

ADOPTION OF INTERCROPS IN THE TRADITIONAL RUBBER GROWING REGIONS IN INDIA: EMERGING TRENDS IN THE SMALLHOLDER SECTOR

T. Siju, K. Tharian George, S. Veeraputhran and Joby Joseph

Rubber Research Institute of India, Rubber Board, Kottayam – 686 009, Kerala, India

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The study confined to the smallholdings, which availed planting subsidy during 2004-10, showed that among the various intercrops, banana was the most popular intercrop in the traditional rubber growing region which spread over five agro-climatic zones. The results of the study revealed that there were notable differences in the extent of adoption of intercropping, choice of crops and size-class-wise preferences. The highest level of adoption of intercrops in rubber plantations was observed in Kanyakumari region (72.8%) followed by Central Kerala (72.2%) and South Kerala (68.2%) during the seven year period under study. Adoption of intercrops was the lowest in North Kerala (36.2%). The analysis revealed that pineapple replaced banana as the choicest intercrop in Central Kerala. The size of holding was a key determinant in the selection of intercrops. A positive relationship was observed between large size of holding and adoption of commercial crops such as banana and pineapple whereas subsistence crops such as tapioca, amorphophallus and colocasia were preferred in the smallest size-class.

Keywords: Adoption, Holding size-class, Intercrops, Smallholdings, Traditional belt

INTRODUCTION

The twin objectives of intercropping in the immature phase of rubber plantations are to generate income in the cash-trap period and to intensify cropping in the spatial and temporal dimensions. Intercrops such as pineapple, banana, vegetables and yams are cultivated during the immature phase of rubber whereas coffee, cocoa and medicinal plants are recommended for the mature phase (Rubber Board, 2011). In the traditional rubber growing regions, the popularity of intercropping and choice of

crops varied significantly (Rajasekharan and Veeraputhran, 2002). The extent of intercropping during the immature phase of rubber plantations varied from 61.5 per cent (North Kerala) to 85 per cent (South Kerala) and the choice of intercrops depended mainly on the size of holdings, local preferences, marketing facilities, price of produce, availability of family labour, irrigation facilities *etc.* (Anilkumar *et al.*, 2005).

Historically, rubber was grown as a monocrop in the traditional regions. The genesis of organised attempts to promote

intercropping in Kerala's rubber plantations was the replanting subsidy scheme (RSS) launched in 1957. The objectives of the institutional interventions to promote the intercropping were: (i) to replant the old and low yielding rubber plants, and (ii) to ensure adequate farm income during the gestation period of rubber plantations. The responses of the planting community had been encouraging and the socio-economic conditions prevailed in the region during the initial phase influenced them to select intercrops which provided both income and employment to the family labour (Krishnankutty, 1977; Mathew *et al.*, 1978). However, priorities and strategies of intercropping in the immature phase of rubber plantations have undergone important changes due to various contributory factors such as the structural changes in the smallholder sector, significant increases in the sources of non-farm income of the planting community and changes in the source and availability of labour employed in the holdings. Based on the main objectives and determinants of intercropping as well as the compatibility between R&D efforts and farm management practices, the evolution of intercropping in the traditional region could be classified into three distinct phases (Siju *et al.*, 2012). The present study was taken up with the following specific objectives (i) to study the extent of adoption of intercrops and the regional preferences and (ii) to analyse the size-class-wise differences in the adoption of intercrops.

MATERIALS AND METHODS

The traditional rubber growing belt of the country extends from Kanyakumari district of Tamil Nadu in the south to Coorg district of Karnataka in the north (8 to 12 °N).

The traditional belt is further subdivided into six regions based on the soil and agro-climatic conditions (Pushpadas and Karthikakuttyamma, 1980). The regions and the districts covered are furnished in Table 1.

Table 1. The regions and districts covered in the traditional rubber growing belt in India

Sl. No.	Region	District
1.	Kanyakumari	Kanyakumari
2.	South Kerala	Trivandrum, Kollam, Pathanamthitta
3.	Central Kerala	Alappuzha, Kottayam, Idukki, Ernakulam
4.	North-Central Kerala	Trichur, Palakkad
5.	North Kerala	Kannur, Kozhikkode, Malappuram
6.	Karnataka	South Canara

The present study was confined to Kerala and Tamil Nadu, and the analysis was based on the primary data gathered from the 26 Regional Offices of the Rubber Board. The database pertained to the growers who availed subsidy under the Rubber Plantation Development (RPD) scheme of the Rubber Board during the seven-year period from 2004 to 2010. However, the database on intercrops is confined to the crops grown under each holding rather than the extent of area under individual crops. Thus, for the analysis of the extent of adoption/popularity of intercrops, the number of plots with intercrops was considered. For the size-class-wise analysis of preferences of intercrops, the plots were classified into ≤ 0.5 ha, $>0.5-1$ ha and above one hectare size-classes. Simple averages and percentages were used to analyse the data.

RESULTS AND DISCUSSION

Regional preferences

At the aggregate level, adoption of intercrops during the seven year period (2004-10) was found to be the highest in Kanyakumari (72.85%) followed by Central Kerala (72.20%), South Kerala (68.18%) and North-Central Kerala (61.55%). Adoption of intercrops was the lowest in North Kerala with almost 64 per cent of the plots considered were without any intercrops (Table 2). Analysis of regional preferences of intercrops (Table 3) had revealed that banana/plantains are the most popular intercrops in the entire traditional belt. Its adoption varied from nearly 86 per cent in North-Central Kerala to 48 per cent in

Central Kerala. In the southern part of the traditional belt, tapioca (11.23% in Kanyakumari and 23.56% in South Kerala) was the second most preferred intercrop. Although tapioca is not recommended for extensive intercropping in rubber due to its agronomic incompatibility, it was extensively intercropped. This was followed by vegetables in the region. In northern regions vegetables (10.22% in North-Central Kerala and 14.84% in North Kerala) were the second most preferred intercrop followed by tapioca (1.86% and 8.71%, respectively in North-Central Kerala and North Kerala). Pineapple was not a major intercrop in the traditional belt except for Central Kerala where the crop had a major stake (39.77%).

Table 2. **Region-wise adoption of intercrops (2004-10)**

Adoption of intercrops	Kanyakumari	South Kerala	Central Kerala	North-Central Kerala	North Kerala
Plots with intercrops (%)	72.85	68.18	72.20	61.55	36.20
Total plots	4519	27184	38584	16064	51544

Table 3. **Regional preferences of intercrops during 2004-10 (%)**

Intercrop	Kanyakumari	South Kerala	Central Kerala	North-Central Kerala	North Kerala
Amorphophallus	0.03	0.84	0.35	0.29	0.93
Banana/plantains	82.65	66.21	48.28	85.75	71.20
Colocasia	0.54	0.44	0.12	0.05	0.50
Ginger	0.30	0.15	0.62	0.12	0.93
Paddy	0.14	0.10	0.06	0.03	0.22
Pineapple	0.72	2.85	39.77	1.13	1.97
Tapioca	11.23	23.56	3.89	1.86	8.71
Turmeric	0.03	0.02	0.14	0.16	0.18
Vegetables	4.24	5.02	5.90	10.22	14.84
Medicinal plants	0.06	0.61	0.09	0.15	0.25
Seedling nursery	0.06	0.20	0.78	0.24	0.27
Total intercropped plots	3292	18534	27857	9887	18658

Table 4. Shift in preferences of intercrops (%)

Intercrop	Kanyakumari		South Kerala		Central Kerala		North-Central Kerala		North Kerala	
	2004	2010	2004	2010	2004	2010	2004	2010	2004	2010
Amorphophallus	0.00	0.00	0.56	1.17	0.48	0.20	0.34	0.00	1.40	1.00
Banana/plantains	78.78	80.66	65.63	69.01	52.24	36.28	82.54	80.76	67.60	66.39
Colocasia	0.00	0.00	0.00	0.83	0.05	0.20	0.00	0.24	0.00	1.63
Ginger	0.00	0.41	0.00	0.14	0.00	1.96	0.00	0.12	0.00	1.91
Paddy	0.00	0.00	0.15	0.14	0.05	0.13	0.00	0.12	0.06	0.09
Pineapple	1.47	1.23	3.20	3.45	35.55	51.40	0.88	3.56	2.07	2.54
Tapioca	17.40	11.52	22.92	22.57	4.38	3.62	2.58	3.09	8.30	10.45
Turmeric	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.35	0.00	1.10
Vegetables	2.06	5.76	7.28	2.00	7.22	4.02	13.52	11.40	20.27	14.53
Medicinal plants	0.29	0.00	0.26	0.28	0.03	0.03	0.14	0.12	0.30	0.09
Seedling nursery	0.00	0.42	0.00	0.41	0.00	1.60	0.00	0.24	0.00	0.27
Total intercropped plots	339	486	2691	1449	3744	3010	1472	842	3577	1101

Shifts in preference of intercrops

Adoption of intercrops at two points of time (2004 and 2010) was analysed to find out the changes, if any, in the regional preferences of intercrops (Table 4). In Kanyakumari, the major intercrops *viz.*, banana/plantains, tapioca and vegetables maintained their respective positions in 2010 as compared to 2004. The share of tapioca declined marginally (17.40 to 11.52%) from 2004 to 2010 while that of banana/plantains and vegetables had registered a marginal increase (78.78 to 80.66% in case of banana/plantains and 2.06 to 5.76% in the case of vegetables).

In South Kerala, banana/plantains (65.63% in 2004 and 69.01% in 2010) and tapioca (22.92% in 2004 and 22.57% in 2010) continued to occupy the first and second positions in both the periods. Vegetables were replaced by pineapple (3.45%) as the third most preferred intercrop in 2010.

In Central Kerala, pineapple (51.40%) had replaced banana/plantains (36.28%) as

the choicest intercrop in 2010. Vegetables continued to occupy the third position in both the phases though its relative share has come down in 2010.

In North-Central Kerala, banana/plantains (82.54% in 2004 and 80.76% in 2010) and vegetables (13.52% in 2004 and 11.40% in 2010) continued to occupy the first and second positions in both the periods. Pineapple (3.56%) had replaced tapioca (3.09%) as the third choicest intercrop in the region. The number of plots under pineapple had registered more than two fold increase from 2004 to 2010.

In North Kerala, banana/plantains, vegetables and tapioca maintained their respective positions in 2010 as was in 2004. While the relative share of vegetables had gone down from 20.27 per cent in 2004 to 14.53 per cent in 2010, the share of tapioca as an intercrop was increased to 10.45 per cent in 2010.

The relative share of plots with minor intercrops like colocasia, ginger, turmeric

Table 5. Holding size-class-wise adoption of intercrops during 2004-10 (%)

Intercrop	Kanyakumari			SouthKerala			Central Kerala			North-Central Kerala			NorthKerala		
	≤ 0.5	>0.5-1	>1	≤ 0.5	>0.5-1	>1	≤ 0.5	>0.5-1	>1	≤ 0.5	>0.5-1	>1	≤ 0.5	>0.5-1	>1
Amorpho-phallus	0.04	0.00	0.00	0.93	0.59	0.39	0.43	0.21	0.05	0.32	0.31	0.10	1.06	0.75	0.15
Banana/plantains	80.73	88.16	91.97	65.65	68.75	69.02	51.36	42.57	36.22	84.84	87.34	88.09	70.45	72.49	75.09
Colocasia	0.59	0.21	0.80	0.47	0.33	0.26	0.13	0.09	0.11	0.05	0.04	0.10	0.52	0.47	0.37
Ginger	0.31	0.42	0.00	0.16	0.19	0.00	0.70	0.49	0.27	0.17	0.04	0.00	0.92	1.06	0.67
Paddy	0.12	0.22	0.00	0.10	0.15	0.13	0.07	0.02	0.11	0.03	0.00	0.10	0.19	0.34	0.22
Pineapple	0.62	0.63	2.01	1.59	5.94	13.44	35.26	47.88	58.52	0.61	1.63	3.32	1.43	2.07	7.06
Tapioca	12.99	6.98	1.61	24.70	20.16	12.96	4.29	3.30	1.76	2.19	1.24	1.17	9.29	7.89	5.28
Turmeric	0.04	0.00	0.00	0.03	0.00	0.00	0.15	0.10	0.05	0.18	0.18	0.00	0.19	0.18	0.00
Vegetables	4.44	3.38	3.21	5.63	2.90	2.23	6.91	4.09	1.76	11.32	8.82	6.25	15.56	13.88	10.42
Medicinal plants	0.04	0.00	0.40	0.60	0.59	0.92	0.11	0.05	0.05	0.11	0.09	0.49	0.21	0.38	0.15
Seedling nursery	0.08	0.00	0.00	0.14	0.40	0.65	0.59	1.20	1.10	0.18	0.31	0.38	0.18	0.49	0.59
Total intercropped plots	2563	473	2561	4688	2694	11521	19439	6585	1833	6589	2267	10311	13435	3867	1356

etc. had increased marginally from 2004 to 2010 in the traditional belt. Rubber seedling nurseries were never grown as an intercrop in young rubber plantations in 2004, but it showed its presence in all the regions by 2010. Rubber seedling nurseries are generally established in the young rubber plantations by the nursery owners on contract basis. This provides another entry point for contractors in the rubber smallholdings sector.

Holding size-wise adoption of intercrops

Holding size-class-wise adoption of intercrops are presented in Table 5. In Kanyakumari, banana/plantains were the most popular intercrop in all the size-classes. Its adoption varied from 80.73 per cent in the smallest size-class to 91.97 per cent in the largest size-class. Banana/plantains

were followed by tapioca and vegetables in the less than one hectare size-classes, while in the above one hectare size-class banana/plantains were followed by vegetables and pineapple. The share of tapioca and vegetables as intercrops were higher in smaller holdings as these crops are mainly grown for own consumption. The popularity of commercial crops such as banana/plantains and pineapple had increased with holding size. Apparently, this trend is an outcome of the growing popularity of contract farming of intercrops in young rubber plantations to harness the advantages of economies of scale as observed in Central Kerala (Siju *et al.*, 2012).

In South Kerala, banana/plantains were the most popular intercrop. Its adoption varied from 65.65 per cent in the smallest size-class to 69.02 per cent in the

largest size-class. It was followed by tapioca (24.70 and 20.16%) in less than or equal to 0.5 ha and >0.5-1 ha size-classes while pineapple occupied the second position (13.44%) in the largest size class. Vegetables occupied the third position in the smaller size-classes while tapioca occupied the third position in the largest size class. The share of crops like tapioca, vegetables, amorphophallus, colocasia *etc.* was more in the smaller holdings, as these crops were grown by smaller farmers for subsistence purpose.

In Central Kerala, pineapple was the choicest intercrop in the larger size-classes. Its adoption varied from 35.26 per cent to 58.52 per cent in the region. Banana/plantains had occupied the first position in the smallest size-class while in >0.5-1 ha (42.57%) and above 1 ha size-classes (36.22%) it was placed second next to pineapple. Vegetables and tapioca are the other major intercrops across the size-classes. As observed in the other regions, inverse relation with size of holdings and adoption of subsistence crops like tapioca, vegetables, amorphophallus *etc.* was observed in this region also. While popularity of pineapple increased with increase in holding size, the relative popularity of banana decreased with increase in holding size. This phenomenon of decrease in popularity of banana *vis-a-vis* increase in holding size was not evident in any other regions of the traditional belt. This may be due to the unprecedented importance gained by pineapple intercropping in the region in the context of contract farming.

In North-Central Kerala, banana/plantains were the most popular intercrop in all size-classes. Its adoption varied from 84.84 per cent in the smallest size-class to 88.09 per cent in the largest size-class. Banana/plantains were followed by

vegetables in all the size-classes. Its adoption varied from 11.32 per cent in the smallest size-class to 6.25 per cent in the largest size-class. Pineapple is emerging as a major intercrop in the above 1 ha size-class. Thus the popularity of banana/plantains, pineapple and seedling nursery as intercrop has increased with increase in holding size.

In North Kerala, banana/plantains were the most popular intercrop in all the size-classes. Its adoption varied from 70.45 per cent in the smallest size-class to 75.09 per cent in the largest size-class. It was followed by vegetables (15.56% to 10.42%). Tapioca was the third most popular intercrop in the below 1 ha size-classes while pineapple occupied the slot in the largest size-class. The popularity of commercial crops like banana/plantains, pineapple and seedling nurseries increased with the size of holdings and popularity of food crops like vegetables, tapioca and yams were more in smaller holdings.

In all the regions, except for Central Kerala, adoption of intercrops was the

Table 6. Distribution of plots with intercrops across size-classes (%)

Region	Size class (ha)		
	≤ 0.5	>0.5-1	>1
Kanyakumari	73.64 (2563)	71.12 (473)	68.40 (256)
South Kerala	68.92 (14688)	65.23 (2694)	62.01 (1152)
Central Kerala	71.64 (19439)	73.43 (6585)	73.70 (1833)
North-Central Kerala	63.12 (6589)	59.87 (2267)	56.14 (1031)
North Kerala	37.39 (13435)	34.02 (3867)	31.93 (1356)

Note: Figures in the parentheses are intercropped plots in the respective size-classes.

highest in the smallest size-class (≤ 0.5 ha) (Table 6). In Central Kerala, the size-class above 1ha had the highest adoption of intercrops in the immature phase of rubber. Thus adoption of intercrops is inversely proportional to the size of holding in the traditional belt except in Central Kerala. The phenomenon in Central Kerala could be attributed to the deeper penetration of contract farming of intercrops.

CONCLUSION

Regional variations in the adoption of intercrops ranged from nearly 73 per cent in Kanyakumari to 36 per cent in North Kerala. Though banana/plantains continued to be the most preferred intercrop in the traditional belt, shifts in regional preferences were evident over time as

underlined by the emergence of pineapple as the choicest crop in Central Kerala. The size-class-wise differences in the adoption of commercial crops and food crops across the regions deserve attention in the backdrop of growing dependence on hired labour and contract farming. In the emerging scenario, the prescribed agro-management practices for intercropping/immature phase of rubber could be the casualty as observed in Central-Kerala (Siju *et al.*, 2012). One potential source of policy intervention may be the involvement of Rubber Producers' Societies (RPS) and the Rubber Board promoted companies to undertake contract planting of rubber and cultivation of intercrops complying with the recommended package of practices.

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