The Impact of Agricultural Reforms on the Production of planting materials: The case of improved *Hevea* Planting Material in rubber belt of Nigeria

D. Y. Giroh[1]; O. Aghughu[2] E.O. Abolagba[3]and Waizah Yakub[4]

1. Extension and Training Services Division 2. Plant Breeding Division 3. Socio-economic Division, 4. Soils and Plant Nutrition Division, Rubber Research Institute of Nigeria, P.M.B 1049, Benin City, Nigeria
girohydengle@yahoo.com

Abstract: The study evaluated the impact of agricultural reforms on the production of *Hevea* planting material at the Rubber Research Institute of Nigeria Main station Nursery Iyanomo, Benin City Edo State, a rubber growing belt of Nigeria. Data collected in a survey using structured questionnaire was evaluated using descriptive statistics and production function analysis. Seedling production analysis revealed a total of 1,785,376 seedlings were budded with a budding success of 1,038,782 stumps with a mean yearly budding operation and budding success of 111,586 and 64,924 seedlings respectively. Females were the dominant source of labour (60.61 percent) for budding operations, the budders were educated and attained one form of formal education or the other and 84.37 percent of them are in their economically active ages with a mean age of 27 years. Cost and return analysis also revealed a gross margin and net farm income of ₦17,757.20 and ₦7,445.61 respectively. Empirical results of the production function analysis indicated that 96.30% of the variations in the production of Hevea planting material were explained by the endogenous variables. Production had decreasing rate of returns to scale (RTS = 0.804). Labour and number of seedlings allotted for budding were significant (p>0.01).

[D. Y. Giroh O. Aghughu E.O. Abolagba, Waizah Yakub. The Impact of Agricultural Reforms on the Production of planting materials: The case of improved *Hevea* Planting Material in rubber belt of Nigeria. Report and Opinion 2011;3(11):7-12]. (ISSN: 1553-9873). http://www.sciencepub.net/report. 2

Keywords: Hevea, on- station, production function, scion, budders, small holder

1. Introduction

One of the critical factors for agricultural production is improved seeds which has the potentials for earlier maturity, disease resistance and high yields. A successive step begins with purchase and planting of improved varieties of seeds for maximum yield thereby enhancing the economic status of farmers. It is anticipated that the seeds are always available, free from adulteration, timely supplied, subsidized and affordable to farmers. Large scale agricultural input subsidies are more a common and major features of agricultural development policy in poor rural economies. Conventional input is for the promotion of increased agricultural productivity and adoption of new technologies. Reduced cost of subsidized inputs improves profitability and reduction of risk. With credit and extension services, input services were supposed to help farmers implement, benefit from and then the withdrawal of the subsidy, the farmers themselves fully fund economically and technically efficient input purchasers and users (Dorward, 2009).

Production of *Hevea* seedlings for planting is mainly by vegetative propagation where Hevea genotype with high latex yielding ability is desired. This can be obtained through budding techniques. The principle involved is the replacement of the shoot system of a rootstock with that of the desired ones (scion). The patch of the bark of the seedling plant (stock) is replaced with a patch of the bark with dominate bud (bud patch) taken from the genotype to be multiplied (scion) and this preserved the genetic constituent of the desired genotypes from one generation to the next (Delabarre and Serier, 2000; Idoko *etal.,* 2007a). Seedling production in Nigeria has been dominated by the use of exotic clones such as Gondang Tapen (GT1), Rubber Research Institute of Malaya's 600, 700 (RRIM 600, RRIM 700 etc) despite reported high advantage of RRIN developed clones. This was attributed by Aigbekaen *etal.,* (2000) to lack of awareness of the high yield potential of NIG 800 and 900 series by farmers .However this seedling production for use by farmers has also been in short supply.

This short supply of rubber planting materials to farmers was also reported by Giroh *et al.,* (2007) to be in the ratio of 3: 1 i.e demand- supply. The implication is that farmers resorted to using un selected and un improved seedlings for plantation establishment rather than the improved budded stumps. This has a number of disadvantages of low yield and other undesirable secondary characteristics such as poor bark regeneration, poor girth regeneration, etc.

To address this problem and move the nation from monoculture economic trend with heavy

dependence on crude oil, the Federal government of Nigeria introduced various reforms and included the National Accelerated Industrial Crops Production Programme (NAICPP) in 1994 and the Presidential Initiative on natural Rubber (PIR) in 2006(Giroh *et al.,* 2007). This study was therefore conducted to evaluate the impact of agricultural reforms on the production of Hevea planting materials. The specific objectives were to determine the socio- economic characteristics of budders in relation to production, estimate cost and return to seedling production and estimate the influence of total seedlings allotted, labour, variable and fixed cost on the success of budding.

2. Research Methodology

The study was conducted at RRIN Main station nursery Iyanomo (latitude 6^0 and 7^0 N, longitude 5^0 and 6^0 E). It falls within the humid rain forest zone of southern Nigeria. The area is rich in fertile soil suitable for the cultivation of natural rubber. The soil pH ranges between 4.0 and 5.5 with an estimated annual rainfall of 1800 mm to 2000 mm (Aigbekaen *et al.,* 2000). Production activities for 2009 on rubber budders were collected. A sample of 33 rubber budders were selected and structure interview schedule was administered on the budders to collect primary data as well as secondary data (budders' productivity, man days of labour and wages). Data collected were analyzed using descriptive statistics while the production function analysis was employed to determine the contribution of total seedlings allotted, man days of labour, variable and fixed cost on the success of budded clones.

2.1 Model specification

The production function postulated for rubber budders in the study area is implicitly presented by equation (1)

$$Y = f(X_1, X_2, X_3, X_4, \mu_1) \quad \ldots\ldots\ldots\ldots (1)$$

Where: Y_i = budding success by the ith budder (Number), X_1 = total seedlings allotted, X_2 = Labour (SMD), X_3 = variable cost (naira), X_4 = depreciation on fixed cost items and μ_1 = the error term (assumed to have zero mean and constant variance).

Four functional forms (Linear, Semi-log, Exponential and Cobb-Douglas) were tried using ordinary least square technique (OLS). The estimated functions were evaluated in in terms of the statistical significance of R^2 as indicated by F-value, the significance of the coefficients as given by the t-values, the signs of the coefficient and the magnitude of standard errors. Based on these statistical, economic and econometric criteria, the Cobb-Douglas functional form was selected as the lead equation which is explicitly represented by equation (2)

$$\text{Log}Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where: β_0 = A constant, β_1, β_2 …. B_4 are regression coefficients to be estimated while other variables are as previously defined.

Gross margin analysis was used to estimate income generated from seedlings production. The specific type of budgeting technique was the gross margin analysis. Gross margin gives difference between the gross income and the total variable cost of production (Adegeye and Dittoh, 1985). The variable and fixed costs were considered while depreciation on fixed cost items computed include depreciation on budding knives, cutlass , sharpening stones, budding boxes.

The Gross margin is explicitly stated thus:
Gross margin (GM) = GI – TVC …… (3)
NFI = GM– TFC …….. (4)
Where: GM = Gross Margin, GI = Gross Income, NFI = Net farm income, TFC= Total fixed cost and TVC = Total variable cost.

3. Results and Discussion

3.1 Socio- economic characteristics of respondents

The socio- economic characteristics of budders revealed that females were the dominant source of labour for budding activities (60.61%). The result is in consonance with earlier studies that revealed high involvement of women in agricultural production (Sigot, 1995; Umoh, 2005; Idoko *et al.,* 2007b). All of the budders are educated and attained one form of formal education or the other. This implies that their productivity is expected to be high. Age distribution of respondents also shows that 84.37% of them are in their economically active age (less than 25 to 40 years) with a mean age of 27 years.

Table 1: Socio- economic characteristics of respondents

Variable	Frequency	Percentage
Gender		
Male	13	39.39
Female	20	60.61
Literacy level		
Primary	26	78.78
JSS 3	1	3.03
Secondary	6	18.18
Age		
Less than 25	4	12.12
25 – 30	14	42.42
31 – 40	10	30.30
41 and above	5	15.15

Source: Field survey, 2010

3.2 Cost and return analysis of seedling production

Data in Table 2 revealed result of budgetary technique. The rate of return (ROR) is the ratio of total revenue to total cost of production is identical to the discounted benefit/ cost ratio of a project. This indicates that for ₦1 invested in seedling production, ₦1.46 is made as revenue. The rate of return per capital invested indicates what is earned by the business per capital outlay. It is the ratio of profit to the total cost of production. The RORCI in this study is ₦0.44 which is higher than the prime- lending rate in many commercial banks in Nigeria. This shows that seedling production is a profitable venture at the non-presidential price of ₦12.50/ stump.

Further more, analysis at the Presidential Initiative price of ₦5.00 per stump indicated negative return. For instance for ₦1 invested in seedling production, ₦0.58 is lost as revenue while ₦0.41 is a loss on capital outlay associated with raising a budded seedling. This is indicative of high input subsidy on the production of planting materials by the Federal Government to encourage farmers adopt improved rubber clones by introducing the initiative in 2006. Analysis further shows that labour cost was high and accounted for over 70% in the production of planting materials. This is as a result of the fact that the Nigeria rubber belt corresponds with the oil block of the country with scarcity and high cost of labour.

Table 2: Average cost and return of seedling production

Variable	Value	Percentage
Variable cost	₦5, 855.30	36.22
Fixed cost	₦10, 311.59	63.78
Total cost	₦16, 166.89	100.00
Total output	1889 budded clones	
Total revenue	₦ 23,6,12.50 (₦ 9,445)*	
Gross margin	₦ 17,757.20(₦3, 589.70)	
NFI	₦ 7,445.61(- ₦6, 721.89)	
ROR	146% (-58%)	
RORCI	44 % (-41%)	

Source: Field survey 2010. * Values in parenthesis are predicted on presidential initiative price (₦5.00)

3.3 Seedling production and associated factors influencing budding operations

Seedlings production from 1994 to 2009 (Table 3) revealed that a total of 1,785,376 seedlings were budded with 1,038,782 successes (58.18 %) while 41.82 percent is the failure rate. Further analysis also revealed mean yearly budding operation and budding success of 111,586 and 64,924 seedlings respectively. Substantial levels of input subsidy on the production of planting material as incentives to encourage rubber farmers to adopt rubber clones for planting in their fields has been carried out by successive governments in Nigeria through a number programmes such as the National Accelerated Industrial Crops Production Programme (NAICPP) in 1994 and the Presidential Initiative on Natural Rubber (PIR) introduced in 2006.

Estimated production function

Log Y= 1.683** + 1.290X_1*** + 0.178X_2*** - 0.033X_3 - 0.047X_4 ……(5)
(0.702) (0.098) (0.027) (0.063) (0.045)

The values in parenthesis under each regression coefficient are the standard errors of the coefficient. R = 0.984, R^2 = 0.968 R^2 adjusted = 0.963 Standard Error of the estimate = 0.256 F value =197.780***. **, *** Indicate significance at 5&1 percent respectively.

Result of the production function analysis (equation 5) indicated that the coefficient of determination (R^2 = 0.963) was significant at 1% level. This showed that the independent variables explained about 96.30% of the variations in output of budders. The entire estimated coefficients except X_3 and X_4 (variable cost and fixed cost items) carried the expected positive sign, which indicated that an increase in these variables would lead to increase in output of rubber budders. The coefficient for total seedlings allotted was significant (p>0.01) implying that increase in the total number of seedlings would increase the success of budding. Labour measured in standard days was significant (p>0.01) and recorded the highest average physical productivity of 46.6849 (Table 4). The result confirms a number of findings on the use of manual labour widely used in the developing countries of the world where mechanization is very low (Utomakili and Molua, 1998; Umoh, 2006).

Return to scale (RTS) of 0.804 indicated decreasing return to scale. This shows that production is in stage II (rational zone) of production where resources were used within economic relevant range. This however, does not mean that the inputs were optimally used as maximum efficiency requires the equality of marginal value products to resources inputs and their unit prices.

Table 3: Seedling production RRIN Main station (1994-2009)

Year	Total seedlings budded	Total success	Percentage Success	Percentage Failure
1994	146,710	53,875	36.72	63.28
1995	130,164	56,134	43.13	56.87
1996	214,911	86,993	40.48	59.52
1997	143,235	76,864	53.66	46.34
1998	116,336	63,176	54.30	45.70
1999	200,866	102,268	50.91	49.09
2000	109,480	91,186	83.29	16.71
2001	94,938	80,347	84.43	15.37
2002	52,862	29,316	55.46	44.54
2003	24,768	21,329	86.12	13.88
2004	54,210	48,856	90.12	9.88
2005	72,235	38,628	53.48	46.52
2006	86,592	44,580	51.48	48.52
2007	106,439	62,475	58.69	41.31
2008	120,576	96,000	79.62	20.38
2009	111,054	86,755	78.12	21.68
	∑1,785,376	**∑1,038,782**	**58.18**	**41.82**

Source: Field survey, 2010

Table 4: Production elasticity

Variable	Elasticity
Total seedlings (X_1)	1.129
Labour (X_2)	0.178
Variable cost (X_3)	-0.033
Fixed cost (X_4)	-0.470
RTS	0.804

Source: Field survey, 2010

Table 5: Average Physical productivity (APP) of inputs used

Variable	APP
Total seedlings (X_1)	0.5549
Labour (X_2)	46.6849
Variable cost (X_3)	0.3226
Fixed cost (X_4)	0.1832

Source: Field survey, 2010

4. Conclusion

The study revealed a substantial level of input subsidy on the production of planting materials as incentives to encourage the adoption of rubber clones by farmers. Cost of labour was high in the production of planting materials. An increase in the total number of seedlings allotted would increase the chances in the success of budding. It is therefore recommended that government should continue with subsidy on the production of rubber clones and provision of incentives such as attractive wage packages to personnel involved in the production of improved planting materials.

Correspondence to:
Dengle Yuniyus Giroh
Rubber Research Institute of Nigeria
P.M.B 1049, Benin City, Nigeria
GSM: +2348034934468; +2348056495009
Email: girohydengle@yahoo.com

REFERENCES

1. 1. Adegeye, A.J. and Dittoh, J.S. (1985): *Essentials of Agricultural Economics* Impact Publishers Nig. Ltd. Ibadan. Pp 113 – 119
2. Aigbekaen, E.O, Imarhiagbe, E.O and Omokhafe, K.O. (2000): Adoption of some recommended Agronomic practices of natural rubber in Nigeria, *Journal of Agriculture Forestry& Fisheries* 1 &2*: 51-56.*
3. Delabarre, M.A and Serier, J.B (2000*): Rubber: The Tropical Agriculturalist.* CTA Macmillan Education Ltd London .pp 22-23
4. Dorward, A. (2009): Rethinking Agricultural inputs Subsidy Programmes in a changing World. Pp 54.
5. Giroh, D.Y., Ephraim, I.J., F.O. Igbinosun and P. Ogwuche.(2007).A quantitative Analysis of adoption of natural rubber technologies among farmers in Southern Nigeria. *Journal of Sustainable Tropical Agricultural Research* 21: 11 – 18
6. Giroh, D.Y and Adebayo, E.F. (2007). Comparative Productivity Analysis of permanent and non-permanent Rubber Tappers in State rubber farms of Nigeria. *Journal of Agriculture and Social Science 3(4):* 107- 111.
7. Giroh, D.Y., A.A.Awah, Balogun, F.E., F.O. Igbinosa and Wuranti, V. (2008). An Overview of the Presidential Initiative on natural rubber in the Agricultural reform in Nigeria. Proceedings, 13th Annual National Conference, Agricultural Extension Society of Nigeria, 8 – 11 April, pp 67- 75.
8. Idoko S.O, O Aghughu, H Umar, M. Abubakar, and V I Omorusi. (2007a).Three years of rubber budded stump production in rubber research institute of Nigeria: demand and supply. *Knowledge Review14:50-54*
9. Idoko, S.O., Haliru, U.Y, Abubakar, M., Oghide, E.A. and Waizah, Y. (2007b). Labour Stability in Budded stumps Production at Rubber Research Institute (RRIN) Nursery Iyanomo, Benin City, Nigeria. *ChemTech Journal* 3:668-672

10. Sigot, A.J (1995): Discourse on Gender and Natural Resource Management In: *Towards Common Ground: Gender and Natural Management in Africa.* Sigot, A.J., L.A. Thrupp and J. Green (eds). ACTS Press Nairobi Pp 1-13
11. Umoh, G.S. (2006): Resource Use efficiency in Urban farming: An Application of Stochastic Frontier Production Function. *International Journal of Agriculture and Biology* 8(1): 38 – 44.
12. Utomakili, J.B. and Molua,E. (1998). Analysis of Resource Use efficiency in Banana Production in the South West province of Cameroon. A Case Study. *International Journal for Tropical Agriculture 1(4): 113 – 118.*

5/12/2011