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ANALYSIS OF LABOUR PRODUCTIVITY AND CONSTRAINTS OF RUBBER LATEX EXPLOITATION AMONG SMALLHOLDER RUBBER FARMERS IN THE NIGER DELTA REGION OF NIGERIA

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ABSTRACT: *The objective of the study was conducted to analyze labour productivity and constraints of small holder rubber farmers in the Niger Delta Region of Nigeria. Primary data were collected from 300 rubber farmer using purposive and random sampling techniques. Data collected were analyzed using descriptive statistics, Likert scale and labour productivity model. Result of the analysis revealed that wage tapping and share arrangement accounted for 43.33 percent and 36.33 percent respectively. Labour productivity analysis revealed a yield of 826,434.31 kg dry rubber per year and gross income of ₦81, 949,226.18 per year while the output per man day was 22.58 kg. Wage / man day was ₦377.78, while an average plantation owner reaps ₦1, 860.56 after adjustments were made to wages and other costs of operation. The major constraints of rubber farmers included shortage and high cost of labour ranked the first major problem, inadequate credit as the second most important and significant constraint of rubber farmers while poor rubber prices and storage facilities problem were the third and the fourth most important significant problems faced by respondents. The study however recommended that rubber farmers should form cooperative societies and associations to enable them access production credit from commercial and Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) for rubber production.*

KEYWORDS: Exploitation, latex, productivity, constraints, smallholder, Niger Delta,Likert scale

INTRODUCTION

Natural rubber, *Hevea brasiliensis* Muell Arg is the major source of natural rubber because of its superior latex yield over other species of *Hevea* was introduced into Nigeria in 1895 from the Wickham collection of 1876. Transition period between 1876 and 1895 was the era of planting at Kew Botanical Gardens in England and Asia (Aigbekaen *et al.,* 2000; Uraih *et al.,* 2006). The earliest plantation in Nigeria was planted in 1903 and by 1925 single estates of about 1000 hectares was planted. The early plantations were raised from unselected seeds with latex yield of 300 – 400 kg/ha/yr. To date, twenty-four high latex yielding clones have been developed in Nigeria through breeding programme at the Rubber Research Institute of Nigeria. These clones have latex yield of 2000 – 3500 kg/ha/yr (Omokhafe and Nasiru, 2004). Natural rubber was ranked as the fourth most valuable agricultural export commodity in Nigeria after cocoa, groundnut and palm kernel, with 92 percent of natural rubber production exported, making rubber essentially a foreign exchange earner for the national economy and employer of labour(Abolagba *et al.,*2003; Abolagba and Giroh 2006). Nigeria has 247,100 hectares of land

under rubber cultivation and majority of these hectares are owned by small-scale farmers (Aigbekaen et *al.,* 2000; Delabarre and Serier, 2000). Despite remarkable improvements in the breeding of high yielding clones of rubber and favourable ecologies, the Nigerian rubber output continue to decline (Table1). The introduction of Structural Adjustment Programme (SAP) in1986 resulted to the increase in production of natural rubber in 1989 which peaked in 1991. The increase in output was not as a result of increase in hectarage cultivated, but it was because farmers returned to the tapping of abandoned plantations because of the high prices of rubber. Thereafter, the trend has been warping and this could be traced to a number of factors such as unstable government policies as well as crash in world prices of rubber which affects producers (Abolagba *et al.*, 2003; Schroth *et al.*, 2004).

The field production of natural rubber (NR) is a labour-intensive sector involving millions of farmers (mostly women). Tapping and latex collection are normally carried out by paid labourers (estates) or household work (smallholdings). If land values were omitted, labour would constitute the largest single cost per kilogramme in the field production of natural rubber. Although this cost varies considerably among countries (owing to differentials in wages and yields), it tends to be prominent in all contexts. According to data drawn from private records of production and marketing enterprises, management and labour represented over half total direct expenditure on estates and smallholdings in many rubber producing countries of the world (IRRDB, 2006). Labour constitutes the total endeavour or effort, which human beings expend in the course of conceptualizing and producing goods and services to meet societal needs and objectives. Labour is productive economic effort (Yusuf (2000). In many countries of West Africa, labour productivity holds key to the development of agricultural economies (Chianu *et al.,* 2001).

The agricultural sub sector of the Nigerian economy has been reported to be constrained by a number of factors that affect many workers employed in the sector. These factors are classified into internal and external factors. The internal factors include wages - the amount, time and method of payment, lack of incentives, and dislike of job while external factors are those of transport, poor housing, schooling facilities and poor health (Johnson, 1990). Chianu *et al*. (2001) reported that labour is a limiting factor of production in the vast majority of West African farming systems technologies and labour productivity holds the key to the development of agricultural economies.

The Nigerian rubber belt corresponds with the oil-producing belt and competes with scarce labour with the oil sector characterized by shortage and high cost of labour where tree exploitation for latex was reported to be below 40 percent, under exploitation due to the inability and unaffordability of vital production inputs and decreased earnings from rubber business are problems of rubber production (Abolagba *et al.,* 2003; Agwu, 2006).

Aigbekaen and Alika (1984) reported that the cost of labour to the overall cost of production of natural rubber in Nigeria is estimated at 63 percent. This implies that even if other costs of inputs are held constant, the overall production cost will be significantly affected as the labour cost continues to rise. As a result of this, majority of small holders have abandoned their holdings due to low availability of labour as the reason for low level of exploitation. A highly significant and negative correlation was obtained between labour wage and rubber production in Nigeria

(Aigbekaen and Alika, 1984). The authors further reported that the productivity of tappers is the daily output of rubber in kilogramme or litres per day and a tapping task of 450 to 500 trees/day. Their studies also revealed an increase in wages paid to tappers from 75 kobo/day in 1973 to ₦4.81 in 1981. The high cost of labour has forced many farmers and estate owners to embark on a share – tappers arrangement that resulted to slaughter tapping in order to make more money.

Chew (2001) conducted a study on share contracts in Malaysian rubber smallholdings. The study identified that rubber harvesting (tapping) were carried out by different parties under share tapping, contract tapping, wage tapping and fixed rent in order to overcome high cost of labour in rubber harvesting. According to this study, a share tapping refers to a process where a share tapper is a tenant contracted the right to tap the trees for a certain percentage; example the tapper may get 40 percent of the dry rubber content (d.r.c.) yield with the owner retaining the remaining 60 percent. A contract tapping is an arrangement where the contract tapper is a tenant with the right to tap the trees for certain remuneration per unit yield where a tapper may get 30 cents for 0.6048 kg. Wage tapping is where the tapper is a tenant employed on a monthly basis by the owner to tap the trees for a fixed daily wage irrespective of the amount of rubber produced.

Table 1: Rubber Production (export and local consumption) in Nigeria in tonnes

Year	Total production	Export	Local consumption
1970	56,250	49,000	7,008
1971	61,750	50,000	11,750
1972	57,199	46,230	10,790
1973	66,250	46,250	20,000
1974	78,000	50,000	28,000
1975	67,500	42,750	25,000
1976	52,500	26,500	26,000
1977	59,250	32,250	27,000
1978	57,500	29,500	28,000
1979	56,250	27,200	29,000
1980	44,500	14,575	29,925
1981	33,200	23,007	10,193
1982	36,298	24,005	12,293
1983	38,950	26,316	12,634
1984	39,206	28,636	10,570
1985	43,571	31,643	11,928
1986	36,761	26,035	10,775
1987	45,286	33,658	11,628
1988	80,500	65,800	14,700
1989	118,400	101,300	17,100
1990	152,000	121,000	19,800
1991	155,000	139,000	16,700
1992	129,000	110,000	19,000

1993	97,700	79,700	18,000
1994	68,600	49,600	19,000
1995	116,200	99,200	17,000
1996	63,800	48,800	15,000
1997	65,000	53,000	12,000
1998	80,000	65,000	15,000
1999	265,000	38,000	227,000
2000	275,000	36,000	239,000
2001	279,000	30,000	249,000
2002	285,000	24,000	261,000
2003	290,000	17,200	272,800
2004	45,000	28,000	17,000
2005	142,000	24,000	118,000
2006	142,500	32,000	110,500
2007	143,000	34,635	108,365
2008	143,500	35,500	108,500

Source: Abolagba *et al.*, (2003); Mesike (2005), CBN Statistical Bulletin various issues

Suyanto *et al*. (2001) in a study on land demand and land management efficiency in smallholder rubber production in customary land areas of Sumatra found out that rubber trees are over exploited under renting arrangement due partly to short term nature of land tenancy contracts and partly to the difficulty land owners face in supervising tapping activities of tenants in spatially dispersed rubber fields. Schroth *et al*. (2004) reported that the consequence of share tapping arrangement is that the trees are damaged. Spore (2004) attributed low availability and high cost of labour as well as the wider use of synthetic rubber products that put natural rubber to the danger of extinction.

Giroh *et al.* (2006*)* conducted a study on the productivity of rubber tappers in the rubber belt of Nigeria and found out that tappers productivity is affected by lack of infrastructures in rubber plantation like living quarters, pipe - borne water, electricity, health facilities and roads. Giroh and Adebayo (2007) identified poor wages, delay in payment, job insecurity, and inadequate management of rubber plantations as factors affecting the productivity of rubber tappers. Umar *et al.* (2008) in another study on factors affecting rubber tappers identified poor welfare package, low wage rate and incidences of stings and bites by insects and reptiles in many rubber plantations in Nigeria. The authors further asserted that poor management of the plantations was a predisposing factor to snake bite and other insects.

Considering these enormous benefits from the rubber tree and its long economic life span calls for careful and efficient exploitation as the bark of the rubber tree is the farm capital or economic reserve of the farmer as its quality conditions the quantity of latex regenerated after successive tapping that determines the financial returns of the rubber plantations. The survival of the Nigerian Rubber industry depends on the skills of the tappers. It is imperative that efficient exploitation of rubber will lead to more output to meet domestic and foreign consumption and consequently uplifting the socio-economic status of the farmers and foreign exchange earning for

the country. A study on the exploitation of rubber latex is necessary and to give direction in resources use and allocation in order to increase output from natural rubber.

The main objective of this work is to study the efficiency of latex production and labour productivity in rubber plantations in Edo and Delta States, Nigeria.

The specific objectives were to:

i. examine labour availability and productivity and;
ii. examine factors or constraints affecting rubber farmers in latex production

METHODOLOGY

The Study Area

The study was conducted in two states of the Niger Delta Region of Nigeria, namely Edo and Delta States. The region accounted for over 35% of natural rubber production in Nigeria. Edo State lies between Latitudes 5^o 44´ and 7^o 34´ N of the equator and between Longitudes 5^o 04´ and 6^o 43´ E of the Greenwich Meridian. It shares boundary to the south by Delta State, in the West by Ondo State and in the East by Kogi and Anambra States (Emokaro and Erhabor, 2006a). The State covers a land area of about 17,902 km^2 with a population of 3,218,332. Edo State is divided into 18 Local Government Areas (NPC, 2006). The State is characterized by a tropical climate which ranges from humid to sub humid at different time of the year. Three distinct vegetation identified in the State are mangrove forest, fresh swamp and Savannah vegetations. The mean annual rainfall in the northern part is 1270 mm to 1520 mm while the southern part of the State receives about 2520 mm to 2540 mm rainfall respectively. Mean temperature in the State ranges from a minimum of 24 ^{0}C to a maximum of 33^0 C. The people of the State are mostly farmers growing a variety of crops such as cassava, rice, yam, plantain, pineapple and tree crops such as rubber, oil palm and cocoa. Other occupations of the State include small and medium scale businesses and jobs done by artisans and civil servants who engage in farming on part time basis (Emokaro and Erhabor, 2006a).

Delta State lies between latitude 5^0 00´ and 6^0 30´ N of the equator and longitude 5^0 00´ and 6^0 45´E of the Greenwich meridian. The State has a land area of 17,440 km^2; about one third of this is swampy and waterlogged (Delta State Diary, 2003). The State is bounded in the North by Edo State, in the East by Anambra and Rivers State and in the South by Bayelsa State. The Atlantic Ocean forms the Western boundary while the North West boundary is Ondo State. There are 25 Local Government Areas in the State with a population of 4,098,391 people (NPC, 2006) .The State has a tropical climate marked by dry and rainy seasons. The rainy season starts in April and ends in October. The dry season starts in November and ends in March. The rainfall ranges from 1905mm to 2660 mm monthly. The temperature ranges from 24 ^{0}C to 34^0 C with an average of 30^0 C (Delta State Ministry of Agriculture, 2000; Ike, 2010).

Sources of Data and Sampling Technique

Data for this study were obtained mainly from primary source. The data were mainly collected on the 2009 and 2010 production activities of the farmers using structured interview schedule in a multi-stage sampling technique. The first stage involved the purposive selection of Ikpoba -

Okha Local Government Area), Iguoriakhi Farm settlement, (Ovia South West Local Government Areas in Edo State) and Utagba – Uno and Mbiri Farm settlements in Ndokwa East and Ika North East Local Government Areas of Delta State respectively.

The second stage of the sampling was obtaining the list of 407 rubber farmers from the selected locations from Tree Crop Units and Ministry of Agriculture and Natural Resources in Edo and Delta States. Finally, a total of 300 rubber farmers were randomly selected using proportionality factor adopted by Adebayo and Olayemi (2005):

$S = p/P \times Q/1$ ……(.1)

Where:

S =Total number of respondents sampled
p = Number of rubber farmers in each location
P = Total population of rubber farmers
Q = Total number of questionnaires administered.

Methods of Data Analysis

The data collected were subjected to labour productivity model and Likert scale

Labour Productivity Analysis

Labour productivity model developed by Upton (1997) and used by Chianu *et al.,* (2001), is explicitly stated as:

$APL = [TPP] / [\Psi]$ ……(2)

$GLP\ (naira) = [q_c \bullet p_c] / [\Psi]$ ……(3)

$NLP\ (naira) = [(q_c \bullet p_c) – (L_c)] / [\Psi]$…… (4)

Where:

TPP = total physical product (kilogramme of dry rubber),
APL = average labour productivity,
GLP = gross labour productivity,
NLP = net labour productivity,
q_c = Output (kg of dry rubber) ,
p_c = unit price / kg of dry rubber content(d.r.c),
L_c = labour cost and
Ψ = number of man-days of labour in standard days.

Likert scale (Osuala, 1993) was used to measure the production constraints of the rubber farmers. The Likert scale was adopted with score of the items of constraints as very serious (3), serious (2) and not serious (1). The mean score, which formed the benchmark on which the constraints were judged, was observed by the formula:

$X = \sum Xi/N$ ……..(5)

Where:

i = 1, 2, 3; X assigned constraint (i.e. 3 very serious, 2 serious and 1 not serious);
N = number of occurrence.
$\sum$= summation sign.

The bench mark on which the significance of the constraints on production efficiency was judged was by summing up assigned values and dividing by the number of occurrence; 3 +2+1 = 6 and divided by 3 = 2. The decision score = 2 was considered significant constraint.

RESULTS AND DISCUSSION

Sources of Labour and Labour Productivity

Result in Table 2 is based on mode of engagement of labour sources for rubber tapping by respondents in the study area. From the table, contract tapping accounted for 9 percent. A contract tapping is an arrangement where the contract tapper is a tenant with the right to tap the trees for certain remuneration per quantity tapped. From Table 2, wage tapping and share arrangement accounted for 43.33 percent and 36.33 percent respectively. This implied that about 43 percent of rubber farmers adopted wage tapping to tap the trees for a fixed wage irrespective of the yield of rubber produced. Giroh and Adebayo (2009) found out that both contract and wage tapping were adopted in Rubber Research Institute of Nigeria plantation where permanent and casual rubber tappers were engaged. The study however revealed that casual labour contracted to tap were paid on the basis of daily productivity (kg of dry rubber tapped) while the permanent tappers were paid irrespective of the quantity of dry rubber tapped.

Share arrangement (36.33 percent) was the second most dominant form of engagement and popular among small holder plantation owners in Edo and Delta States. This arrangement is a situation where a share tapper is a tenant contracted the right to tap the trees for a certain terms of agreement based either on percentage dry rubber content (d.r.c.) yield or the number trees based on the sharing formula with the owner. It was found from the study that majority of the farmers used a sharing ratio of 3:1 trees tapped and not based on kilogramme of dry rubber. This translates to owner of the plantation retaining 75 percent while the share tapper has 25 percent of the trees tapped.

Table 2: Distribution of Respondents based on mode of Tapping arrangement

Mode of engagement	Frequency	Percentage
Contract tapping	27	9.00
Wage tapping	130	43.33
Share arrangement	109	36.33
Owned and tapped by self	34	11.33
Total	300	100

Source: Field survey, 2010

The result is similar to that of Chew (2001) who conducted a study on share contracts in Malaysian rubber smallholdings. The study identified that rubber harvesting (tapping) were carried out by different parties under share tapping, contract tapping, wage tapping and fixed rent in order to overcome high cost of labour in rubber harvesting. Schroth *et al*. (2004) reported that the consequence of share tapping arrangement is that the trees are damaged. Respondents who owned and tapped plantation themselves accounted for 11.33 percent using family members as source of labour for latex exploitation.

Labour productivity model result is presented in Table3. Labour productivity can be measured either in terms of total physical products (826,434.31 kg dry rubber) or monetary value (₦81,949,226.18) as gross revenue while output per man day of 22.58 kg was obtained from the

study. Wage / man day was ₦377.78, while an average plantation owner reaps ₦1,860.56 after adjustments were made to wages and other variable cost of operation. It could be inferred from this study that there was an increase in labour productivity as compared to 11.93 kg and 17.09 kg of dry rubber for permanent and casual tappers reported by Giroh and Adebayo (2007) and 9.56 kg of dry rubber/ day as reported by Aigbekaen and Alika (1984). This increase in output per man day was as a result of improved or a response to contract tapping where a plantation owner engages a tapper to tap and payments subjected to the quantity tapped. The more the quantity tapped, the more the tapper is paid.

Table 3: Result of Labour Productivity Model

Variable	Value
a. Total output	826,434.31 kg
b. APL (average productivity of labour)	22.58 kg(a/c)
c. Total labour (man days)	36,598.22
d. Gross revenue	₦81,949,226.18 (a x ₦99.16)
e. GLP (gross labour productivity)	₦ 2,239.16(d/c)
f. NLP (net labour productivity)	₦ 1,860.56(d- g x c/c)
g. Labour cost/ man day	₦ 377.78(c x g/c)

Source: Field survey, 2010

Constraints of Rubber Farmers

Analysis of the result (Table 4) indicates that the major problems affecting plantation owners include poor rubber prices, pests and diseases, inadequate credit, shortage and high cost of labour, inadequate farm machineries, lack of market information, inadequate research/ extension support services, storage facilities problem, inaccessibility to cheap farm inputs and land tenure problem.

Shortage and high cost of labour ranked the first major problem (10.91 percent) experienced by farmers. This is as a result of the fact that the rubber growing belt is in the oil belt of Nigeria where active population are attracted leaving rubber cultivation to the older and aged population as reported by Abolagba and Giroh (2006). The attendant consequence may be reduction in hectarage under cultivation and declining productivity.

Inadequate credit affected all the farmers and was the second most important and significant constraint of rubber farmers. Rubber production is both labour and capital intensive and therefore requires a large capital outlay and inadequacy of credit would stifle expansion of rubber production. This result is consistent with the work of Banmeke and Omoregbee (2009) that identified inadequate credit as one of the major problems of rubber farmers in Edo and Delta States of Nigeria.

Poor rubber prices were a significant factor and accounted for 10.91 percent and ranked the third most important problem of rubber farmers. Poor prices offered may be a disincentive to rubber farmers leading to decline in production. The result is in agreement with Abolagba *et al.*, (2003) who identified inaccurate pricing natural rubber that leads to low farm income and a

disturbing problem of the rubber industry. This is due mainly to the activities of the middlemen who pass wrong price signals to the unsuspecting farmers.

Storage facilities problem was the fourth most important significant problem faced by respondents and this accounted about 9.93 percent. Attractive prices for natural rubber have to do with storage facilities to avoid chances of produce adulteration. Studies conducted by Uraih *et al.*(2006) identified high cost associated with the use of cemented surface and other improved storage facilities as the problem faced by rubber farmers in the rubber belt of Nigeria.

All respondents viewed lack of market information as the fifth most important problem facing them (Table 4). This shows that without information on product prices, farmers are likely to be cheated and some middlemen will capitalize on this short coming by offering less attractive prices, a disincentive towards boosting rubber production. Studies have indicated that adequate information sources available to farmers enable them to adopt technologies and improve their wellbeing. Studies in Malaysian rubber farms indicated that farmers overcome inadequate market information by the formation of rubber related associations for exchange of market information and other matters of mutual interest (Malaysian Rubber Board; MRB 2009). Nigerian rubber farmers can also form similar association to enhance their production activities.

Table 4: Constraints to Latex Production

Constraint	Total score	Frequency	Percentage	Mean score	Rank order*
Poor rubber prices	860	300	10.91	2.87	3
Pests/ diseases	681	259	9.42	2.63	6
Inadequate credit	879	300	10.91	2.93	2
Shortage and high cost of labour	891	300	10.91	2.97	1
Incidence of fire	612	250	9.09	2.45	9
Lack of market information	831	300	10.91	2.77	5
Storage facilities problem	764	273	9.93	2.80	4
Inadequate research/ extension support services	715	290	10.55	2.46	8
Inaccessibility to cheap farm inputs	729	286	10.40	2.54	7
Land tenure problem	340	191	6.95	1.78	10

Source: Field survey 2010.* Rank order based on mean values of constraints

CONCLUSION

Labour productivity analysis revealed a yield of 826,434.31 kg dry rubber per year with gross income of ₦81, 949,226.18 while output per man day was 22.58 kg. The major constraints of rubber farmers included shortage and high cost of labour, inadequate credit, poor rubber prices and storage facilities were the most important and significant problems faced by respondents. Based on the findings of the study, the following recommendations are made: Farmers should

form cooperative societies and associations to enable them access production credit from commercial and Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB).This will enable the farmers to employ labour and pay for wages commensurate to output. Prompt and regular payment of such wages will spur tappers to increase output. End users of research results on rubber, NGOs and the three tiers of government in the rubber producing belt should be encouraged to fund farmers' capacity building activities like famers field days, OFAR trials to enhance their efficiencies in production.

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