + a_3Y_3 + a_4Y_4 + a_5Y_5 + a_6Y_6 + a_7Y_7 + a_8Y_8 + v$ (2)

Where;

- Y_1 = Retail Price(₦ /Kg)
- Y_2 = Diseases outbreak e.g bird flu
- Y_3 = Access to credit (₦)
- Y_4 = Flock size (number of turkey raised)
- Y_5 = Cost of production (₦)
- Y_6 = Return on investment
- Y_7 = Educational level
- Y_8 = Experience (in years)
- v = Error term

The system above is mathematically complete because it has three equations in three endogenous variables (Q_d , Q_s , and P). Both the demand and supply equations are over-identified. Therefore, the Two-Stage Least Squares technique being the most important single-equation technique for estimation of over-identified models will be used.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

The result of the analysis of the various socioeconomic characteristics of turkey producers and consumers are presented in Table 1.. These include

the age distribution, sex, marital status, household size, educational level, experience of respondents. Analysis of the age structure showed the mean age of producer was 39 years and 41 years for consumer. This shows that most of the turkey producers are relatively younger than consumers. The average household size of producers was 5 persons and 5 persons for consumers. This result shows similarity in the household size. Both producers and consumers have small household size. Marital status analysis shows that about 79 percent of the producers were married while the married consumers accounted for about 67 percent. This implies some high level of financial commitment. The result further revealed that about 59 percent of the producers were male while 52 percent of consumers were male. This implies that the business of turkey production is male oriented. The average farm size for producers was 73 birds while the mean farming experience was 5 years. This reiterates the fact that turkey production is basically small scale. About 97% of the producers had formal education while 92% of consumers also had formal education. This reveals that majority of the turkey producers can read and write. This also means that they will be able to harness information and make good use of it.

Table 1: Socioeconomic characteristics of respondents

Variables	Producers (n=35)	Consumer(n= 95)
Age (years)	39.25 (15.90)	41.29(12.27)
Household size(#)	4.69(1.92)	4.96(2.09)
Married (%)	79.5	67.4
Farm size (No of birds)	73.21(32.28)	
Male (%)	59.0	52.6
Farming Experience (years)	5.31(2.17)	
Formal education(years)	97.5	92.6

Note: Figures in parentheses () are standard deviations; ***, **Significant at 1% 5% respectively.

Determinants of Turkey Meat Supply

Table 2 reveals the factors affecting turkey meat supply. The coefficients of flock size ($p < 0.1$) and return on investment ($p < 0.01$) were positive. The positive sign suggests a positive relationship between these variables and turkey meat supply. This implies that for every unit increase in any of these variables, turkey meat supply increases by the magnitude of their coefficients; 1.09kg for flock size, and 0.001kg for return on investment. The coefficients of educational level ($p < 0.1$), disease outbreak ($p < 0.05$)

and cost of production ($p < 0.01$) were negative. The negative sign indicates a negative influence on turkey meat supply. This implies that for every unit increase in any of these variables, turkey meat supply decreases by the magnitude of their coefficients; 27.05 kg for educational level, 71.63 kg for disease outbreak, and 0.001 kg for production cost. This follows the findings of Okoli (2005) and Abdul *et al.* (2010) that high cost of production affects the production and supply of poultry meat.

Table 2: First stage least squares estimate for determinants of turkey meat supply in the study area

Variable	Estimates
Constant	74.214 (0.814)
Price	0.075 (1.404)
Flock size	1.089 (1.937) ***
Experience	4.807(1.176)
Diseases outbreak	-71.631(-2.426) **
Access to credit	10.745 (0.402)
Return on investment	0.001 (70.853) *
Educational level	-27.053 (-1.734) ***
Cost of production	-0.001(-10.406)
Adjusted R ² = 0.95	
P value (F) = 5.4234	

* 10% level of significance, ** 5% level of significance and *** 1% level of significance. Figure in parenthesis () represents t-value

Determinants of Turkey Meat Demand

Table 3 reveals the factors affecting turkey meat demand. The coefficients of income ($p < 0.05$) and educational level ($p < 0.1$) were positive. The positive sign signifies a positive influence on turkey meat demand. This implies that for every unit increase in

any of these variables, turkey meat demand increases by the magnitude of their coefficients; 1.97 kg for income, and 0.229 kg for educational level. This follows the findings of Angie, Katharine, and Holdsworth (2016) that educational level has a positive influence on demand for meat.

Table 3: Second stage least squares estimates for determinants of turkey meat demand in the study area

Variable	Estimates
Constant	2.684(1.666)
Retail price	-0.003(-1.592)
Price of substitutes	0.001(0.257)
Income	1.972 (2.372)**
Household size	-0.086(-0.717)
Age	0.005 (0.681)
Taste	0.105(1.088)
Educational level	0.229(1.821) ***
Adjusted R ² = 0.69	
P value (F) = 6.09	

* 10% significance level, ** 5% significance level, *** 1% significance level. Figure in parenthesis () represents t-value

CONCLUSION

The study revealed that the significant determinants of supply of turkey meat are flock size, diseases outbreak, return on investment, educational level and cost of production. This implies with a lesser frequency of diseases outbreak, the flock size tends to increase and consequently supply, and also, a lesser cost of production, tends to increase the return to investment and consequently supply. The study also revealed that the more educated and experienced the farmers is, with having a better knowledge of management practices will consequently increase supply. The study further revealed the significant determinants of demand are income and educational level. Implying that consumers will demand more of

turkey meat as income rises, and also that consumers with higher level of education will demand more of turkey meat because of their knowledge about the nutritional and health benefits of turkey meat. Based on the finding of the study, we recommend that farmers should be sensitized on good management practices to prevent and control diseases by making use of available extension and veterinary services in order to increase turkey meat supply. Also, consumers should be sensitized on the nutritional benefits of poultry meat through advertisement. This will, in turn, help consumers in meeting the FAO recommendation for daily animal protein intake.

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