

Research Paper

Analysis of demand and supply of Hevea planting materials at the Rubber Research Institute of Nigeria

Mesike C.S., Agbonaye O.E*, Eboigbe G. and Uwumarongie A.M.D

Rubber Research Institute of Nigeria, PMB 1049, Benin City, Nigeria.

*Corresponding Author E-mail: otasagbons@gmail.com

Received 2 December 2015; Accepted 16 January, 2016

The study evaluated the demand and supply of *Hevea* planting materials at the main station of the Rubber Research Institute of Nigeria from 1999 to 2008 production periods. Data collected on demand and supply of *Hevea* planting materials in Rubber Research Institute of Nigeria during the period under review were analyzed using descriptive statistics. Linear regression analysis was also used to determine the relationship between variables and best-fit models. Empirical results of the analysis revealed a highest demand and supply in 2008 while the least supply

was recorded in 2002 and the least demand was record in 2003. The Linear regression analysis revealed that domestic price of natural rubber and presidential initiative price of planting materials are significantly related with the demand for planting materials at $p>0.1$ and $p>0.01$ respectively.

Key words: Demand, *Hevea* planting materials, production function, supply.

INTRODUCTION

Domestication and cultivation of natural rubber (NR) is believed to have started in about 1876 and spread round the World by 1913. Sir Henry Wickhan was among the first planters of NR in 1876. He selected about 70,000 rubber seeds from Brazil and introduced them in his garden in Singapore. In about 1903, there were many established rubber estates and small rubber farm holders in the world among which was Nigeria, which had her first rubber estate in 1903 at Saponba, Edo state (William, 2006). The plant continued to gain awareness among farmers worldwide and in 2004, the percentage production growth rate of NR in the world was about 7.2% or higher if not for the 'threat' posed by the utilization of synthetic rubber (SR) production (Rubber

Asia, 2004). It is however disheartening to note that African contribution to the production and consumption of NR is still very low as Africa only account for 5% of world supply of NR and with only about 2% production growth rate as shown in Table 1, while South–East Asia supply 90% with about 6.2% production growth rate (Rubber Asia, 2004). The general increase in rubber production in the world is in consonance with its demand because of increase demand of natural rubber by the automobile industries in the world as clearly indicated in Figure 1.

Natural rubber (*Hevea brasiliensis*) was introduced into Nigeria from Kew gardens, England in 1895 and has become increasingly important since the beginning of the 20th century. *Hevea* belongs to the family *Euphorbiaceae*.

Table 1. Rates of NR production changes in the world (000's thousands).

Production region	2003	2004	% change	2005	% change
Thailand	2,873	3,055	6.3	3,245	6.2
Indonesia	1,761	1,905	8.2	2,020	6.0
Malaysia	678	741	9.4	789	5.9
Other Asia	1,807	1,862	3.0	1,920	3.1
Africa	375	383	2.2	391	2.2
Latin America	161	164	2.4	170	3.2
World	7,800	8,358	7.2	8,792	5.1

Source: Rubber Asia 2004.

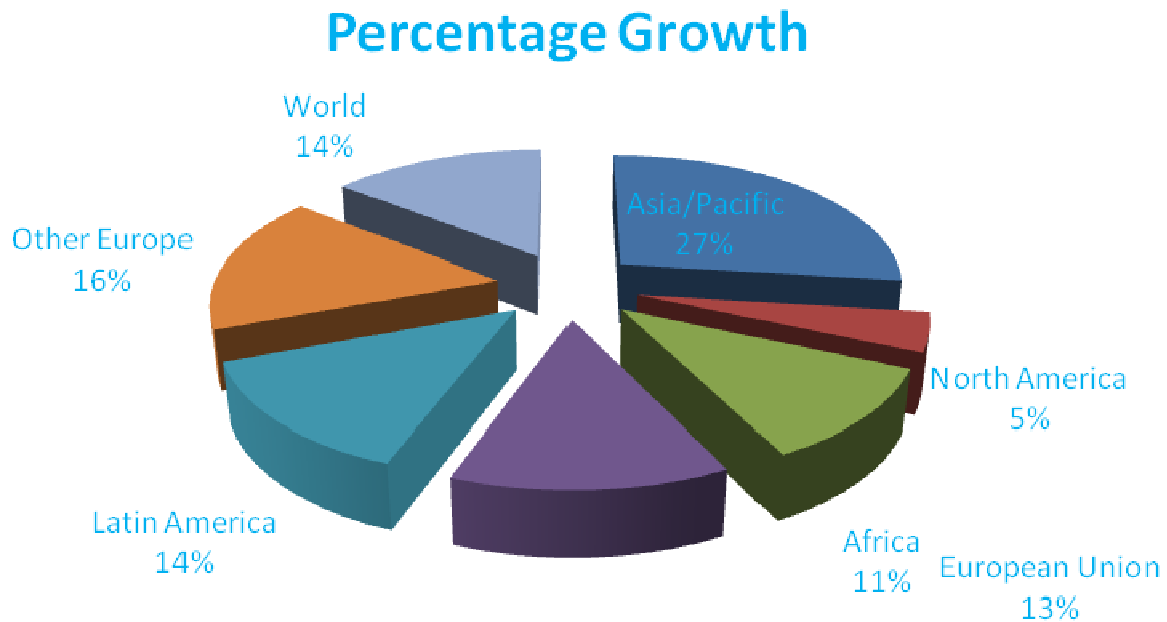


Figure 1. Natural rubber Consumption growth rate in the world. Source: Rubber Asia 2004.

Natural rubber production in Nigeria is mainly by small-scale farmers. The main problem for the development of the rubber industry is the fluctuating rubber prices (Delabarre and Serier, 2000). Government funding of research for natural rubber resulted in remarkable improvements in the breeding of high yielding clones of rubber by the Rubber Research Institute of Nigeria (RRIN). RRIN adapted (exotic) clones and RRIN developed clones (NIG-800 series) have latex yield of 900 to 1600 and 2300 to 3800 kg per hectare per year respectively (Omokhafe and Nasiru, 2004). This increase in yield propelled an increasing demand for *Hevea* planting materials by farmers while supply lags behind.

Phenomenal increase in the demand for *Hevea* seedlings for planting has been attributed to favourable government policy on input subsidy, increase demand for natural rubber products and rising prices of rubber at

world market which has a multiplier effect on many rubber producing countries of the world. Few agencies' such Rubber Research Institute of Nigeria (RRIN), Rubber Estate Nigeria Limited (RENL) and PAMOL Nigeria Limited are currently involved in raising certified rubber seedlings, due to inadequate trained man power in budding techniques which results into supply deficits of planting materials to farmers.

As part of the effort to tackle the supply gap of hevea planting material, the Federal government introduced the National Accelerated Industrial Crops Production Programme (NAICPP) in 1994 and the Presidential Initiative on natural Rubber (PIR) in 2006 to address the needs of the farmers for planting materials and to move the nation heavy dependence on crude as major revenue earner for the country (Giroh et al. 2007; Giroh et al. 2008; Mesike et al. 2010). Giroh et al. 2007 reported a

Table2. Demand and supply of planting materials at RRIN Main station Iyanomo.

Year/Item	Demand	Supply	Supply deficit	% supply deficit	% supplied
1999	106,224	29,850	76,374	- 71.85	28.15
2000	91,000	28,690	62,310	- 68.47	31.35
2001	80,347	43,536	36,811	- 45.82	54.18
2002	52,862	8,950	43,921	- 83.07	16.93
2003	30,768	16,200	14,568	- 47.35	52.65
2004	54,210	22,200	32,010	- 57.48	42.52
2005	72,235	53,511	18,724	- 25.92	74.08
2006	86,592	38,628	47,964	- 55.39	44.61
2007	111,054	57,540	53,514	- 48.19	50.81
2008	150,000	92,000	58,000	- 38.67	61.33
Mean	Σ835,292	Σ391,105	Σ444,196	- 53.18	46.82
Standard Deviation	83529.20	39110.50	44419.60		
Coefficient of Variation	34120.30	24218.89	19391.77		
	0.41	0.62	0.44		

Source: Field survey, 2009.

National demand–supply ratio of 3:1 for planting materials. The implication is that farmers resorted to using unselected and unimproved seedlings for plantation establishment rather than the improved budded stumps. This has a number of disadvantages of low yield and other undesirable secondary characteristic such as poor bark regeneration and poor girth.

This study was therefore conducted to analyze the demand and supply for planting materials. The specific objective was to evaluate the influence of domestic, world price and presidential and non presidential initiative prices on the demand for planting materials.

METHODOLOGY

The study was conducted at the main station of the Rubber Research Institute of Nigeria Iyanomo. Time series data were collected on the demand and supply of planting materials from 1999 to 2008. Other variables such as domestic price, world price of natural rubber and prices of planting materials at the presidential and non presidential initiative were collected for analysis. Data collected were analyzed using descriptive statistics. Linear regression analysis was also used to determine the relationship between variables and best-fit models.

The implicit function of the regression analysis is presented in equation 1

$$Y=f(X_1, X_2, X_3, X_4, \mu) \quad (1)$$

Where:

Y = demand for planting materials

X₁ = Price of planting material (Dummy variable, 1 for presidential initiative price and zero otherwise,

X₂ = Price of planting material (Dummy variable, 1 for non

presidential initiative price otherwise zero,

X₃=Domestic price of natural rubber in naira/ metric tonne.

X₄= World price of natural rubber in naira/ metric tonne

μ = error term (assumed to have zero mean and constant variance).

Linear function gave the best fit and was used for analysis and this is explicitly represented in equation 2

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4 \quad (2)$$

Where: β₀ = a constant, β₁, β₂, β₃, β₄ are regression coefficients to be determine while X₁, X₂, X₃, X₄ and μ are previously defined.

RESULTS AND DISCUSSION

Demand and supply of planting materials

Analysis of the demand and supply of planting materials (1999 to 2008) revealed that out of 835,292 budded stump demanded, only 391,105 budded stumps were supplied (46.82%) while 444,196 stumps (-53.18%) were supply deficit as shown in (Table 2). This result shows that the Institute cannot cope with the increasing demand for certified planting materials as a result of increased awareness of farmers on subsidy on the planting materials. The introduction of the Presidential Initiative on natural Rubber by the Federal Government of Nigeria in 2006 which led to the discovery for the production of natural rubber in marginal areas of northern part of the country which include Southern part of Kaduna, Adamawa and Taraba State may be another propelling factor for the increase in demand for planting materials. The study has policy implication for the country

Table 3. Regression analysis of the demand for Hevea planting materials and its fundamental.

Parameter	Coefficient	Standard error	T value
Constant	212334.328	148393.986	1.43
X ₁ = Price of planting material(dummy 1for PI otherwise zero)	8694.870	2861.843	3.038***
X ₂ = Price of planting material(dummy 1for NPI otherwise zero)	-5779.317	7315.210	-.790
X ₃ = Domestic price of rubber N/ metric tone	.538	.303	1.773*
X ₄ = World price of rubber N/metric tonne	0.037	.333	0.112

Source: Data Analysis 2009 R = 0.844, R² = 0.712, Adjusted R² = 0.698, F = 3.091***

*, *** indicate significance at 5% and 1% respectively. PI (Presidential initiative), NPI (non presidential initiative).

on the need for the decentralization of the production of planting materials at close proximity to the rubber farmers in Nigeria by engaging the Agricultural Development Programmes (ADPs) and other agencies that involve in seedlings production. The Institute should also be empowered by adequate funding in the provision of technical support services to these agencies in areas of capacity building of personnel to be involved in the production of planting materials.

Regression analysis of the demand for Hevea planting materials and its fundamentals

Table 3 indicates that the coefficient for X₁ (price of planting material) was positive and significant at $p > 0.01$ probability level and in conformity with a priori expectation. Most agricultural inputs that have subsidy components are one of the motivating factors for wide adoption by farmers in many countries of the world. The introduction of the Presidential Initiative on natural Rubber in Nigeria by the Federal Government led to a high subsidy on planting materials as low as N5.00/ budded stump and the offering of free technical services by the Rubber Research Institute of Nigeria. Domestic price of natural rubber in naira/ metric tonne (X₃) was positive and significant ($p > 0.1$). Domestic prices of natural rubber are highly dependent on world prices of natural rubber which have multiplier effect on domestic prices in many rubber producing countries of the world. This result is in line with earlier studies conducted by Abolagba et al. (2006); Mesike (2006) who found a positive relationship between domestic and world prices of natural rubber. World price has more effects on natural rubber demand. As prices become attractive at domestic and international markets, farmers are likely motivated to go into production starting with purchase of planting materials.

CONCLUSION AND RECOMMENDATION

Analysis of the demand and supply of planting materials

(1999 to 2008) revealed that Rubber Research Institute of Nigeria was not able to meet the demand of farmers for planting materials in the period of study as only 391,105 budded stumps were supplied (46.82%) out of 835,292 budded stumps demanded during the period of study with a deficit of 53.18%. Also, input subsidy on planting materials and domestic prices of natural rubber had significant relationship with demand for planting materials. The study recommends that input subsidy on the production of planting materials should be sustained by government and nongovernmental organizations through financial support and capacity building efforts to revamp the ailing rubber industry. Ministries of Agriculture and Private estate owners should also be encouraged to establish nurseries for the production of planting materials within economic radius of rubber farmers. Public enlightenment campaign should be mounted by government to create awareness among rubber farmers on the availability of highly subsidized planting materials. Extension activities should be strengthened for technology delivery to the farmers.

AUTHORS' DECLARATION

We declare that this study is an original research by our research team and we agree to publish it in the journal.

REFERENCES

- Abolagba EO, Aigbekaen EO, Omokhafa KO (2006). Farm Gate Marketing of Natural Rubber in the South East Rubber Growing zone of Nigeria, Nigeria Journal of Agriculture and Rural Development, 6:40-48.
- Delabarre MA, Serier JB (2000). Rubber: The Tropical Agriculturalist. CTA Macmillan Education Ltd London pp 4-11.
- Giroh DY, Awah AA, Balogun FE, Igbinosa FO, Wuranti V (2008). An Overview of the Presidential Initiative on natural rubber in the Agricultural reform in Nigeria. Proceedings, 13th Annual Conference, Agricultural Extension Society of Nigeria. Pp. 67 – 75.
- Giroh DY, Ephraim IJ, Igbinosa FO, Ogwuche P (2007). A quantitative Analysis of adoption of natural rubber technologies among farmers in Southern Nigeria. Journal of Sustainable Tropical Agricultural Research 21:11 – 18.
- Sir Henry Wickham (1876). Rough Notes of a Journey through the

- wilderness, from Trinidad to para Brazil. Year do not correspond with the one cited author should check.
- Mesike CS(2006). An Explorative Analysis of Rubber Exports from Nigeria. Indian Journal of Natural Rubber Research 19(1&2) : 9-15.
- Mesike CS, Okoh RN, Inoni OE (2010). Supply response of rubber farmers in Nigeria: An application of vector error correction model. Agricultural Journal. 5(3):146-150.
- Omokhafa KO, Nasiru I (2004). Polygene inheritance of latex yield in *Hevea brasiliensis*: Muell Arg.Plant Genetic Resources Newsletter 140:48-50.
- Rubber Asia (2004). A complete rubber magazine, May-June 2004. rubberasia.com.
- William AE (2006). Brief on the export market for Nigerian natural rubber. Held at the Rubber Research Institute of Nigeria, Benin City, August 24-25, 2006.