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Research Article

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Regional disparity in yield from rubber smallholdings and the reasons thereof

K.G. Mohanan* and Ramesh B. Nair[1]

Rubber Board, Kottayam, Kerala, India

[1]Rubber Research Institute of India, Kottayam, India

Abstract

This study was taken up in two traditionally rubber growing villages in Kerala to find out the extent of difference in yield between these villages and the reasons thereof. From each village, 10% of the holdings have been selected and data collected, using a questionnaire. Significant difference in yield per hectare per year (around 15%), was observed between the villages studied. Higher total annual yield in one village was due to daily tapping and the higher number of trees per hectare. Where alternate daily tapping was followed and the number of trees per hectare was lower, the yield per tree per tap was higher. In agromanagement and tapping practices also, significant differences were observed between the villages. One of the important observations in the study was that there was no considerable difference between the yield in virgin and renewed bark in both villages. The study results point to the need for reorienting the extension priorities in different rubber growing tracts even in the traditional belt, taking into consideration of the felt needs of each region.

Keywords: adoption of technology, development, extension, regional difference, strategies

Introductiion

In India, the state of Kerala and Kanyakumari district of Tamil Nadu constitute the traditional rubber growing belt. Commercial cultivation of rubber in this region started more than 100 years ago. Though initially rubber planting was taken up by large growers only, over the years much structural transformation took place in the sector and now rubber is mainly a small growers' crop. Of the 1.09 million rubber holdings in the country, only 260 are classified as estates (>20 ha). The average size of a holding has reduced from 1.30 ha in 1955-56 (Krishnakumar and Nair, 1997) to 0.50 ha now. (Rubber Board, 2007). Small and marginal growers account for 89% of the area and contribute 92% of the production in the country.

As a result of Rubber Board's extension efforts and the long association of the growers with this crop, rubber growers in Kerala in general, have some knowledge about the scientific cultivation and harvesting practices of the crop. However, it is a general observation from the field that there is marked regional difference in adoption of technology in plantation maintenance and harvesting practices even in Kerala. The level of adoption of various agromanagement practices varied between zones. Level of adoption of all the practices was the highest in the northern region (Palakkad) and the lowest in the southern zone (Antony *et al.*, 2005). In this study an attempt is made to assess the level of disparity in yield in smallholdings, in different parts of the state and to identify the reasons thereof.

Materials and Methods

The rubber growing tract in Kerala can be classified into three zones namely North, Central and South. The South zone comprises of the districts Thiruvananthapuram and Kollam and a portion of Pathanamthitta. The Central zone comprises of major portion of Pathanamthitta and the districts of Alappuzha, Kottayam, Idukki, Ernakulam and Trichur. All districts in Kerala from Palakkad towards north come under North Zone. For the purpose of this study, the Central and South zones of Kerala were selected. The North zone was exempted because there are earlier reports that adoption level of technology in north zone is the highest and technology gap in that zone is relatively small. One traditional rubber growing district each was identified in

* *Corresponding author e-mail : kgmohanan@rubberboard.org.in*

the central and south zones as Kottayam and Thiruvananthapuram. From each district one village with good concentration of rubber smallholdings was randomly selected. As per the enumeration of holdings done by the Rubber Board in 2006, the number of smallholdings in Meenachil village was 2450 and 2000 in Ottassekharamangalam village. From each village, 10 per cent of the holdings were selected using random sampling method. Accordingly the sample size was 245 holdings and 200 holdings, respectively. In order to have uniformity in production potential, only holdings planted with the variety RRII 105 were selected for the study. The relevant data were collected from the field by extension officers of Rubber Board using a specially designed questionnaire after interviewing the growers. Information on maintenance of the holding during immature and mature phases, adoption of cultural practices such as weeding, fertilizer application, soil and moisture conservation, establishment of cover crop and rain guarding were gathered from each of the holdings studied. Data relating to productivity, training of tappers, tapping panel, tapping intensity, slope and depth of tapping, practice of using template etc. were also collected from each holding. The data were statistically analyzed.

Results and Discussion

The data indicate that average annual yield per ha was more in Ottassekharamangalam village by around 15% than in Meenachil village and the difference is highly significant (Table 1). But when it comes to yield per tree per tap and the total yield per tree per year, the trend was just the reverse. In Meenachil the yield per tree per tap was 78% more than in Ottasekharamangalm and the difference was statistically significant (Table 1). Higher yield from less number of tapping will be beneficial for maintaining tree health, besides, being more economic and extending the productive period. The difference in yield per tree per year also was statistically significant between the holdings in Meenachil and Ottasekharamangalam. The yield per tree per year was also more in Meenachil, an indication of more healthy trees. (Table 1). One of the reasons for the higher yield per ha per year in Ottassekharamangalam is the higher stand of rubber trees in that village (506 trees under tapping per hectare) compared to only 371 such trees in Meenachil village. Keeping more than the optimum number of trees per hectare increases the cost of maintaining the plantation. It also affects girthing of trees resulting in less yield. The thickness of bark and its renewal after commencement of tapping, and the incidence of panel diseases are also influenced by density of planting (Napituplu, 1977). Another reason for the higher annual yield per hectare in Ottassekharamangalam village is the daily tapping system followed by the small growers in that village, which is discussed later in this paper.

Table 1. Yield per ha per year, per tree per tap and per tree per year

Variables	Ottassekharamangalam		Meenachil		
	Mean	SD	Mean	SD	Z
Yield (kg/ha)	2395	612	2096	646	4.97**
Yield (gm/tree/tap)	34.90	12.41	62.21	21.84	-15.59**
Yield (kg/tree/year)	5.11	1.78	5.81	2.03	-3.80

**Significant (1%)

A yield of 2500 kg per ha per year for the clone RRII105 is quite common in smallholdings. From Table 2, it can be seen that 73% of the holdings in Meenachil village and 63% of the holdings in Ottasekharamangalam village yielded less than 2500 kg per ha per year. T shows that there is scope for further improvement in yie in holdings in both the villages. 506

Table 2. Classification of holdings based on productivity

Productivity range (kg/ha)	Ottassekharamangalam		Meenachil	
	No. of holdings	%	No. of holdings	%
<=1500	16	8	50	20
1500-2000	46	23	80	33
2000-2500	65	32.5	48	20
2500-3000	36	18	47	19
>3000	37	18.5	20	8
Total	200	100	245	100

The difference in yield between the virgin (BO-1 and BO-2) and the renewed bark (BI-1 and BI-2), in both villages was not statistically significant (Table 3). This calls for more in-depth study in different regions.

Table 3. Yield difference between virgin and renewed bark (kg/ha /yr)

Village	Panel	Mean	SD	Z-value
Ottassekharamangalam	BO-1 & BO-2	2457	717	1.18
	BI -1 & BI -2	2341	654	
Meenachil	BO-1 & BO-2	2079	653	0.09
	BI -1 & BI -2	2071	670	

Intensity of tapping is a deciding factor in the total annual yield from a rubber plantation. The number of small growers following different intensities of tapping in the two villages is given in Table 4. There is highly significant difference between Meenachil and Ottasekharamangalam with regard to adoption of different intensities of tapping. In Ottasekharamangalam, 91% of the growers tap their trees daily (1/2S D/1),

whereas it is only one out of the 245 in Meenachil. In Meenachil, 92% of the growers tap their trees on alternate days (1/2S D/2). The ideal tapping system recommended for high yielding clones like RRII 105 is half spiral, once in 3 days (1/2S D/3). Percentage of growers following the recommended tapping system in Ottasekharamangalam was 2.5 and 7 in Meenachil. This is an area where education is needed for the growers in both the villages. One of the reasons for the higher annual yield per hectare observed in Ottasekharamangalam is the adoption of daily tapping in the holdings. This is a very unhealthy practice, which affects the health and longevity of the yielding phase of rubber trees. Daily tapping necessitates replanting of the trees at younger age.

Table 4. Tapping system followed

Village	1/2S D/1	1/2S D/2	1/2S D/3	1/2S D/4
Ottassekharamangalam	182	13	5	-
Meenachil	1	226	17	1
Z value	19.32**	-18.04*	-2.15*	-

**Significant (5%); **Significant (1%)*

Besides the intensity, other aspects such as slope of tapping cut, depth of tapping, use of template, training of tapper, own tapping or hired tapper, etc. are also important factors that determine the quality of tapping. At the time of opening the trees for tapping and every year thereafter, templates are to be used for marking the trees at the correct slope. All the growers are not using template even when trees are first opened for tapping, not to speak about subsequent years. Per cent growers using template in the first year is significantly different between the villages: 66 % in Meenachil and 48 % in Ottasekharamangalam. Use of template for marking the trees every year has to be promoted vigorously as the adoption even in the first year is low.

Acute scarcity of workers, especially skilled tappers is experienced in the plantation sector. Hence tapping the trees by owners themselves has to be encouraged. Very few growers in both villages tapped their trees by themselves and the difference between the regions was significant (16% in Ottasekharamangalam and 37% in Meenachil).

Training of tappers in all aspects of scientific harvesting is very important to ensure good quality of tapping. While 7.5 % tappers are trained in scientific tapping in Ottasekharamangalam, in Meenachil, the percentage of trained tappers was only 4.9. The results indicate that training of tappers should be undertaken with priority in both the villages.

A slope of 30 degrees is the optimum for budded rubber trees to ensure cutting of maximum number of latex vessels and for smooth flow of latex (without any overflow and consequent loss). If the slope is more than the optimum, there will be wastage of bark. Only 42% growers in Ottasekharamangalam and 38% growers in Meenachil maintained optimum slope. Majority of the growers in both the regions did not follow the recommended practice and the difference between the regions studied was not significant.

Depth of tapping is another important aspect that determines the yield. Tapping shall not be either too deep or too shallow. Data collected indicate that 63% of growers in Meenachil and 39% in Ottasekharamangalam villages tap their trees at the optimum depth. The difference between regions was significant.

Rainguarding is a recommended practice for minimizing loss of tapping days during rainy season. In Meenachil village, 54% of the growers followed this practice whereas in Ottasekharamangalam village only 3.5% growers rainguarded their trees. Difference between regions is significant. This shows that rainguarding has to be popularized further.

Girth of tapping rubber trees also influence the yield from rubber plantations and the relevant data from both the villages were also recorded (Table 5). Mean girth was significantly more in Meenachil (72.91cm) than in Ottasekharamangalam (66.50 cm).

Table 5. Mean girth of trees in two regions (cm)

Panel	Ottassekharamangalam		Meenachil		Z - value
	Mean	SD	Mean	SD	
BO-1	60.92	15.48	63.84	12.37	-1.05
BO-2	65.16	17.27	72.62	9.80	-3.07 **
BI-1	66.07	13.94	77.16	14.31	-4.28 **
BI-2	74.36	13.94	81.86	16.63	-2.22 *
Overall	66.50	15.70	72.91	14.53	-4.41 **

***Significant (1%)*

Agromanagement practices such as weeding, fertilizer application, establishment of cover crop in the initial years and soil moisture conservation also pay important roles in determining the yield from rubber plantations. Data on these aspects aregiven in Table 6. From the data it can be inferred that most of the holdings adopted weeding. However, the adoption in Meenachil was significantly superior to Ottasekharamangalam. Most of the holdings in both the villages applied fertilizers. The difference between the regions was statistically not significant. Only 14% growers established cover crop in their holdings in Ottasekharamangalam, whereas in Meenachil, 69% growers adopted this practice. Variation between villages was highly significant. Rubber growers

in Ottasekharamangalam have to be educated about the benefits of planting leguminous ground cover in rubber plantations.

Table 6. Agromanagement practices followed

Variable	Ottassekharamangalam Adoption		Meenachil Adoption		Z
	No.	Percentage	No.	Percentage	
Weeding	170	85	230	94	-3.18 **
Fertilizer application	180	90	228	93	1.16
Establishment of cover crop	28	14	148	69	-9.63 **
Soil & moisture conservation	4	2	80	33	-8.13 **

**Significant (1%)

Soil moisture conservation is another important agromanagement practice recommended in rubber plantations. A yield increase of 15% is achievable by adopting proper soil and water conservation practices. From the data presented in Table 6, it can be observed that majority of the growers do not follow this practice in their holdings. While about one third of the growers in Meenachil adopted such practices, the adoption was negligible in Ottasekharamangalam. The difference between regions was statistically significant. Extension efforts have to be intensified to educate the growers about the need for adopting soil and moisture conservation measures.

Maintenance of rubber holdings during both immature and mature periods is reflected in the yield from the plantation. Information regarding the early maintenance of the holding gathered through discussion with the growers was classified as poor, good and excellent. In Ottasekharamangalam, 40% of holdings came under the categories of good and excellent, whereas 60% of the holdings came under this category in Meenachil village in immature phase. Difference between regions was significant. Data relating to mature area maintenance showed that in Ottasekharamangalam, 9% holdings came under the category Good and Excellent whereas, 31% of the holdings came under this category in Meenachil village. Difference between regions in this matter is also significant. There is a scope for further improvement in maintenance of plantation during both immature and mature periods.

A comparison of the factors influencing yield from the two villages shows that the higher per hectare yield observed at Ottasekharamangalam is due to higher density and consequent more number of tapped trees and the practice of daily tapping. The higher per tap yield and per tree yield as well as girth observed in Meenachil indicates healthier trees and lower cost of maintenance as a result of fewer numbers of trees per hectare. Punnoose and Lakshmanan (2000) have observed that the per hectare yield may be higher up to a certain extent when density is more but it will be at the expense of health of trees and cost of tapping. Daily tapping as done in Ottasekharamangalam is not advisable due to its higher stress on trees and more bark consumption leading to lower productive life of the plantation. The drastic reduction in yield (116 kg/year) of renewed bark observed in Ottasekharamangalam reflects the adverse impact of high intensity tapping. In the case of tapping system followed, tapping by owners themselves, depth of tapping, use of template, rainguarding, practice of moisture conservation measures and general maintenance of the holdings in immature and mature phases, there was significant difference between the two villages studied.

Conculsion

It can be concluded from the observations from the study that there is considerable difference in the adoption level of technologies in plantation maintenance and harvesting practices in the two regions studied. In Ottasekharamangalam village more extension efforts are needed to educate the growers to maintain only optimum number of trees in their holdings. Other areas where extension work and continued educational efforts are needed in Ottasekharamangalam are (a) reducing the tapping intensity, (b) scientific training of rubber tappers, (c) use of template for marking the trees every year to maintain the optimum slope for tapping cut, (d) maintaining optimum depth for tapping, (e) rainguarding, (f) adopting soil and moisture conservation measures and (g) scientific maintenance of plantations in the immature as well as mature phases. Although the level of adoption of the recommendations of the Rubber Board was highe in Meenachil when compared to Ottasekharamangalam, there is still scope for improvement in productivity through better adoption of scientific methods of cultivation in both the villages. The conclusion is that extension requirements are different even in the two rubber growing villages studied in the traditional belt and so the extension priorities have to be reoriented and appropriate strategies evolved, based on the needs of each region.

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