



Productivity ratings in relation to holding size and resource-management in Indian rubber plantation sector

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Abstract

The smallholdings dominate the natural rubber (NR) plantation industry in India. The holding size profile of the smallholdings shows that about 86 per cent are below 2 ha, 62 per cent of which falls within 0.5 -2.0 ha. The average unit size is above 1.0 ha in non-traditional (NT) area where NR plantation expansion is in progress. This study was taken up to analyze the relation between the holding size, resource management and productivity since resource-poor smallholders' productivity is remarkably higher than that of larger units. The productivity and the resource availability/management in smallholdings falling under three categories, viz., <0.5 ha, between 0.5 and 2.0 ha and >2.0 ha, were analyzed based on primary data collected from smallholdings having linkage with RPSs. Data from respondent estates also were analyzed. The difference in the productivity between the three categories studied was found to be significant. The larger holdings enjoyed better resource availability than smaller ones; but, the latter was better in resource-management. Highest productivity was recorded from units < 0.5 ha. Productivity and unit size were inversely proportional within the categories of smallholdings analyzed. Measures to ensure prompt adoption of productivity enhancement practices in medium/large holdings by way of effective resource management possible through group approach have to be initiated to increase the production of NR in India as they occupy a major chunk of NR plantations. Estates too can attempt to tap the potentials of group synergy through workers' SHGs. Productivity enhancement through optimum resource-use has a direct bearing on sustainability of Indian NR industry.

Keywords: Adoption, holding size, productivity, resource management, rubber

Introduction

Natural rubber (NR) sector in India is characterized by the dominance of smallholdings. Percentage share of smallholdings in area and production are 90 and 93 respectively. Currently, India occupies the first position in productivity among the NR producing countries in the world; further, the productivity of smallholdings is much higher than that of the estate sector (Rubber Board, 2011). Productivity of smallholdings was 1850 kg ha⁻¹ while that of the estates was only 1370 kg ha⁻¹ during 2010-11. As a result of population growth and the resultant fragmentation of landed properties, the size of the holdings progressively diminishes, especially in southern districts of Kerala, leading to

a wide variation in the resource profile of small growers which is a matter of concern in development perspectives in traditional area. Clonal and climatic variations significantly affect the productivity that varies between the traditional and non-traditional regions. But, within the traditional area that occupies about 75 per cent of the area under rubber, the prevailing inter-regional variation in productivity is due to varying level of adherence to scientific stipulations in planting and critical cultural practices (Mohan and Nair, 2009). Adoption level, in general, is rated with the availability of resources. Wide range prevails with regard to the resource availability between different regions within the traditional rubber growing tract of India. The score

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of aggregate resources for smallholders was lowest in south zone, moderate in central zone and highest in north zone (Venugopal *et al.*, 2009). On the contrary, the productivity of smallholdings is high in south zone and low in north zone; *i.e.*, the productivity difference within the smallholdings having varying unit size is irrespective of the inter-regional variations in available resources. It points to the fact that holding size has a direct bearing on productivity because of the variability in resource-management pattern for adoption of critical cultural practices. The homestead cultivation practice of smallholdings having less than 0.5 ha in Kerala depicts the efficacy of effective resource management for achieving higher productivity.

Rubber is a crop with long gestation period and NR plantation industry is relatively high investment, labour intensive enterprise and hence high resource requiring. Optimal use of resources for maximizing returns by enhancing productivity is essential to ensure sustainability of the industry (Krishnakumar, 2006). Traditional rubber growing tracts are almost saturated and the availability of suitable/marginally suitable land for cultivation of rubber in non-traditional area is limited; hence, the scope for expansion of area of rubber plantations for increasing NR production within the country is also limited. But, earlier studies revealed that adoption of proper agro-management practices will enhance productivity significantly (Antony *et al.*, 2006). Therefore, increasing the productivity of existing plantations by better technology adoption through efficient resource-management is the only possible way to meet the ever-increasing demand of NR and to save the foreign exchange which otherwise would be required for import.

It has been established that in spite of the inter-regional variations in resource profile and resource use, the productivity is maintained at a higher level in smallholdings, especially when the unit size is smaller. The scope of replicating resource-use pattern with regard to the critical variables in marginal smallholdings to relatively larger holdings and even to estates has to be explored for enhancing the production of NR in the country. The present study was therefore, taken up (1) to analyze the level of adoption of critical cultural

practices in relation to holding size (2) to examine the resource - management pattern in different holding size/estates for technology adoption (3) to observe the relation between resource-management pattern and the productivity ratings (4) to identify the replicable approaches of resource management, if any, for different holding size/estates (5) to have data-base for formulation of alternative strategies for resource management aiming at productivity enhancement with special reference to larger holdings and estates.

Material and methods

Primary data for the study was collected from Rubber Producers Societies (RPSs) under Kozhikode, Nilambur, Mannarkad, Thrissur, Pala, Erattupetta and Kottarakara Regional Offices, spread over the traditional rubber growing belt. Small holdings under identified RPS were selected based on stratified systematic sampling to cover 151 samples and 10 estates from different regions in the traditional rubber area were also included for the study. Holdings which utilize the services of RPS for processing/marketing of their produce only were selected to get a reliable, documented data on productivity. Additional information on the smallholders selected for the study was collected through interactions in person or over phone using a check list. Secondary data utilized for the study was from the publications of Rubber Board (Rubber Board, 1958-2011).

The variations in resources were analyzed on the basis of physical, human, financial and social resources. The physical resources included the infrastructure related to plantation-mainly, the tools, implements and equipments for planting, maintenance and crop processing. The financial resources included the various sources of income such as salary, business, agriculture (rubber /non-rubber). The human resources included the availability of manpower for plantation related jobs. The social resources included the formal and informal relationships of the small growers/estate owners as indicated from their membership in RPSs/ Co-operatives/Associations *etc.* The resource use was rated on the basis of percentage share of individual management and group management of various cultural operations.

Productivity of the holdings was collected from the records of RPS with which the smallholders considered for this study had been closely associated for processing and marketing/trading their produce. Production data was calculated considering the dry rubber content (DRC) of latex traded/ sheet processed together with the field coagulum sold. Data from productive units of age group between 10-20 years and following S/2 d2 system of tapping were collected. Productivity data was statistically analyzed following anova method.

Results and discussion

The data collected for this study revealed that within the smallholdings, the percentage share of units having area between 0.5 ha and 2 ha [group-2] was the highest (55.6%) followed by 34.4 per cent in those units having less than 0.5 ha [group-1] and 9.9 per cent in the larger ones ranging between 2 ha and 10 ha [group-3].

The availability of resources with the above three categories of growers and the corresponding productivity, when analyzed based on the primary data, was found to vary remarkably between them.

Productivity

The mean productivity of 52 studied units under group 1 (T1) was found to be 2183.25 kg ha⁻¹ year⁻¹, whereas that of 84 units under group 2 (T2) was 1988.9 kg ha⁻¹ year⁻¹ and it was still lower (1744.3 kg ha⁻¹ year⁻¹) in 15 units under group 3 (T3).

Table 1. Statistical analysis of the productivity of different groups of smallholdings

Groups	Count	Productivity (kg ha ⁻¹ yr ⁻¹)	CD
T1 (≤ 0.5 ha)	52	2183.3	T1 vs T2 214.6
T2 (0.5-2 ha)	84	1988.9	T1 vs T3 356.4
T3 (2-10 ha)	15	1744.3	T2 vs T3 340.9

Variance Ratio = 3.50*

*Indicates $P < 0.05$

The difference in productivity between different groups was found to be statistically significant. Productivity of units having less than 0.5 ha was found as the highest and it is significantly different from those above 2 ha. The inference from this analysis is that 'productivity rating is more or

less inversely proportional to holding size in smallholdings'.

Resource-use

The resource availability and resource management/in relation to productivity was analyzed in detail within the three groups of smallholders considered for this study and the observations are as follows:

1. Human resources (HR)

The planting material used for raising a plantation is crucial in deciding the productivity. Raising a nursery near to the planting point to prepare planting materials of desired standards is the ideal practice recommended. But, this is an activity requiring suitable manpower (HR). While 19 per cent of smallholders in group 1 had adequate HR for raising own nursery for developing their plantation, groups 2 and 3 had only 13 and 10 per cent respectively (Table 2), *i.e.*, the resource availability for this practice is limited in all the three categories. Hence, the general trend was to resort to private sources for planting material.

Selection of healthy plants of approved clones and desired standards from a private nursery also require involvement of manpower. Growers coming under group 1 could pay more attention in selection of planting material of their choice because (a) they require limited number of plants and (b) they could devote more time for the purpose as the percentage of salaried class (employees) among them is the lowest (Table 3). This factor might have contributed significantly towards raising a small plantation with quality assured planting material, better performance of plantations and higher productivity.

Rubber plantation activity involves various critical cultural practices. Non adoption of these operations will reflect adversely on the productivity. But, non-availability of adequate manpower (HR) was found as a limiting factor for carrying out these seasonal cultural operations. However, major chunk of the growers in all the three groups somehow manage to do the pre-planting, planting and maintenance operations individually by engaging scarcely available and expensive paid labour. As a solution to this issue through better resource management, these services could be offered to the

smallholders adopting a group approach labour banks/SHGs) under a reliable agency such as RPS/Companies in RPS sector.

Proper disease management contributes significantly to productivity. This is a labour (HR) intensive cultural practice. Availability of labour force for plant protection operations to growers of group 1, 2 and 3 were only 10, 30 and 65 per cent respectively. To overcome this crisis small and marginal farmers resort to entrust the job with trained contractual groups arranged under RPS/Companies in RPS sector. This ensures timely adoption. Since group 3 have their own force, their preference to group approach is less.

emergence of Group Processing Centres (GPC) under RPS. The individual utilization of HR for processing and marketing is only 18, 15 and 30 per cent in groups 1, 2 and 3 respectively. Even though this factor do not have a direct impact on productivity it contributes indirectly to enhancing productivity as the work load of tappers reduced considerably because of detaching processing job from their task.

In general, it could be found that there is dearth in resource management due to a host of factors. The situation becomes grave, as the holding size increases. Plantation resource management focusing on productivity enhancement and thereby increasing the net farm income from holdings is

Table 2. Resource availability and management pattern in smallholdings

Particulars	Management by self / Individual management (%)			Management using other's service/ Group management (%)		
	Group 1 (< 0.5 ha)	Group 2 (0.5-2.0 ha)	Group 3 (>2.0 ha)	Group 1 (< 0.5 ha)	Group 2 (0.5-2.0 ha)	Group 3 (>2.0 ha)
Human resources						
1. Nursery	19	13	10	81	87	90
2. Preplanting	96	92	100	4	8	0
3. Planting and maintenance	96	92	100	4	8	0
4. Plant protection	10	30	65	90	70	35
5. Harvesting	30	86	100	70	14	0
6. Processing and marketing	18	15	30	82	85	70
Physical resources						
1. Manual tools	73	98	100	27	2	0
2. Harvesting access.	90	95	100	10	5	0
3. Processing infrastructure	17	30	50	83	70	50
4. Mechanical tools/implements	15	45	60	85	55	40

Harvesting is a HR requiring skilled job. When 100 per cent of group 3 and 86 per cent of group 2 have suitably skilled HR with them for harvesting, only 30 per cent of group 1 enjoys that privilege and hence utilize shared HR for this purpose. This may adversely reflect on the tree maintenance and quality of tapping. Small and marginal farmers who follow a homestead style of cultivation are better managers of HR, especially the tappers. This factor also contributes considerably to better yield realization in smallholdings and thus the productivity. If tree maintenance and tapping standards can be made better in smallholdings there is potential for further increasing the productivity.

A declining trend in the availability of HR for processing/marketing could be noticed with the

imperative for the sustenance of the industry. The probability of floating labour banks under RPSs/Companies in RPS sector for providing paid service to ensure timely adoption of cultural practices which will enable realization of higher productivity from existing plantations, has to be analyzed with a view to formulate strategic plans.

2. Physical resources

The physical resources include tools and implements for planting, maintenance, harvesting and infrastructure for processing. With regard to the availability of tools and implements such as 'Manvetty', 'Koondaly' *etc.* for planting and maintenance groups 2 and 3 are almost self-sufficient and group 1 is in a comfortable position

as 73 per cent of them possess the essential tool and implements and the remaining manage their needs by sharing. 90-95 per cent of the growers under group 1 and 2 and 100 per cent under group 3 have their own harvesting accessories. The general trend within the units covered in this study is to share the available infrastructure for processing and marketing. While above 70 per cent of the growers under groups 1 and 2 choose the group processing/marketing facilities through RPSs, 50 per cent of group 3 also were found to remain attached to the GPCs.

3. Financial resources

Growers under groups 2 and 3 are (70-71%) far above those under group 1 (36.3%) regarding the availability of financial resources. Moreover, the former groups have a fairly good alternative source of income too. The growers under group 1 having less financial resources adopt the group approach to overcome the limitations for carrying out more finance requiring cultural operations. In other words, shortage of finance never tempted marginal growers to refrain from adoption of timely cultural practices or availability of finance did not ensure adoption in financially well off groups.

4. Social resources

The focus group members for this study were selected from RPSs. Hence, all of them under group 1 were members in social forum and avail the services through RPSs. Even if the sample selection was through RPSs, it could be noted that a few (11% and 20% of group 2 and 3 respectively) among them remained out of the fold of this social forum. Other social resources to group 2 and 3 are more due to their better accessibility to charitable/social organizations, clubs *etc.* whereas opportunity for issue-based informal gatherings is equal to all the groups. But, small holders under group 1 only utilize this opportunity properly while the other two evade from such situations due to their false ego. Hence, farmers under group 1 can be rated high with regard to social resources availability and use.

The analysis of data received from 10 estates is furnished in table 4 and it is self-explanatory with regard to the better availability of resources. But,

Table 3. Category-wise resource availability (Financial and social)

Particulars	Group 1 (%)	Group 2 (%)	Group 3 (%)
Financial resources			
Having a steady income (salary, business etc. other than agriculture)	36	71	70
Having a secondary source	39	61	80
Social resources			
Having membership in social forum (RPS etc.)	100	89	80
Avail the services of the social forum	100	72	70

the mean productivity of identified units (10-20 year old, planted with RRII 105, following S/2 d2 or S/2 d3 system of tapping) in these estates is recorded as 1428.2 kg ha⁻¹ yr⁻¹. The difference existed between the formal and structured resource management style in estates and the informal/casual style of resource management, pooling resources from available sources, in smallholdings influences the productivity

Table 4. Resource availability in estate sector

Particulars	Percentage
Human resources	
Skilled labour	52.5
Regular unskilled labour	56.6
Outsourced labour (need-based)	13.3
Contractual labour (operation-wise)	20.0
Physical resources	
Own tools/implements	87.5
Hired tools/implements	12.5
Financial resources	
Own resources (Rubber-based)	70.0
Social Resources	
Membership in social forum	60.0
Availing service of social forum	20.0
Productivity (kg ha ⁻¹ year ⁻¹)	1428.2

Productivity

The detailed analysis of the data obtained from the three categories of smallholders and that from estates establishes the significant difference prevailing between them with regard to productivity. In units where size was less than 0.5 ha, the productivity was high and it progressively reduced as the unit size increased up to 2 ha and above 2 ha. Productivity was found to increase against the reduction in size of the holding. The reason for this

increase could be noticed as the effective management of resources rather than the availability of resources. In other words, the resource management rating diminishes against the increase in holding size, resulting in a productivity decline, though not truly proportional.

Conclusions

The productivity of the bigger sized units is lesser in spite of their better resource availability than the smaller sized units. It is a matter of concern and requires in-depth study. Together with the technology diffusion efforts promotion of technology adoption measures also have to be undertaken for ensuring productivity enhancement. This study reveals that resource management matters more than resource availability for achieving productivity hike. Utilization of the advantages of group synergy (labour banks, service provider concept *etc.*) through bringing all the smallholders under the umbrella of RPS is the solution. Extension strategies to ensure optimized resource-use through effective resource management are the need for the sustainable development of the NR plantation industry in India.

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