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Impact of Research Findings on the Agronomic, Sociocultural and Economic Base of Small Holder Rubber Farmers-A Case Study of Two Farm Settlements in Southern Nigeria

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Abstract: A survey to evaluate the impact of research findings on the agronomic, socio cultural as well as the economic base of small holder rubber farmers was conducted in two farm settlements on acid soils in Southern Nigeria. The survey was conducted to provide information on the present state of rubber-based cropping systems in the farm settlements with a view to conducting research oriented towards the management of the environmental resource base to ensure sustainability. Data was generated through a single-visit questionnaire survey of a sample of rubber farmers. Results however showed that all the farmers surveyed intercropped arable crops with rubber saplings. Melon/maize/cassava ranked the highest in the choice of cropping pattern in a 1 year cropping cycle. The mean rubber area of 1-5 years with 1.52 ha was the highest in the two farm settlements. Seventy percent of the farmers surveyed use chemical fertilizers. Cash income of N72,000 from rubber at Mbiri farm settlements ranked highest in the two farm settlements. The highest cash income from other crops was N55,000 and from Mbiri farm settlement. Non cash income was highest at Mbiri while mean gross income of N134,000 and mean net income of N42,000 was also highest at Mbiri farm settlements. On cropping pattern basis income that accrued to farmers were N17,000, N26,500 and N15,000 for rubber/melon/maize/cassava (1 year), rubber/melon/maize/yam/cassava (2 years) and rubber/melon/pineapple (3 years), respectively. The study highlighted the need to take low input technology developed to farmers in the farm settlements. The lack of technical assistance have affected the net earnings of the settlers.

Key words: Rubber-based cropping systems, farm settlements, agronomic, economic, acid soil, small holder farmer

INTRODUCTION

The policy and objectives of Government for settling up farm settlements in Midwestern Nigeria in 1964 as spelt out in the Policy, objectives and Programme of Farm Settlement in Mid-Western Group of Province (POPFS) was among others to introduce as settlers, individuals who have the disposition to respond readily to new methods of farming, to serve as a model and to lay a balanced emphasis on arable and tree crops and livestock for consumption and marketing, such as will bring economic returns to settlers.

Some other objectives include increase productivity and production through intensive training in modern scientific farming; demonstrate that with planning, scientific techniques and good husbandry, farming provides living standards comparable to what obtains in urban employments and create model centers for demonstrating modern farm practices and potentialities of farming.

The farming settlements at inception were to be effective machinery for providing skills and efficiency to the farming population. This will contribute towards the establishment of a stable economy and a sound social structure. To accomplish this however, a concerted effort will be required to train and produce farmers with modern techniques of agricultural production. Hence, as part of the programme for training of settlers, POPFS (1964) stated that the specialists and research staff of the ministries will regard the farm settlements as important areas of their research programme. They will be expected to visit and carry out investigations on farm settlements as a matter of routine, and to report from time to time to the Ministry of Agriculture and Natural Resources.

The programme of training settlers was to ensure that settlers were technically sound in modern farming techniques which will ensure the success of the scheme. Studies in Malaysia have shown that not all settlement schemes have been successful. Failure has occurred perhaps when settlers have been allocated

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uneconomically small-plots or have lacked the resources necessary to plant their rubber or bring it to maturity. They may have lacked prior experience of the crop or received inadequate technical support (Webster and Baulkwill, 1985).

In a survey in Southern Thailand Musae and Cramb (1995) reported that most of the inter-croppers interviewed learned about inter-cropping practice from their neighbours and relatives, together with their own trials. Only a few reported receiving advice or recommendations from extension officers. Barlow and Peries (1997) in their review of research programmes in the major rubber-producing countries concluded that until recently there has been an almost exclusive concentration on techniques and technologies appropriate for large-scale plantations. They argue that, because of the emphasis on capital intensive, labour-saving innovations, the new-technologies are not generally suitable for small rubber farms.

Three factors that influences the rate and bias of technical change against the small growers in tropical agricultural research have been identified by a study carried out by the Consultative Group in International Agricultural Research (CGIAR). The first is the difficulty of society (including political decision-makers) in perceiving the expected pay offs from research, which places the scientists in a position of having to create the demand for his future work. Secondly, there is the predisposition for scientists to seek for recognition through scientific achievements instead of seeking maximum impact on civil society through technological advances. And the third is the tendency for scientists to link up with the groups in society with the greatest financing capacity, typically the more aggressive producer associations (De Janvy and Dethier, 1985).

Considering the present trend in agricultural research, this study was initiated with the following objectives:

- To evaluate the impact of research findings on the agronomic, economic and social aspects of rubber inter-cropping.
- To identify research projects which will best meet the needs of the settlers.

MATERIALS AND METHODS

The survey was conducted in two farm settlements. Each of the farm settlement located in Delta and Edo States in the rubber growing belt of Southern Nigeria. Delta and Edo States were selected because the two states have the highest concentration of smallholders and also the presence of large estates. The settlements were then selected based on the comparative proximity to Research Institutes, University with a Faculty of Agriculture, College of Agriculture and market, which can affect the management of rubber-based cropping systems in the farm settlements.

Iguoriakhi farm settlement located in Edo State has loamy sand texture, high acidity with pH that ranges between 4.45-5.0 (pH in H_2O). The soil is generally devoid of stones and is dominantly ultisols. Mbiri also has the same soil characteristics with Iguoriaki except with a pH range of 5.0-5.8 (pH in H_2O).

Iguoriakhi is located 35 km southwest of Benin City the capital of Edo State. Benin City has two research institutes namely the Rubber Research Institute of Nigeria (RRIN) and the Nigerian Institute for Oil Palm Research (NIFOR), one University with a faculty of agriculture (University of Benin), one ADP centre and a College of Agriculture which is just a walking distance from the farm settlement.

Mbiri farm settlement is located 18 km from Agbor and 50 km from Asaba the capital of Delta State. The two towns have no research institutes, university and college of Agriculture except ADP centers. The towns also have comparatively lower population compared to Benin City.

The bottom-top participatory approach in the development of researcher/farmer managed on-farm-adaptive research was adopted in the collection of data. This involved a single-visit questionnaire of a sample of rubber farmer in the farm settlements between November 1999 and January 2000. The survey also included informal interaction with the President and Secretaries of the farm settlements, some farmers and direct observation of settler's farm and household environment.

RESULTS

Table 1 shows the characteristics of some of the respondents in the two farm settlements. From the table the settlers that had secondary education were the highest representing 55% of the respondents surveyed. All the 20 respondents in each of the farm settlements grow rubber with other tree crops like oil palm. Each settler has a total land holding of 4.61 ha. a mean gross income of N103,400 and N144,000 accrued to each settler per year at Iguoriakhi and Mbiri, respectively.

Cassava, maize, yam, melon, vegetables (leafy vegetables, pepper, tomato, okra), plantain, banana, cocoyam and pineapple are the choice crops of the settlers as intercrops with immature rubber in Iguoriakhi. But in Mbiri all crops in Iguoriakhi except plantain, cocoyam and groundnut were not common. Cowpea and soybean were not prefer in both farm settlements (Table 2).

Table 1: Some characteristics of respondents

Characteristics	Farm settlements		
	Iguoriakhi (n = 10)	Mbiri (n = 10)	Total
Education (No.)			
Nil	0.00	0.00	0.00
Primary	4.00	3.00	7.00
S. 75	0.00	0.00	0.00
Secondary	4.00	7.00	11.00
Vocational	1.00	0.00	1.00
College of Agriculture	1.00	0.00	1.00
Polytechnic	0.00	0.00	0.00
University	0.00	0.00	0.00
Status in household			
Head	10.00	10.00	20.00
Spouse	0.00	0.00	0.00
Others	0.00	0.00	0.00
Religion			
Christian	7.00	10.00	17.00
Muslim	0.00	0.00	0.00
Traditional	3.00	0.00	3.00
Household members(No)			
<10 years	2.00	2.10	2.05
10-40	3.10	3.32	3.21
40-60	0.90	2.10	1.50
>60	0.10	0.00	0.50
Total	6.10	7.52	6.81
Primary occupation			
Rubber growers	10.00	10.00	20.00
Others	10.00	10.00	20.00
Landholdings (ha)	4.16	4.16	8.22
Gross income (year-1)	103, 400 ($ 1034)	144, 000 ($ 1440)	247, 400($2474)

N 100 = 1.00 (US$)

Table 2: Choice of crops as intercrops with immature rubber by settlers

Crops	Farmers in the farm settlements (%)		
	Iguoriakhi	Mbiri	Mean
Cassava	100.0	100.0	100.0
Maize	100.0	100.0	100.0
Yam	100.0	100.0	100.0
Vegetables	100.0	100.0	100.0
Melon	100.0	100.0	100.0
Plantain/Banana	30.0	0.0	15.0
Cocoyam	30.0	0.0	15.0
Pineapple	10.0	20.0	15.0
Groundnut	20.0	0.0	10.0
Cowpea	0.0	0.0	0.0
Soybean	0.0	0.0	0.0

Table 3: Choice of cropping patterns under the rubber-based cropping system in the farm settlements

Cropping patterns	Farmers (%)		
	Iguoriakhi	Mbiri	Mean
Melon/cassava (1 year)	0.0	0.0	0.0
Melon /maize/ cassava (1 year)	100.0	100.0	100.0
Melon/maize/yam/cassava (2 years)	100.0	50.0	50.0
Cassava/cassava (2 year)	0.0	0.0	0.0
Pineapple/pineapple (3 years)	0.0	20.0	10.0
Plantain (3 years)	0.0	0.0	0.0
Banana (3 years)	0.0	0.0	0.0

Rubber/melon/maize/cassava (1 year) cropping pattern constitute 100% of total farmers, followed by rubber/melon/maize/yam/cassava (2 years) cropping pattern which constitute 50% of total farmers and rubber/pineapple/pineapple (3 years) cropping pattern which constitute 10% of total farmers (Table 3).

The mean rubber area of between 1-5 years of age was 1.52 ha and this ranked the highest in the two farm settlements. All the settlers surveyed intercrop their young rubber plantation. However, 90 and 95% of the total area of young rubber between 1-5 years are being intercropped at Mbiri and Iguoriakhi respectively (Table 4). Only 2.5% of the settlers at Iguoriakhi use burning in their young plantation. Thirty percent make use of organic fertilizer, 70% use chemical fertilizers. Non of the settlers interviewed at Mbiri make use of fertilizers. The settlers do not make use of any form of traction in cultivation. They still rely on cutlasses and hoes for cultivating their fields. Settlers at Iguoriakhi farm settlement where chemical fertilizers were used do not know anything about soil test and plant tissue analysis in the process of fertilizer application in their plantation. Source of labour is household and hired at both Iguoriakhi and Mbiri.

Cash income of N72,000 from rubber at Mbiri farm settlements ranked highest in the two farm settlements. Cash income from other crops was N35,000 and N55,000 at Iguoriakhi and Mbiri farm settlements respectively. Non cash income was greater at Mbiri. Mean gross income of N134,000 was higher at Mbiri and mean

Table 4: Technical aspect of rubber-based systems in the farm settlements

	Farm settlements		
Rubber intercropping	Iguoriakhi	Mbiri	Mean
Area under rubber (ha)			
Mean rubber area of 1-5 years	1.00	2.02	1.51
Mean rubber area of 5-10 years	0.00	0.00	0.00
Mean rubber area of >10 years	1.00	0.81	0.805
Inter-croppers (%)			
Area intercropped	100.00	100.00	100.00
Use of burning	95.00	90.00	93.00
Use of fertilizers	5.00	0.00	2.50
Organic fertilizer			
Organo-mineral fertilizer	30.00	0.00	15.00
Chemical fertilizer	0.00	0.00	0.00
No fertilizer	70.00	0.00	35.00
Use of herbicides	0.00	100.00	50.00
Use of nematicides	0.00	0.00	0.00
Use of pesticides	0.00	0.00	0.00
Use of nematicides	0.00	0.00	0.00
Use of tractor operated implements	0.00	0.00	0.00
Use cutlasses and hoes	100.00	100.00	100.00
Soil test and plant analysis	0.00	0.00	0.00

Table 5: Economics of rubber-based cropping system in the farm settlements

	Iguoriakhi	Mbiri
Economic aspect	(N year -1)	
Cash income from rubber	67,000 ($670)	72,000 ($720)
Cash income from others crops	50,000 ($500)	55,000 ($550)
Non cash income	6,400 ($64)	7,000 ($70)
Gross income	123,400($1234)	134,000($1340)
Household expenditure	90,000($900)	92,000 ($920)
Net income	32,400 ($324)	42,000 ($420)

Table 6: Gross income by cropping patterns in rubber-based cropping systems in the farm settlements

	Gross income (year^{-1})		
Cropping pattern	Iguoriakhi	Mbiri	Total income (year^{-1})+
Rubber/melon/ maize/cassava (2 years)	16,000	18,000 *34,000($340)	17,000 ($340)
Rubber/melon/maize/ yam/cassava (2 years)	26,000	27,000 *53,000 ($530)	26,500 ($265)
Rubber/pineapple/ pineapple (3 years)	15,000	30,000 *45,000 ($450)	15,000 ($150)

*Total of the two farm settlements, +Average of the two farm settlement based on the number of years

net income of N42,000 was also higher at Mbiri farm settlements (Table 5). The results also showed that on cropping pattern basis income that accrued to farmers on a yearly basis was N17,000, N26,500 and N15,000 for rubber/melon/maize/cassava (1 year), rubber/melon/maize/ yam/cassava (2 years) and rubber/melon/pineapple (3 years) respectively (Table 6).

DISCUSSION

From the results of this study there were no illiterates among the respondents in the farm settlements. This confirms the first policy of government in establishing the farm settlements (POPFS, 1964). Settlers intercrop young rubber plantations and spaces that are available in the old plantation with arable crops such as cassava, yam, maize, melon, pineapple and vegetables as this attracts extra income due to the long gestation period which often serve as a disincentive to rubber farming. This however confirms the possibilities of making some income before rubber reaches it tappable age as observed by Esekhade *et al.* (1996).

At the establishment of the farm settlements (POPFS, 1964), apart from serving as model farms, emphasis was also on consumption and marketing of products which will in turn bring economic returns. The agro-ecology of the area and socio-culture of the people informed their choice of crops and cropping patterns. Among the research packages introduced to the farm settlements on soil fertility, settlers at Iguoriakhi use poultry droppings and oil palm fibres as organic manure, while NKP 15-15-15 was used as chemical fertilizer where available. Settlers sourced the fertilizers from the state ADP and a near by rubber estate. Where chemical fertilizer was not used e.g. Mbiri, the organic fertilizer was used. Minimum disturbance of the soil in cultivation as advocated by research to farmers informed their use of cutlasses and hoes as the major means of cultivating their farms. This corroborates with Agboola (1987).

De Janvy and Dethier (1985) however in their own work suggested technical knowledge of modern farming to small scale farmers as in the farm settlements studied. Under the implementation of the farm settlements scheme, provision was made for supervision and training of staff.

The proximity of Iguoriakhi farm settlement to research centers and a university did not seem to have much impact as one would have expected on the use of developed technology when compared to Mbiri farm settlement. This may have been due to scientists and extensionists inability to reach out to the settlers as often as the need would have been and also due to generation of technologies which do not favour small farmers. This also corroborates the findings of Barlow and Peries (1977). The lack of political will and the economy could also have effect on research and extension activities.

As observed in the findings of this research, cash earnings of the settlers were low when compared to Esekhade *et al.* (2003) findings on gross return per hectare from rubber intercropped with other arable crops. This could be attributed to inadequate technology to the settlers.

Webster and Baulkwill (1985) in their report on development programmes for small holders proffered some solutions in overcoming these problems. They include channeling innovative techniques to farmers through project-oriented activities. Masae and Cramb (1995) concluded from their study that small holder

farmers will only adopt practices that are both technically productive and economically viable.

Based on above findings from this study farmers must therefore be involved in the decision of projects that will be embarked on. However, such technologies need to be affordable by low-input farmers. Presently, researcher/farmer managed studies on spacing techniques, fertilizer trials and pathological investigations are in progress. Thus, it is hoped that this will meet the technological needs for now and will serve as a means of improving settlers' socio-economic status.

CONCLUSIONS

The study revealed that the objectives of setting up farm settlements in Nigeria have not been fully achieved. This is because since the inception of the farm settlements, they are still a far cry from being model centers to agricultural communities around them. Although, Rubber Research Institute of Nigeria (RRIN) has recently taken interest in checking the agricultural pulses of the neighbouring farm settlements. The Federal and State Ministries of Agricultural should also renew their interest in meeting up with the objectives of setting up these farm settlements.

On the whole, the gains from the farm operations compares with earnings from an average white collar job. Introduction of modern farm techniques and effective management of the same may eventually increase the net gains. Rubber disease management, effective waste recycling methods, biomass production knowledge of planted areas, soil analysis and environmental conservation practices are some of the fundamental aspects that need to be seen in operation in these farm settlements. The extension arms of Agricultural Research Institutes need to be encouraged in disseminating on-shelf research findings to these settlements. Also, the extension and socio-economic branches of the relevant institutes need to carry out studies in these farm settlements in order to highlight areas needing urgent research attention.

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