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INDUSTRIAL DEMAND ANALYSIS FOR MILLET IN KADUNA AND KANO STATES OF NIGERIA

ABSTRACT

This study examined industrial demand analysis for millet in Kaduna and Kano States of Nigeria. The Primary data used for the investigation were obtained using structured questionnaires administered to 31 firms. Descriptive statistics; demand function and grafted polynomials model were used for the analysis of data. The results showed that price of substitute, sorghum; income derived; price of millet and price of substitute, maize were the significant factors influencing quantity of millet demanded by the industries at 5% and 1% probability levels respectively. The grafted polynomial model used for forecasting demand of millet in tonnes for Kaduna and Kano States showed an increase in industrial quantity demanded for a forecast period of 2006 to 2015.It is recommended that industrial demand of millet should be conducted for all States of the Federation, so that annual consumption can be estimated.

Keywords:- Industrial demand, Millet, Kaduna and Kano States, Nigeria

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1.0 INTRODUCTION

Millet (*Pennisetum glaucum*) constitutes the main staple diet in Western Africa [1]. Millet is potentially attractive raw materials for feed, food and industries [2]. [3] reported that millet grain and bran are used as poultry feed and crop residues for livestock. Millet therefore indirectly contributes to receipts from

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livestock sales much more than which is observed from direct sales [4]. [5] reported that adequately processed sorghum and millet grain may be 95% as efficient as maize. [6] recommended that sorghum and millet be processed by grinding, pelleting or rolling for diets of beef and diary or calves in order to be used efficiently. [7] reported that at an equal protein levels, pear millet was equal to sorghum with respect to weight gains and feed efficiency in chicks. [8,9] carried out extensive studies on the selection of sorghum and millet grain for malting was dependent on the genetic factor and seasonal factor. Millet starches generally exhibited higher gelatinization temperature, higher water binding capacity and slow in enzymatic hydrolysis than wheat or rice starches [10]. ICRISAT develop suitable recipe for non- wheat bread using 70% maize, sorghum, or millet flour and 30% cassava starch. Other ingredients are added at the following percentage of total weight, 20% yeast; 1.5% salt, 1% fat; 0.2% fungal amylase and 80% water [11]. [12] reported that the future of composite flour in the baking industry in Nigeria is quite promising. The success of this product, however will largely depend on the government policy in favour of concerned research and agro-industries in that sector, in addition making fund and other necessities available for research to solve impending problems relative to palatability, appearance and shelf life of those composite flour based products could further enhance their acceptable among the consumers [11]. The use of millet, maize and sorghum as raw materials in the agro-allied industries gained importance especially with import substitution prevalent in the brewing industry, starch and pharmaceutical companies [10]. Utilization of millet; sorghum and maize by commercial industries to produce breakfast cereals, baby food, baked good, beverage and starch products is increasing, providing more diverse market for farmers [10]. In West

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Africa Nigeria is a pioneer in the industrial utilization of millet, sorghum and maize [13]. A total utilization of millet use in the manufacturing and food industries would increase cash flow to the farmers and thereby constitute an incentive to increase production [2]. Millet can be malted and used for the production of traditional Africa beer or in a mixture with precooked or extruded cereals for weaning food [14]. Starch properties of millet and sorghum hybrids and high-yielding varieties and those of maize are suitable for industrial starch production [15]. [16] emphasized the need to investigate and analyzed the food grain industrial demand. An understanding of the role of agro- processing industries is important for designing appropriate policies for developing the sector. [17] investigated the determinants of the changing pattern of cereal used in West Africa and concluded that the patter is demand driven.

1.1 Research Questions

(i) Which firms utilize millet, their location and years of existence in the study area?

(ii) What is the quantity of millet demanded by these firms?

(iii) What are the factors influencing industrial demand of millet in the study area?

(iv) What will be the demand function for millet by these industries in the study area?

(v) What will be the forecast of industrial millet demanded per annum by the industries in the study area?

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1.2 Objectives of the Study

The broad objective is to evaluate industrial demand analysis for millet in Kaduna and Kano States of Nigeria. The specific objectives are to:

(i) identify firms utilizing millet, their location and years of existence in the study area;

(ii) estimate quantity of millet used by the firms;

(iii) identify the factors influencing the industrial demand for millet in the study area;

(iv) estimate the demand function for millet by these industries in the study area;

(v) forecast for ten (10) years the industrial demand for millet per annum to be the industries in the study area.

2.0 METHODOLOGY

This study was conducted in Kaduna and Kano States of Nigeria. Kaduna state is located between Latitudes 9^0N and 12^0N and Longitudes 6^0E of the prime meridian. It shares common borders with Abuja in the South-East and six other states namely, Katsina, Kano, Zamfara, in the North-North Nasarawa, Plateau in the North-East, Niger in the North-West. The climate varies from North Guinea Savanna in the North and Southern Guinea Savannah in the South. The State has a population of 6,066,562people according to 2006 census [18]. Kano state is located between Latitudes 10^0N and Longitudes 8^0E and 9^0E of the prime median. Kano State lies with Savanna except the southern part where Guinea Savanna predominates. The population of the State on the basis of a census conducted in

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2006 was out at 9,383,682 people [18]. The purposive sampling was used to select Kaduna and Kano States. The primary data used for this study were obtained using structured questionnaire. A total number of 31 identified firms were used to achieve objective 1.

2.1 Descriptive Statistics:- such as percentage frequency- distribution tables, arithmetic means and coefficient of variation were used to group and summarize the data obtained form the field, the coefficient of variation is expressed as:-

$$CV = \frac{S}{\bar{X}} \times 100$$

Where, CV = Coefficient of Variation, S = Standard Deviation, $\bar{X}$ =Arithmetic Mean

2.2 Demand Function Analysis:- In implicit form, the demand function for millet can be expressed as:-

$$Q = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e_t)$$

Where Q = Total millet demanded (tonnes); X_1 = Price of millet (₦/tonnes); X_2 = Price of substitute, maize (₦/tonnes); X_3 =Price of substitute, sorghum (₦/tonnes); X_4 = Price of millet last year (₦/tonnes); X_5 =Colour/Variation of millet (White, 1;0, Otherwise); X_6 =Total imported/processed millet (tonnes); X_7 = Income derived per annum (₦);e_t = Error term. The explicit forms of these functions are as follows:

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$Q \quad = a + bX_1 + cX_2 + dX_3 + eX_4 + fX_5 + gX_6 + hX_7 + e_t$(Linear)

$Q \quad = a + blogX_1 + clogX_2 + dlogX_3 + elogX_4 + flogX_5 + glogX_6$

$+ hlogX_7 + e_t$(Semi-Log)

$LogQ \quad = a + blogX_1 + clogX_2 + dlogX_3 + elogX_4 + flogX_5 + glogX_6$

$+ hlogX_7 + e_t$(Double-Log)

2.3 Grafted Polynomial or Spline Function:- These models are also referred to as grafted relationship or grafted function or Spline function segment of polynomial can be used to forecast time series [19]. These segmented curves are restricted to be continuous derivation at a joint. For quadratic-linear function, the mean function can be represented as.

$$Y_t = \alpha_2 + \beta_2 t + \lambda dt$$

$$d_t = \begin{cases} (K-t)^2 \; for \; t < K \\ 0 \; for \; t > K \end{cases}$$

Y_t =Estimate forecast in the year (t) for millet; K = Joint point; $\alpha_2, \beta_2, \lambda$ = Structural parameters; t =Time factors in years.

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3.0 RESULTS AND DISCUSSION

3.1 Variability in Industrial Quantity Demanded and Price of Millet in Kaduna and Kano States of Nigeria: - Table 1 shows that the industrial quantity demanded and price of millet seems to be stable based on coefficient of variation 26.36 and 6.41 percent respectively.

3.2 Types, Location and Year of Existence of Firm: - The type and location of firm using millet were confined to the grouping of various firms into three related industries and their locations in the two states of the study. Table 2 reveals that 71.19% of the firms in the sample were into livestock feed production. Most of these firms produced chick mash, broiler starter, broiler finisher, layer mash; about 10% of the firms were in beverages, while the remaining 16% were in food and confectionary. Table 3 indicates that 83% of the firms were located in Kaduna. About 16% were located in Kano State. Table 4 showed that few firms 6% were in existence for about 30 years ago. This study was in agreement with [20] who reported in his study on characteristics of industrial end users of agricultural raw material that majority of firms in Nigeria has post independent origin.

3.3 Demand Function Analysis for Millet:- The Coefficients of Multiple Determinations R^2 value of 0.79 revealed that 79.0% of the quantity of millet demanded by the industries was explained by the variables included in the model. The study as shown in Table 5 observed that all the regression coefficients of the independent variables except constant value had a positive relationship with quantity of millet demanded by the industries. The constant value; price of millet; price of substitute, maize; price of substitute, sorghum; and income derived were significant at 1% level of probability. The F-value of 20.38

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Table 1: Variation in Industrial Quantity Demanded and Price of Millet In Kaduna And Kano States of Nigeria.

Estimates	Quantity Demanded (Tones)	Price (₦/Tones)
Maximum	4500	42,000
Minimum	16	37,500
Average	1857.33	40,500
Standard Deviation	2346.94	2598.07
Coefficient of Variation	26.36	6.41

Source:- Field Survey, 2007

Table 2:- Types and Number of Firms using Millet

Industries	Number of Firms	Percentage of Total
Livestock Feed	23	71.19
Beverage	3	9.68
Food and Confectionary	5	16.13
Total	31	100.00

Source:- Field Survey, 2007

Table 3:- Location and Number of Various Firms in Each State

Location	Livestock	Food and Confectionary	Beverages	Total No. of Firms in Each State	% of Firms in Each State
Kaduna State	20	3	3	26	83.87
Kano State	3	2	-	05	16.13

Source: Field Survey, 2007

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was significant at 1%, which is an indication that variables in the model were significantly responsible for the variation in the quantity demanded of millet by the industries. The structural coefficients of total quantity of millet demanded by industries were presented in Table 6. The estimate of the coefficients of X_1, X_3 $F \quad -Value$ and intercept were significant at 1% probability level for millet. This study agrees with [21] who reported in his study using grafted polynomial function to forecast maize production trend in Nigeria that the intercept, coefficients of X_1, and X_2 were significant at 1% probability level. The estimates of the grafted function were utilized to obtain expost forecast of total quantity of millet demanded by the industries in Kano and Kaduna States of Nigeria. The study as shown in Table 7 indicates expost forecast of millet in tonnes for Kaduna and Kano States of Nigeria.

4.0 CONCLUSION AND RECOMMENDATIONS

The industrial demand for millet is greatly influenced by income and other characteristics of millet. Linear demand function was used to examine the impact of these independent variables on the industrial demand for millet. Based on the result the following recommendations are made: - research institutes should develop varieties and quantities (colour) that could encourage industrial demand millet. There is need to identify all the agro-industries using millet and other agricultural produce as raw materials in the State of the Federation. Identifying the industries will help in determining their annual consumption of these produce. This will further help in aggregate estimation of the country consumption of these produce and finally help in food formulation policies of the country.

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Table 4:- Years of Existence of Firm in Kaduna and Kano States

Years of Existence	Number of Firms	Percentage of Total Firm
0-10	21	67.74
11-20	5	16.13
21-30	3	9.68
31-40	1	3.23
Greater than 40	1	3.23
Total	31	100.00

Source: Field Survey, 2007

Table 5:- Estimate Demand Function for Millet in Kaduna and Kano States of Nigeria

Variable	Regression Coefficient	Standard Error	t-value	Level of Significance
Constant	-24053.3	6056.95	3.971	0.01
X_1 (Price of Millet)	0.105	0.019	5.547	0.01
X_2 (Price of Substitute, Maize)	0.818	0.111	7.366	0.01
X_3 (Price of Substitute, Sorghum)	1299	0.387	3.359	0.01
X_4(Price of Millet Last Year)	-0.388	0.254	1.528	NS
X_5(Colour/Varieties of millet)	0.009	0.125	0.072	NS

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X_7 (Income Derived)	0.49	0.136	3.59	0.01
$R^2 = 0.79$				
$F \quad = 20.38***$				

Source: Field Survey, 2007 ***-Significant at 1% of probability

Table 6:- Estimate of the Structural Parameters of the Total Quantities of Millet Demanded By Industries (Grafted Functions)

	Grafted Function		
Variables	Coefficient	t-value	Level of Significance
Intercept	6797.686	8.732	0.01
X_1	681.598	11.914	0.01
X_2	-6.227	0.362	NS
X_3	88.319	5.109	0.01
d.f	15		
$F - \quad Value$	100.097***		
R^2	0.959		

Source: - Field Survey, 2007 ***-Significant at 1% of probability

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Table 7:- Expost Forecast of Millet (Tones) In Kaduna and Kano States of Nigeria

Year	Industrial Quantity Demanded (tonnes)
2006	13589.09
2007	13632.63
2008	13663.73
2009	13682.37
2010	13688.51
2011	13682.27
2012	13663.53
2013	13725.98
2014	13966.87
2015	14383.51

Source:- Field Survey, 2007

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