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THE DETERMINANTS OF THE DEMAND AND SUPPLY OF EGGS IN IBADAN, OYO STATE

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ABSTRACT

This study assessed the major determinants for demand and supply of poultry products in Nigeria, using eggs as an example of poultry products and Ibadan as the case study area. Cross-Sectional survey was conducted for both demand and supply of eggs in Ibadan using pre-tested questionnaires. Stratified random sampling techniques was used in drawing the consumers sample, while the population of poultry farmers in Ibadan served as the sampling frame for suppliers. The hypothesis that the presence of broiler enterprise on the farm limits the quantity of eggs supplied was upheld, so also was the hypothesis that the income elasticity of demand for eggs was positive. Layers mash was found to be highly price elastic; the own price elasticity of demand for eggs was found also to be elastic while the income elasticity of demand for eggs was also positive (i.e. elastic).

***Key words**: Eggs, determinants, demand, supply elasticity.*

INTRODUCTION

Poultry refers to those species of birds raised by man for his livelihood. The commonest include chickens, turkeys, ducks, swans guinea fowls, pigeon and ostriches. The most important of these in Nigeria are chickens.

The main products obtainable from poultry in Nigeria are eggs and poultry meat. These are good sources of animal protein. Protein from livestock is nutritionally superior to that of vegetable origin because the former contains a complete range of amino acids that are essential for the maintenance of good health and body growth.

Dietary shortages of protein in both quantity and quality is a major economic problem in Nigeria. The FAO estimated the daily protein requirements per capita of Nigeria's population (1961-63) as approximately 61g. However, the daily protein consumption stands at 51.0g per capita, of which animal protein accounted for just 6.5g or 12.75%. Daily protein intake for the years (1979-81) and (1984-86) were 50.9 and 46.6g respectively out of which animal protein accounted for 10.0g and 6.8g or 19.65% and 14.59% respectively. Livestock production, therefore, supplies only about 15 percent of the average daily protein intake in Nigeria (FAO, 1986).

Livestock contribute substantially to the country's Gross Domestic Product (GDP). In 1981 for instance, livestock sector accounted for about N2 billion out of a total GDP estimates of N38.55 billion for the whole country (Amanor-Boadu 1987). The Food Strategies Mission commissioned

by the Federal Ministry of Agriculture in 1980 noted that "poultry production offers the greatest scope for increasing the quantity and quality of animal protein" in Nigeria. Of all farm animals, poultry has been recognised as having the quickest return on investment. Also when compared with other farm animals, poultry gave the highest ratio of edible product as a percentage of feed intake.

The performance of the poultry industry in Nigeria has been on the downward trend since the early 1980's particularly as a result of the ban imposed on importation of grains with which the poultry feed was being compounded (Akande and Oluyemi, 1989). Also the introduction of SAP had put a stop to the importation of concentrates and other feed additives, as well as importation of day old chicks and medicaments with the consequent adverse effects on the poultry industry (Akintola, 1989). The result has manifested itself in terms of high cost and poor quality of inputs. While SAP had shifted attention to locally available substitutes, the costs of these substitutes have also gone up because of increased competition for their uses. For instance, cassava and sweet potatoes can replace maize in poultry feed, but these are in short supply because of high demand for human consumption. The implication of this is that there are deficiencies of energy in poultry feed. Similarly, the cost of procurement of fish meal and feed additives had gone up following rapid devaluation of the Naira, thereby leading to problems of insufficient protein intake.

The aggregate effect of the above was fall in poultry production in Nigeria either in terms of number of farms or population per farm. The high cost of production has also led to high prices for eggs and poultry meat thus resulting in decline of poultry consumption in the country (Adediji, 1989). Infact Joseph et. al (1995) confirmed in their study that not only was exotic chicken the most consumed by Nigerians but that cost was the most important singular constraint on consumption of poultry products. In order to arrest the situation, it is important to examine the determinants of supply and demand for poultry products in Nigeria.

The main objective of this paper therefore is to assess the major determinants of the demand and supply for poultry products in Nigeria, focusing on eggs as poultry product and Ibadan the case study area.

Ibadan was chosen as the study area for this research because of the unique characteristics of the city. It is the largest city in West Africa, yet manifests traditional rural characteristics especially in the suburbs. The heterogeneity of the population made it easy for samples with wide range of income groups, family sizes, diverse educational background as well as many other unspecified characteristics to be drawn. Ibadan also has a large number of poultry farmers thus making for a reasonable selection of representative samples of poultry producers. It is expected that the results of the study would provide information for policy direction relating to poultry products.

The specific objectives of the paper are:

(a) to estimate income and price elasticities of demand for eggs in the study area; and

(b) to estimate the short-run price elasticity of supply of eggs with a view to informing policy makers of egg supply situation in Nigeria.

METHODOLOGY

Most Nigerian poultry farms are situated usually in or around urban areas, because urban dwellers constitute the bulk of egg consumers. Furthermore, urban location ensures faster product distribution, easy access to major consumer markets and reduces transportation costs.

Cross-sectional survey was conducted for both demand and supply of eggs in Ibadan using structured questionnaires. Data on supply of eggs in Ibadan were collected from a population of poultry farmers in Ibadan. The register of the Poultry Association of Nigeria, (PAN) Oyo State Chapter was also consulted. Questionnaires were distributed to 26 farmers on their farms.

Stratified random sampling technique was used in drawing the consumers' sample. The suburbs were the first stage of sampling, since residents within a particular suburb generally have similar characteristics. The streets of each were the next stratum from which random samples were drawn. Lastly, the households were randomly drawn from the selected streets. A total of 142 consumers were selected and interviewed. The field investigation conducted in 1991 lasted for six months.

Ordinary least squares regression technique was the main analytical tool. Five functional forms (linear, quadratic, semi-logarithm, double-logarithm and exponential functions) were explored for each model. The 'lead' equation for each model was selected on the basis of economic, statistical and econometric criteria. The major limitation of the data collected was the small number of producers interviewed. Only 37 out of 287 members of the PAN were in operation in Ibadan, from which 26 respondents were interviewed. The small sample size may create some problems with the normal distribution assumptions of the OLS (Kmenta, 1971). However, a sample size of 142 used on the demand analysis is believed to be large enough to allow the assumptions of normal distribution to hold.

In selecting the appropriate econometric models for this study, the social and economic variables which are expected to influence the demand and supply relations were carefully considered. Two econometric models were chosen, one for demand and the other supply of eggs.

Demand model: The demand for eggs is specified as:

$Qa = f(Pe, Pf, Pm, Yi, ei)$.....(1)

Where,

Q_d = quantity of eggs demanded by a household in a given month; (in crates).

P_e = average price per crate of eggs; in N

P_f = average price per kilogram of fish; in N

P_m = average price per kilogram of beef; in N

Y_i = average total monthly income of household, in N

e_i = stochastic error term.

Supply model:

The supply of eggs in Ibadan is determined by the price of eggs; Pe; the price of broiler Pb; and the price of layers mash, P_z

The model is presented as follows:

$Qs = Qs (Pe, Pb, Ps, Ui)$.....(2)

Where Ui is the stochastic error term and Pe is price of eggs, while Pz is price of feed and Pb is price of broiler. And Qs is the quantity of eggs supplied in crates.

Theoretical framework to Poultry Demand Determinant

Theoretically, the demand relation discusses the quantity of a commodity that would be purchased at different prices, relative to the prices of other commodities, for a given time period Slutsky (1915). The demand for poultry products is generally affected by factors such as the price of poultry producers; the income of the consumer; the price of related commodities such as beef and fish which represent complementary or substitute commodities; together with tastes and preferences of the household, which are usually expressed as trend variable in most demand functions (Olayide and Oni 1969; Olayide 1972).

Theoretical Framework for Poultry Supply Determinants

The supply relation describes the quantity of a product that would be offered for sale at different prices, relative to the prices of other commodities for a given time period and a given state of the arts (Cockrane, 1955). Implied in this definition are;

(i) the variation of one or more factors in the production prices being possible, and
(ii) the substitutability of factors among enterprise.

Explicit is the notion that the quantity supplied is related to price while all other influencing factor, such as technology and scale are held constant.

The supply of poultry products is affected by factors including price of poultry products, the price of feed, the quality and quantity of feed fed to the birds (Akinokun 1978), and the profitability of competitive enterprises. Other factors include availability of day old chicks, veterinary services and water.

RESULTS AND DISCUSSION

Analysis of Demand model:

Based on the specified economic and statistical criteria, the double logarithm form was chosen as the lead equation. The estimated equation is presented in equation 3:

LnQd0.43137−1.32944LnPe−0.10235LnPf+0.35112LnPm+0.9626LnYi.... (3)
(−0.688) (−0.173) (0.266) (0.0878)
t-ratio(1.93)* (0.59) (1.32) (10.96)*
R^2 − 0.58 F − 47.30

***The figures in the first row parenthesis are the standard errors of the coefficients while those of the second row are the t−ratios.

The estimated income regression coefficient shows that income and price of egg are significant at 10 per cent, while the included variables were able to explain about 58 percent of the variability in egg demand. One established elegance of the double logarithm function is that its coefficient are also the direct elasticities. Its weakness, however, is that the elasticities are constant over the range of the data.

From the results in equation (3), the value of egg price elasticity of demand is −1.33. This implies that when the price of egg is increased by N1.00, its demand will drop by 33 Kobo. The income elasticity of demand for egg was 0.963 implying that if nominal income of the consumers were increased by N1.00 about 96 kobo will be spent on egg purchase. This confirmed the hypothesis that income elasticity of demand for egg is positive.

Hence, the null hypothesis that income elasticity of the demand for egg is zero was rejected.

Analysis of the Supply Model

Out of the five functions fitted, the quadratic function was selected as the 'Lead' equation. The estimated lead equation is presented as follows:

Qs =	8610519.687	+ 2708019.57Pe	− 1341734.85Pb
		(2579066.25)	(467503.43)
	t−ratio	(1.05)	(2.87)*
−	483746.18Pz	+ 205356.15Pe^2	− 38290.05Pb^2
	(383925.53)	(190144.58)	(8782.12)
	(1.26)	(1.08)	(4.36)*
	2647.69Pz^2	252937.90PePb	96416.82PePz
	(4073.36)	(83477.85)	(37516.27)
	(0.65)	(3.03)	(2.57)*
−	8831.15PbPz		
	(3995.99)		
	(2.21)*		

.....(4)

***The figures in the first row parenthesis are the standard errors of the coefficients while those of the second row are the t−ratios. The signs of the coefficients for Pe and Pb conform with economic theory since Qs increases as price of egg increases; while Qs increases as price of broilers increases.

The relationship between Qs and Pb and Pz implies that the quantity of egg supplied is increasing at an increasing rate with the price of broiler. This result is expected since any increase in broiler price makes it

more difficult to sell in relation to eggs. The value of layers mash price elasticity of supply of eggs was estimated to be -4.385 taking Pz and Qs at their means. This means that the quantity of eggs supplied is highly layers mash elastic.

The estimated own price elasticity of supply of egg, at the arithmetic means of Pe and Qs was 3.36[1].

Summary and Policy Implication

This study was aimed at finding the determinants of demand and supply of poultry in Nigeria using eggs as an example of poultry product and Ibadan as a case study. The empirical results revealed that the price of feed, price of broiler, and the price of egg were found to positively influence the quantity of eggs supplied. The presence of a broiler enterprise negatively affected the quantity of eggs supplied.

The hypothesis that the presence of a broiler enterprise on the farm limits the quantity of eggs supplied was accepted. Demand for egg was found to be influenced by the price of egg, prices of fish and beef and the income of the consuming household. The hypothesis that income elasticity of demand was positive was accepted.

[1]Elasticity of production using quadratic function is obtained by the formula v

$$E_{pz} = \frac{MP_z}{AP_z} = \frac{a_z + 2a_z P_z}{a_z + a_z P_z} \quad \ldots\ldots (1)$$

where Pz = price of broiler mash and az = regression coefficient.

A summary of the elasticities estimated from the study is presented in table 2.

From the analysis, it was observed that layers mash was highly price elastic, thus attention needs to be focused on layers' mash, and other inputs in order to reduce the cost of production and increase the output of poultry products in general. The own price elasticity of demand for egg was found to be elastic. This means consumers respond to price changes. It is believed that the price of egg cannot be manipulated directly due to the complex nature of the market. Thus to reduce the price to stimulate demand is not as flexible as to expand supply through lowering price of layers' mash (and possibly those of other inputs).

The responsiveness of demand for eggs to income changes suggest a need for an increase in income of consumers. However, nominal increase in income has always been accompanied by inflation in this country. We would, therefore, suggest that income is increased simultaneously with increase in employment and productivity.

The demand for poultry products is expected to rise rapidly in the foreseeable future because of the combined effects of population growth, income growth and growing awareness of the importance of animal protein in nutrition.

Table 3 shows the projected demand and supply of poultry products for the 1985-95 period. The increasing trend in the national level of demand for poultry products makes it imperative that a bold programme should be evolved to ensure maximum use of available resources in order to promote poultry production in Nigeria.

The inadequacy of domestic supply that necessitated importation needs to be carefully addressed. Since the village poultry flock contributes a significant proportion of total domestic supply, encouragement should be given to the increased production of poultry at the village level. This is important in overcoming the critical feed constraint which hampers poultry production under commercial system. Poultry at the village level feed mainly on crop residues, including those of millet, sorghum, or

maize from the granary without imported concentrates. This will go a long way in solving the existing problem of high cost of feed for the industry.

CONCLUSION

This study has shown that the price of layers mash together with the presence of broiler enterprise on a farm effectively limits the quantity of eggs that could be supplied from that farm. It can also be asserted that the consumer's income level determines the amount of eggs they could consume at any point in time. In order to effect a decrease in the price of eggs, the price of layers mash has to be reduced possibly through import substitution in compounding poultry feeds.

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Table 1 Estimate of Relative Percentage Feed Nutrients Converted to Edible Products of Animal Species.

Animal Product Type	Energy Conversion	Protein Conversion	Gross Edible Product
	(KJ)	(KJ)	(% of Food)
Beef	8	15	10
Lamb	6	10	7
Pork	15	20	30
Egg	15	20	33
Broiler	10	25	45

Source: Ilagsoni: "The Role of Animals in World Agric." Am., J. of Dairy Sci. No. 54449, In Gbolade, F.O. 1984.

Table 2: Summary of elasticities estimated from the study.

Type of elasticity	Value of Elasticity
Egg price elasticity of Demand	-1.329
Income elasticity of Demand	0.963
Fish Price elasticity of Demand	-0.102
Beef Price elasticity of Demand	0.351
Egg price elasticity of supply	3.360
Layers' mash elasticity of supply	-4.385

Source: Data Analysis 1992.

Table 3: Projected demand and supply of poultry products in Nigeria 1985-1995

Year	Poultry Meat '000 metric tonne			Eggs		
	Projected demand	Projects supply	Gap	Projected	Projected supply	Gap
1985	130	120	-10	212	212	0
1986	138	124	-14	226	218	-8
1987	147	129	-18	240	225	-15
1988	157	133	-24	256	232	-24
1989	167	138	-29	273	239	-34
1990	178	143	-35	290	246	-44
1991	190	148	-42	309	253	-56
1992	202	153	-49	329	261	-68
1993	215	158	-57	351	268	-83
1994	229	164	-65	374	277	-97
1995	244	175	-69	400	289	-111
Average Growth rate	6.5%	3.5%		6.5%	3.0%	

Source: Nigerian Food Balance Sheet 1985 1995.
Federal Ministry of National Planning (1986).