ECONOMICS OF RUBBER PRODUCTION: EMPIRICAL EVIDENCE FROM ILUSHIN AND WATERSIDE RUBBER ESTATES, OGUN STATE, NIGERIA

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Abstract

The study was carried out to appraise the economics of rubber production in rural Nigeria. Secondary data were used for the study. The data collected were analysed using budgetary analysis and multiple regression model. The Net Farm Profit of ₦176, 657.88 and ₦213, 105.71 per hectare for Ilushin Rubber Estate Limited (IREL) and Waterside Rubber Estate Limited (WAREL), respectively was an indication of the economic viability of rubber enterprise. The cost structure of the two rubber estates indicated that rubber enterprise requires huge capital outlay and is labour intensive. The results of the multiple regression revealed that labour input, transportation cost, maintenance cost, agrochemical and age of the tree were the determinants of rubber output. The study thus recommends the checking of the system of land acquisition in the country to enable potential investors venture into such a land demanding investment as rubber enterprise. Also, provision of sustainable credit is recommended as rubber enterprise is capital intensive. Lastly, existing policies on plantation establishment should be reviewed and enabling environment provided to ensure local consumption of rubber products.

Key words: rubber production, estate, plantation, Nigeria

Introduction

Before the nineteen seventies, agriculture was the pride of the Nigeria economy. During these periods, it contributed over 60% of the Gross Domestic Product (Famoriyo and Nwagbo, 1981; CBN, 2005a). The sector remains the largest contributor to the Nigerian economy behind crude oil; accounting for over 38% of the non-oil foreign exchange earnings, employing about 70% of the active labour force of the population and meet the food and raw materials requirement of the country (CBN, 2005b). However, Nigeria is yet to attain self-sufficiency in food and raw material production. In 1999 and 2000, agriculture contributed an estimated 38.6% and 37.9% of Gross Domestic Product (GDP) to the Nigerian economy respectively and the principal cash crops produced were cocoa, rubber and oil palm (CBN, 2003). Ojo and Akanji (1996) reported that in spite of the predominance of the petroleum sub-sector in Nigerian economic growth and development, agriculture remains a major source of economic resilience.

It is also important to note that Nigeria, once a leading exporter of several agricultural products like cocoa, rubber, palm kernel and groundnut has lost her leading position in the exportation of these important agricultural commodities. During the oil boom era, between late 1970's and early 1980's, Nigeria shifted focus from agriculture to oil exports (Aigbekaen and Nwagbo, 1999; Adedipe *et al*, 1997). During this boom period, farmers and merchants alike preferred to take up menial jobs in cities. Natural rubber, though still being exported, has been facing a dwindling performance in terms

of aggregate output and export quantities. RRIN (1993) and Mesike (2005) emphasized that the declining performance of rubber manifested in cutting down of rubber trees and the substitution with food crops and by 1980 the country's land area under rubber small holdings had declined from 207,500 hectares in 1966 to about 147,000 hectares.

The rising demand for food to feed the ever-growing population informed strenuous efforts by government at various periods of National Development Plan to enhance agricultural productivity and increase the sectors share of the Gross Domestic Product (GDP). Nigeria's first National Development Plan (1962–1968) emphasized the introduction of more modern agricultural methods, through farm settlements, cooperative (nucleus) plantations, supply of improved farm implements and a greatly expanded agricultural extension services. During the second National Development Plan period (1970 – 1974), government, in a bid to address the problem of low productivity introduced the National Seed Multiplications Scheme, promoted improved production techniques and subsidized fertilizer and pesticides. Other development plans launched many programmes and policies such as Operation Feed the Nation (1976), Green Revolution Programme (1980), and a host of others. However, while some of these government initiatives achieved the set goals some failed woefully due to inconsistency in government policy.

Rubber is an important plant not only for world economic strategies but also for the use of mankind. Social development enhances more demand for rubber-based products for human existence. Natural latex is one of the important raw materials available for making various kinds of products in heavy industries such as automobile industry, kitchen wares and house wares. About 70% of latex produced from rubber trees is consumed in the manufacture of tyres, tubes, and other materials associated with the automobile industry; about 6% is utilized for footwear and nearly 4% for wire and cable insulation. Other miscellaneous products include rubberized fabric, raincoats, household and hospital supplies (such as sheets, hot wear bags, surgery's gloves), shock absorbers, washers, gaskets, belts, hoses, sport goods, toys, erasers, adhesives, rubber bands and a host of other auxiliary products.

Concentrated latex is used for most dipped goods such as gloves, balloons and contraceptive appliances. Sponge rubber from foamed latex is used in upholstery i.e. seating, cushions, mattress, pillows, and carpeting. Rubber and bitumen are used for road surfacing. Rubber also find its use in all sorts of military clothing, pressurized suits for aircraft personnel operating at high elevations, frogmen's suits for divers spending considerable time under water and insulated suits to keep men in the arctic zones warm. When rubber discontinues supplying natural latex, rubber tree is cut off for making furniture, wooden photo frames, etc. Rubber trees also have some recreational benefits on the environment.

In 1965, the total land area planted to rubber in Nigeria was estimated at 191, 350 hectares (RMRDC, 2005). By 2005, the active rubber estates have a total of 48, 199 hectares (33.4%) while smallholdings occupied 96,000 hectares (66.6%). The remaining rubber planted areas are no longer exploited. Most of the holdings were either abandoned or cut down during the period 1967-1978 as a result of the Nigerian civil war as well as the petroleum oil boom. Presently, it is estimated that smallholdings, which are actively in business, occupy only about 50% (96,000ha) of the land area held by this sector in 1965. The implication of the above analysis is that only 144,199ha of rubber was under exploitation in the country as at 2005 (RMRDC, 2005). The situation could be worse today.

NRCSG (2002) conducted field survey on 30 rubber estates in Nigeria with a total area of 43,273 hectares. The study revealed that about 84% of the total tree population had existed for over 35years, signaling chaos in the industry since the economic life of rubber tree is 35-40years, with another 39% being moribund. According to RMRDC (2005), Nigeria produced 93,000 tonnes of rubber out of the

world output of 5,800,000 tonnes in 1995. Also, the natural rubber production in the country as at December 2003 was estimated at 95,456 tonnes. RMRDC (2005) also estimated the total land area planted to rubber in Ogun State at 5,680 hectares. Notable estates in the State are Remo Rubber Plantation, Ilushin Rubber Estate and Waterside Rubber Estate occupying 1,267ha, 2,055ha and 1,280ha, respectively. The remaining rubber plantations in the State are smallholdings.

It is an establish fact that agricultural sector has suffered much neglect since the discovery and exportation of petroleum commodity. This neglect has no doubt affected the contribution of rubber to the world output and National economy. It has been observed that the producers of natural rubber face the world market directly. They reap profits when prices are good but absorb and suffer losses when prices fall. As a consequence, the producer's price has become unstable and this create disincentive for production thus making output and exports to suffer (Chidebelu *et al*, 1998). This could have negative implications on the rubber industry and on national income. Moreover, the world market for rubber has been prone to price fluctuations over the years and there has also been downward trend in the output and exports in recent years (FAOSTAT, 2004). All these suggest that all is not well with rubber industry. The findings from this study are expected to add to the existing knowledge on the economic importance of natural rubber because rubber is an important economic crop. Policy makers will also find the results of the study useful, especially for the present administration which emphasized value chain addition. It is against this background that this study was set to examine the cost and return structure as well as factors influencing rubber production in selected rubber plantations in Ogun State, Nigeria.

Methodology

The study area:
The study was carried out in Ogun Waterside Local Government Area of Ogun State. The two rubber estates selected were Ilushin Rubber Estate Limited (IREL) and Waterside Rubber Estate Limited (WAREL). The Local Government Area has an annual average rainfall of about 1430mm. Ogun Waterside is located in the eastern part of Ogun State, sharing boundary with Ondo State in the North and Lagos State in the South. The area is blessed with large expense of fertile land that supports the growth of both arable and plantation crops.

Ilushin Rubber Estate Limited (IREL) was established in 1957 by a private company, the Nigerian Joint Agency Limited (NIJAL) with the head quarter in Lagos. In 1957, only 242 hectares were planted to rubber seedlings. However, by 1973 total hectarage had increased to 2,313.6 out of which 1,943.6 hectares were matured plants. The plantation size increased to about 5,600 hectares in 1992. However, the size of the plantation has reduced to 4,390 hectares. At present, the estate has four shareholders: Ogun State Agricultural Development Corporation (41%), NIJAL (40%), Joint Local Government of Ogun State (9%) and Ilushin Estate Limited Workers (10%).

Waterside Rubber Estate Limited (WAREL) is also situated at Ilushin, Ogun Waterside, about 150Km from Lagos and Benin. The estate shares the same boundary with IREL. WAREL was established in 1965 under the control of Western State, with the head quarter at Ibadan. However, in 1976 the controlling body was transferred to Ogun State following the creation of more states from the Western region. In 1996, a share of 80% was sold to Michelin Group of Companies while the state withheld the remaining 20%. The estate has 1,093 hectares of old plantation, 147 hectares of new plantation, 1,089 hectares of immature plantation and 379 hectares of reserve plantation. The major clones of rubber planted in this estate include GT1, RRIM'S, IRCA 209 and IRCA 230.

Source and method of data collection

Secondary data were used for the study. These were collected through structured questionnaires containing open questions administered on the management of the two estates. Data were collected for different production years to capture the trend in the rubber output. Information collected for the study included the types of clones planted, production capacity of the clone, planting distance and planting date. In addition, data were collected on the fixed and variable cost items used in production. Variable cost items include labour cost, value of planting materials, transportation cost, field maintenance cost, and cost of agrochemicals while the fixed cost includes rent on land and depreciation of farm assets such as bucket, file, latex cups, cup hangers, tapping knife, spouts, boots and cutlasses. Data on production were collected from the estates records on the 100 hectares of rubber plantation (established in 1987) and 50 hectares of rubber plantation (established in 1987) for IREL and WAREL, respectively. This gave data for 23years used for the study.

Analytical Technique:

The data collected were analyzed using budgetary analysis and regression analysis.

Budgetary analysis

Budgetary technique was used to estimate the profitability level of the two plantations. The structural relation is given as:

$$GM = TR - TVC \quad (1)$$

$$\prod = GM - TFC \quad (2)$$

Where:

$\prod$ = Net Farm Profit
GM = Gross Margin
TFC = Total Fixed Cost

Farm assets were depreciated using straight line method given as:

$$D = \frac{P-S}{n} \quad (3)$$

Where:

D = Annual depreciation (₦)
P = Purchase price (₦)
S = Salvage value (₦)
n = Economic life of the asset (Year)

Budgetary Analysis includes some estimators which have good implication for farm management.

These include:

(i) Profit Margin on Sales (PMS): This is the ratio of Net Farm Profit to Total Revenue given as:

$$PMS = \frac{\pi}{TR} \quad (4)$$

(ii) Rate of return on investment (RORI): This is the remuneration to investment stated as a proportion of total cost incurred.

$$RORI = \frac{\pi}{TC} \quad (5)$$

Multiple Regression Model:

Multiple regression analysis was employed to explain the relationship between the rubber output and some set of explanatory variables that can affect rubber production. The usefulness of the regression analysis is basically in the numerical estimates of the regression coefficients which have economic interpretations when they are viewed as marginal propensities and elasticity. These coefficients are used for policy making and forecasting of economic magnitude.

The explicit form of the model is given as:

$$\ln Y = \beta_o + \beta_1 \ln X_1 + \beta_1 \ln X_2 + \beta_1 \ln X_3 + \beta_1 \ln X_4 + \beta_1 \ln X_5 + \beta_1 \ln X_6 + \mu \quad (6)$$

Where:

Y	=	Rubber output (Tonnes)
X_1	=	Labour input (Manday)
X_2	=	Fertilizer input (kg)
X_3	=	Maintenance cost (₦)
X_4	=	Transportation cost (₦)
X_5	=	Other agrochemical (litre)
X_6	=	Age of the tree (year)
μ	=	Random error term

Results and Discussion

Budgetary analysis:

Cost and return estimates of the rubber plantation are shown in Table 1. Total variable cost per hectare cumulated for year 2010 was estimated at ₦130, 800.00 and ₦134,950.00 and accounted for 72.45 percent and 71.54 percent of the total cost of production for IREL and WAREL, respectively. Also, total fixed cost per hectare was estimated at ₦49,746.00 and ₦53,670.00 and accounted for 27.55 percent and 28.45 percent for IREL and WAREL, respectively. The cost estimates showed that variable costs constitute the larger proportion of cost of production for the two rubber plantations. Like other economic (plantation) crops, rubber enterprise is labour intensive, largest proportion of cost of production is usually expended on labour. As shown in Table 1, the average labour cost per hectare was estimated at ₦95,000.00 and ₦97,000.00 and constituted 52.62 percent and 51.43 percent of the total cost of production for IREL and WAREL, respectively. Much cost is incurred on labour because of many operations usually carried out on the field which require man power. These operations include land preparation, filling of bags with top soil, digging of planting holes, lining and pegging, weeding, thinning, fertilizer application, budding, opening of panel, watering and supplying during the early stage. However, at maturity the operation is limited to tapping and weed control.

In addition, the total revenue, gross margin and net farm profit per hectare cumulated for year 2010 were estimated at ₦357,203.88, ₦226,403.88 and ₦176,657.88, respectively for IREL and ₦401,725.71, ₦266,775.71 and ₦213,105.71, respectively for WAREL. This implies that rubber production is a profitable enterprise. Projecting this figures into the estimated area of plantation that is currently being harvested and current size of the plantation, it can be deduced that rubber production enterprise yield huge amount of money taking into consideration the economics of size.

Profit Margin on Sales (PMS) was estimated at 0.49 and 0.53 for IREL and WAREL, respectively. This implies that on every one naira revenue 49 kobo and 53 kobo is earned as profit by IREL and WAREL, respectively. The Rate of Return on Investment (RORI) was estimated at 0.98 and 1.13 for IREL and WAREL, respectively. The implication of this is that for every one naira invested, IREL and WAREL earn profit of 98kobo and ₦1.13, respectively.

Determinants of Rubber Output:
The results of the multiple regression analysis on the determinants of rubber output are as presented in Table 2. The f-values which are significant at 1 percent showed the overall significant of the two models. The adjusted R-square of 0.72 and 0.95 imply that 72 percent of variation in rubber output is explained by the explanatory variables included in the model for IREL and 95 percent variability in rubber output of WAREL is explained by the explanatory variables considered, respectively. The regression results revealed that five variables have significant effect on rubber output. In the case of IREL, the significant variables include labour (0.05), maintenance cost (0.01), transportation cost (0.10) agrochemical (0.01) and age of the tree (0.10). For WAREL, the significant variables include labour (0.01), maintenance cost (0.05), transportation cost (0.01) and age of the tree (0.01). This implies that rubber output will increase with an increase in labour input, maintenance cost, transportation cost and tree age in the case of IREL while rubber output increases with an increase in labour input and tree age but decreases with increase in maintenance cost and agrochemical in the case of WAREL. The decrease in rubber output with increase in maintenance cost and agrochemical may be attributed to crisis experienced by this estate while the workers are out of work but costs are being incurred to maintain the plantation. It should be noted, however that rubber output will increase with tree age at young ages but decreases as the trees grow older (usually 35 years and above).

Conclusion and Recommendations

Results of the budgetary analysis suggest the direction towards which the rubber enterprise is moving. The net farm profit per hectare estimated for the two estates gives an indication of the economic viability of rubber enterprise. The cost structure of the two estates indicated that rubber enterprise requires huge capital outlay and is labour intensive. This can be justified based on the fact that rubber production usually requires more capital investment within the first 10 years of establishment before it starts to yield benefits. However, under intensive management, the benefits may double the cost incurred after the first ten years of establishment, *ceteris paribus*. Based on the cost and return analysis and the replanting programme of the two estates, it was observed that WREL has more prospects in production and profit generation. In addition, the significant determinants of rubber output include labour input, transportation cost, maintenance cost, agrochemical and age of rubber tree.

Above all, constraints to rubber production identified include shortage of capital, high labour cost, non-availability of land, natural disaster, non-availability of high yielding clone, low price of produce, non-availability of equipment, poor tapping system, lack of marketing outlets, lack of technical/extension support and old age of the tree, in order of important. The study thus recommends the checking of the system of land acquisition in the country to enable potential investors venture into such a land demanding investment as rubber enterprise, more effort on replanting programme and enabling environment to position rubber products for local consumption. Lastly, provision of sustainable credit is recommended as rubber enterprise is capital intensive.

Table 1: Cost and return structure of rubber production per hectare

Description	Ilushin Rubber Estate (IREL)	% of total cost	Waterside Rubber Estate (WAREL)	% of total cost
Output (tonne/ha/year)		2.5		2.7
Price (₦/tonne)		142,881.55		148,787.3
Revenue		**357,203.88**		**401,725.71**
Variable Cost Items				
Fertilizer	4,000	2.22	4,500	2.39
Herbicide	3,500	1.94	3,700	1.97
Fungicide	1,900	1.05	2,000	1.06
Planting material	9,600	5.32	10,100	5.35
Coagulant/anticoagulant	1,800	1.00	1,850	0.98
Transportation	15,000	8.31	15,800	8.38
Labour	95,000	52.62	97,000	51.43
Total Variable Cost	**130,80072.45**		**134,95071.54**	
Gross Margin	**226,403.88**		**266,775.71**	
Fixed Cost Items				
Land rent	20,000	11.08	22,000	11.66
Depreciation:				
Tapping knife	2,100	1.16	2,200	1.17
Tank	8,000	4.43	8,000	4.24
Latex cup	1,646	0.91	1,720	0.91
File	4,900	2.71	5,130	2.74
Bucket	6,000	3.32	6,120	3.24
Cup hanger	2,100	1.16	2,250	1.19
Spout	1,000	0.55	1,310	0.69
Farm boot	1,500	0.83	1,840	0.98
Cutlass	2,500	1.38	3,100	1.64
Total Depreciation Cost	29,746	16.48	31,670	16.79
Total Fixed Cost	**49,746**	**27.55**	**53,670**	**28.45**
Total Cost	**180,546**	**100**	**188,620**	**100**
Net Farm Profit	**176,657.88**		**213,105.71**	
PMS	0.49		0.53	
RORI	0.98		1.13	

Source: Computed from Field Survey Data, 2010

Table 2: Multiple regression results on determinants of rubber output

	Ilushin Rubber Estate Limited			**Waterside Rubber Estate Limited**		
Variable	Coefficient	Standard error	t-ratio	Coefficient	Standard error	t-ratio
Constant	-38.25***	13.11	-2.9	-29.82***	4.42	-6.06
Labour	3.47**	1.54	2.25	2.51***	0.79	3.18
Fertilizer	0.136	0.39	0.34	0.0344	0.223	0.154
Maintenance Cost	0.40***	0.141	2.84	-0.139**	0.06	-2.3
Transportation Cost	0.782*	0.425	1.84	6.649***	0.236	2.76
Agrochemical	-1.27***	0.232	-5.5	-0.0171	0.089	-0.19
Age of Rubber Tree	1.17*	0.677	1.73	1.33***	0.319	4.18
Adjusted R^2		0.72			0.95	
F-value		9.35			58.89	

*** implies significant at 1%, ** implies significant at 5%, * implies significant at 10%
Source: Computed from Field Survey Data, 2010

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