

Exploitation Systems of Hevea Trees Amongst Smallholders in Nigeria

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Abstract: It is estimated that about 18 million hectares of land is suitable for the cultivation of natural rubber in Nigeria. This area of land is mainly located in the rainforest Zone, the abandoned traditional, nontraditional and marginal rubber growing area of the Country. Nigeria has about 247,000 hectares of land under natural rubber cultivation. Smallholdings (usually 1 - 5 ha) account for between 75 - 85 % of the total land area planted to rubber, while the remainder is held by the estate plantation. Production estimate is around 90,000 metric tones per annum. The rubber industry plays a socioeconomic role in providing employment, rural development and foreign exchange for the Country. This paper reports on the exploitation systems practiced in Nigeria with a view of not only providing a database for the rubber industry, but also identifying the gaps to be filled in order to develop a suitable exploitation system for the Nigerian rubber farmer. The paper concludes that it is possible to improve the present production output of the smallholdings by adopting low intensity tapping systems with stimulation, enlarged tapping task, coupled with planting of high yielding and disease resistant clones. [Omo-Ikerodah, E. E., Ehika, S.N., Egharevba, O., Waizah Yakub., Mokwunye, M.U.B., Orimoloye J. R. **Exploitation Systems of Hevea Trees Amongst Smallholders in Nigeria** Researcher. 2011;3(12):23-29]. (ISSN: 1553-9865)

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1. Introduction:

Nigeria is blessed with a varied ecology but the rainforest belt provides the most suitable and edaphic condition for growth of natural rubber (NR). Rubber is grown in Edo, Delta, Abia, Imo, Rivers, Akwa Ibom, Cross River, Bayelsa, Anambra, Oyo, Ondo, Taraba, Ogun, and marginally in areas like Ebonyi, Enugu, Ekiti, and southern Kaduna (Figure 1). The Nigeria rubber industry has enormous potentials for sustainable growth and development. It provides employment opportunity and also serves as source of foreign exchange for the country.

It has been estimated that about 18 million hectares of land is suitable for the cultivation of natural rubber in Nigeria. The country has about 247,000 hectares of land under natural rubber cultivation; however, only about 154,000 ha are under tapping. Small holding (usually 1 - 5 ha) account for between 75 - 85 % of the total land area planted to rubber while the remainder is held by the Estate plantation (Aigbekean, *et al.*, 2000, Okwu *et al.*, 2005, Giroh and Adebayo, 2007a). Annual total production is 95,000 metric tonnes; while about 60,000 mt is exported leaving a balance of 35,000 mt for local consumption. Dunlop and Michelin tire manufacturing companies are the two major consumers of NR in Nigeria. Others are a few companies engaged in the production of rubber goods such as shoe soles, foot mats, and auto rubber parts.

The overall production/ha in Nigeria among the smallholders is low (about 500 kg/kg/ha/yr). This is because the trees are old (> 80 % are above 35 years); most of the plantations were planted with unselected planting materials whose potential

yields are about 500 kg dry rubber/ha/year and the use of poor exploitation systems. Other reasons include poor adoptions of agronomic practices as a result of low and unstable income levels, unsatisfactorily extension services which are also a result of lack of sufficient funds to the extension workers.

As a result of the improvement in the world rubber market price, there has been a renewed interest in the revival of the rubber industry in Nigeria. In 2005 a new programme on rubber known as "The Presidential Initiative on Rubber Production, Utilization and Export (PIR)", was put in place in an attempt to revive the rubber industry. The overall objective of the PIR is to increase both local production and utilization of NR to a point where Nigeria can export and have enough for domestic consumption, generate rural employment, increase farmers income and standard of living as well as ensure food security. If this new programme as proposed by the PIR is to be achieved, suitable exploitation systems must be in place to ensure that the rehabilitated and new plantations produce optimally to the benefit of the rubber farmers. This paper reports on the exploitation systems practiced among the smallholders in Nigeria with a view of not only providing a database for the rubber industry, but also identifying the gaps to be filled in order to develop a suitable exploitation system for the Nigeria rubber farmer.

2. Exploitation systems practiced by smallholders in Nigeria:

Exploitation technology basically deals with the commercial harvesting of latex from *Hevea*

brasiliensis. Latex harvesting is a major activity and cost center in the rubber plantation industry. In Nigeria, cost of harvesting accounts for between 60-70% of the total cost of production of NR. An ideal exploitation system should achieve high and sustainable tree, tapper and land productivity with minimal deleterious effect on latex production and growth of tree, throughout the economic life of the *Hevea* tree (Vijayakumar, *et al.*, 2005). Judicious exploitation of *Hevea* is an important aspect of long term sustained production. Smallholders tap their trees by themselves according to their convenience while some hire labour to do the tapping. Many smallholders in Nigeria own small size farm often less than one hectare in size. In these holdings daily or more intensive forms of tapping are practiced. The bark is exhausted in a short time and when panels are retapped, poor yields are obtained with high incidence of Tapping Panels Dryness (TPD). In some cases the field is abandoned for other farm works until when it is again convenient to return to it for tapping. To redress these situations, it is necessary that the farmers know a few things that constitute the essence of good exploitation systems. A detailed description of what is recommended and what is actually in practice in exploitation of *Hevea* trees in Nigeria is given in Table 1 and is further discussed briefly.

Planting density: The planting density among smallholders ranges from 350 - 450 trees per hectares.

Immaturity period: The immaturity period is between 7 - 9 years. This is due to poor agronomic practices and manuring or fertilizer application is almost absent.

Girth at opening: Most smallholders open their plantation for tapping when 60 – 70 % of the trees in the plantation have attained a bole circumference of 45 – 50 cm. This is in line with the recommended practice. The Jebong tapping knife (Heiso brand) is popular among the smallholders.

Height of opening: Most of the smallholdings commence tapping at a height of 150 cm.

Length of tapping cut in the Basal Panel: the length of tapping cut recommended for basal panel in Nigeria is 1/2S and this is what is commonly practiced by small holders.

Frequency of tapping: Alternate day tapping (d/2) is commonly used among the smallholders. Only the estates and negligible numbers of the smallholders practice low intensity tapping (LIT) with stimulation.

Nigeria rubber industry is labour intensive particularly in the area of plantation maintenance

and tapping. Studies have shown a negative correlation between wages and rubber production in Nigeria (Aigbekaen and Alika, 1984, Giroh and Adebayo, 2007a). The high labour wage has forced the majority of plantation owners to either abandon or adopt a share cropping system with willing tappers. This system of management fails to give the owner sufficient control over the tapper. This arrangement motivates tapper to “slaughter tap” or “over tap” all in an effort to make more money resulting in poor bark regeneration and declining productivity of the trees. In other cases the plantation is tapped irregularly at the convenience of the farmer.

Tapping System Practiced by the Smallholder: Tapping system is here referred to as a combination of length of tapping cut and frequency of tapping. It can therefore be said that the tapping system practice by most smallholders is 1/2S d/2 i.e. half spiral alternate day tapping as alluded to earlier.

Bark Consumption: Bark consumption is high amongst smallholders in Nigeria. In some cases it could be as high as 5 cm / month under the 1/2S, d/2 tapping system.

Rest periods: There is usually no rest period amongst smallholders in Nigeria. Apart from Sundays and Federal Government public holidays, the tappers are at work all year round. Average tapping days per annum is 300 days. In the estates rest period is observed in March during wintering.

Use of Rain Guards: The use of rain guard is not practiced in Nigeria. Consequently some tapping days are lost due to rain especially between July and September. Annual mean rainfall in Nigeria is about 2160 mm. Rainfall has two peaks in the year (July and September) but highest in July and there is a dry spell in August (Figure 2). Climatic factors are critical to rubber production with the highest production being attained in January when the temperature is usually low. From our survey it was found out that tapping does not take place in most plantations on rainy days. On rainy days labour is mobilized to other sectors of the farms for other farm activities such as field maintenance, cleaning of cups, preparation of tapping utensils, thereby affecting rubber output for those days. Table 2 shows a Ten-year data of rain - out days at RRIN station. Average number of days that the tapper did not tap as a result of rain is about once in a month thus even though latex is lost during rainy days, Although, the cost of acquiring rain guard/rain gutter and fixing them is discouraging to the farmer, the smallholder will greatly improve the quantity and quality of latex harvested by using the rain guard technology.

Tapping Task: The tapping task is about 450 trees/tapper/day and in some cases up to 600. However, tappers tap less than this number because of low density plants/ha.

Practice of Controlled Upward Tapping (CUT):

This is not significantly practiced among smallholders in Nigeria. However, the high panel may be exploited prior to replanting.

Economic Life: The economic life of the *Hevea* trees in Nigeria is about 20 years. Most of the smallholdings are over 30 years and have passed their economic lives. There have been government interventions for increased rehabilitation of plantations under 20 years and replanting of those over 30 years.

Stimulation: Stimulation is not very popular among smallholders in Nigeria. It is only the estates and the smallholders organized by the estates that have stimulation programme. There are two main reasons why the farmers do not carry out stimulation in their harvesting programme.

- i. Poor extension works on latex exploitation in Nigeria. This is as a result of poor funding of research and extension activities.
- ii. Cost and unavailability of stimulants.

The few smallholders and Estates (<20%) who carry out stimulation in their harvesting programme have the following exploitation systems:-

1/2S d/3. ↓ET 1.5 % La/ba/pa 24/y on BO-1, BO-2
1/2S d/3. ↓ET 2.5% La/ba/Pa 4/y on BO-1 or BO-2
or B1-1 or B1-2

1/2S d/4. ↓ET 2.5% La 4/y on B1-1, B1-2

1/4S d/4, ↑ET 1.4% La 24/y on HO-1. HO-2.
(Pamol Estate)

Key to Tapping Notation

S = spiral cut

1/2S = one half spiral cut

1/4S = one quarter spiral cut

d/2 = alternate daily tapping (one day in two)

d/3 = third daily tapping (one day in three)

d/4 = fourth daily tapping (one day in four)

ET = Ethephon

↓ET 2.5% = Stimulated with 2.5 % of ethephon, cuts tapped downward

Pa = Panel application (on the renewing bark close to the tapping cut)

Ba = bark application (on scrap bark below the tapping cut)

La = lace application (on the tapping cut over tree lace)

4/y = 4 applications per year.

BO-1 = base panel 1

BO-2 = base panel 2

B1-1 = First renewed bark panel 1

B1-2 = First renewed bark panel 2

HO-1 = high panel 1

HO-2 = high panel 2

3. Recommended clones:

The recommended rubber clones for replanting and rehabilitation of the small holdings are GTI, IRCA 41, RRIC 100, PB 314, PB 260 that yield about 1.8 tons per hectare/year, while the clones from RRIN are NIG 800, NIG 802, NIG 803, NIG 804 NIG 805 with estimated yield of 2.5 tones/ha/year.

4. Socio-economic characteristic of the Smallholder:

Males are more involved in rubber tapping than females (70 % and 30% respectively). Low level of women participation in tapping operation is largely due to socio-cultural barriers. It was however shown that male tappers were more efficient than females (Giroh and Adebayo 2007b). One of the reasons adduced being that female tappers devote most of their time in household activities taking care of their families. Majority of the tappers had primary education (91.67%) and 8.33% had secondary education and 5.00% were widowed (Giroh *et al.*, 2006). Age distributions of the tappers are in the economically active years with an average of 36 years.

5. Summary of Major Constraints Associated with Exploitation Systems of the Smallholder Rubber Industry

- i) About 80 percent of the smallholding plantations are over 30 years and have passed their economic lives of 25 years.
- ii) Most plantations are planted with unselected plantation materials
- iii) The rubber belt corresponds with the Oil producing belt of Nigeria, and competes for scarce land and labour with the oil sector.
- iv) Shortage and high cost of labour
- v) Zero allocation or inadequate/late release of funds to execute approved programmes
- vi) Inadequate information and poor marketing facilities
- vii) Lack of credit facilities and high cost of credit
- viii) Low yields and under-exploitation due to the inability and un-affordability of vital production inputs
- ix) Little focus by some State Government to the promotion of rubber production
- x) Long gestation of 6 - 7 years
- xii) Bush burning
- xiii) Inadequate infrastructural facilities
- xiv) High cost of fertilizers and chemicals
- xv) Untrustworthy hired labourers
- xvi) Inadequate extension services
- xvii) Lack of subsidized input
- xviii) Poor field/harvesting hygiene

Table 1: Practices in Exploitation Technology of Hevea Trees in Nigeria by smallholders.

Variable	Exploitation Technology Practiced
Region	South east & South west zones
Planted area (ha)	247,100
Area under tapping (ha)	154,000
Productivity (kg / ha /yr)	
Smallholdings	300-500
Holding size (ha)	
Smallholdings	15
Mean annual rainfall (mm)	
Mean	2160
Range	1770-2480
Maximum temperature (O C)	
Mean	28
Range	28 – 36
Minimum temperature (o c) – range	12 – 18
Major clones planted	RRIM 600, PB 28/ 59, GT1, NIG 800
High yielding	HERBAL 1, RRIM 601, RRIC 45
Density of Planting (trees / ha)	
Recommended	450
Smallholdings	450
Immaturity period (years)	7
Girth at opening (cm)	
Recommended	45 – 50
Smallholdings	≥ 40
Percent of Immature trees at opening	
Recommended	30
Smallholdings	50
Height of opening (cm)	
Recommended	
Bo – 1	120
Bo – 2	130
B1 – 1	150
B1 – 2	150
Smallholdings	
Bo – 1	120
Bo -2	120
B1 – 1	120
B1 – 2	120
Type of tapping knife in use	Jebong tapping knife
Tapping system Recommended	
High yielding clones	
Bo – 1	1/2S d/2. ET. 1.5 % La 4/y
Bo – 2	1/2S d/2. ET. 2.5 % La. 4/y
B1 – 1	1/2S d/2. ET. 2.5 % La.4/y
B1 – 2	1/2S d/2. ET. 2.5% La. 4/y
Medium yielding clones	
Bo -1	1/2S d/2. ET. 5.% La. 4/y
Bo – 2	12S d/2. ET. 2.5 % La. 4/y
BI – 1	1/2S d/2. ET. 5.0 % La. 6/y
BI - 2	1/2S d/2. ET. 5.0 % La. 6/y
Smallholdings	1/2S d/2 Nil stimulation
Extent of stimulation	
Smallholdings	Virtually no stimulation
Rest period	
Recommended	Feb. / March or March / April during

	wintering
In practice	March
Quality of tapping	
Smallholdings	Excessive back consumption
Bark consumption	
Smallholdings	≤ 50 cm / annum
Rain guarding	
Recommended or Not Recommended	Recommended
Small holding	Not in use
Tapping days / year	About 300
Tapping days lost due to rain /year	5-23
Whether tapping is 6d / 7 or 7d / 7	6 d / 7
Regularity of tapping	
Smallholdings	Regular
Task of tapping (no of trees)	
Recommended	450
Smallholdings	300 – 500
Duties of tapper other than tapping	
Smallholdings	Plantation maintenance
Person doing cleaning of cup & removal of tree laces	
Smallholdings	Tapper
Person doing collection of coagulum	Tapper
Sex ratio of tappers	
male	70 %
Female	30 %
Tappers wage (USD)	
Wage / day	
Smallholdings	3
Wage / 100 trees	Not applicable
Crop sharing and % of sharing	
Smallholdings	Tapper – 40 %, owner – 60 %
Percent of smallholdings who do tapping themselves	<10 %
Tapping system in the terminal 2 years	
Smallholdings	1/2S d/2.
Economic life of trees (years)	
Small holding	>15 years

Source: Original data by authors, Omo-Ikerodah et al., 2011

Table 2: Rain–Out Days at the RRIN main station. (1991-2000).

	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1991	-	-	-	1	-	1	4	3	2	1	-	-	12
1992	-	-	-	-	-	-	3	1	-	1	-	-	5
1993	-	-	-	-	-	1	3	2	1	1	-	-	8
1994	-	-	-	-	1	-	4	3	1	2	-	-	11
1995	-	-	1	-	5	1	2	3	4	2	2	-	20
1996	-	-	-	-	-	3	1	2	4	2	-	-	12
1997	-	-	2	1	5	3	2	5	2	3	-	-	23
1998	-	-	-	-	1	-	2	4	4	2	-	-	13
1999	-	1	-	1	2	2	6	3	1	5	-	-	21
2000	-	1	-	2	-	4	3	3	3	4	-	-	20
Total													145

Source: Original data by authors, Omo-Ikerodah et al., 2011



Fig.1 Map of Nigeria showing the Rubber growing zone (green flags).

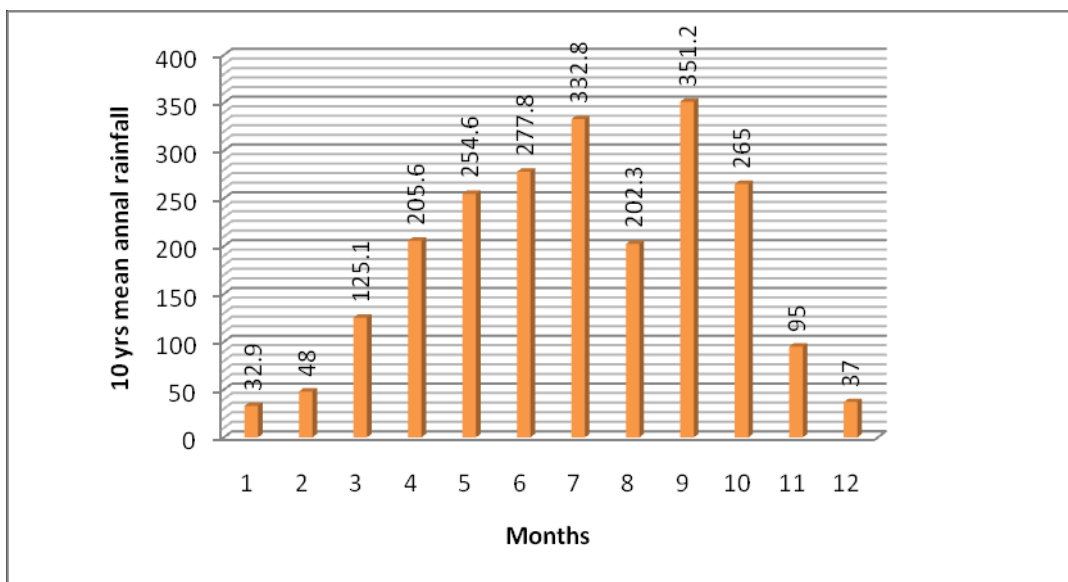


Fig. 2 Ten years (1994 - 2003) mean annual rainfall at Rubber Research Institute of Nigeria, Iyanomo.

5. The Way Forward

Considering the constraints faced by the smallholdings and the fact that they own plantations of various ages and conditions, the following exploitation systems are recommended

- a) 1/2S d/3 with ethephon stimulant on panels B0-1, B0-2 or B1-1 and B1-2. With B1-1 and B1-2 on d/3 the concentration and frequency of ethephon application may be slightly increased. This system will not only improve yield but will also solve the problem of labour and shortage in the industry. Ethephon stimulant is preferred because of its availability and ease of application.
- b) CUT – controlled upward tapping for plantations whose basal panels have exceeded B1-2 and have been exploited for over 15 years. This should be on panels HO-1 or HO-2 (i.e high panels.) the recommended tapping system is 1/8 S↑ d/3 using ET 5.0%

RRIN should champion the procurement and use of Ethephon as stimulant to boost the use of effective exploitation technologies and technology transfer should be integrated into the Presidential Initiative on Rubber if the goals of the initiative are to be realized at reduced cost and enhanced land and labour productivity.

6. Conclusion

Tapping operations in Nigeria was presented and discussed. The smallholders experience a multiplicity of problems centered on labour, inputs used in rubber production and old and moribund rubber trees. With the high demand for NR and improved world price of rubber the Nigerian smallholders should avail themselves of several profitable alternative technologies in the world rubber industry. This change should be lead and driven by RRIN in line with Government goals and aspirations to see a vibrant and profitable rubber Industry in Nigeria.

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