EFFECT OF RUBBER ON INTERCROPPED TEA DURING IMMATURE PHASE OF RUBBER CULTIVATION

Gitali Das, Rama Shankar Singh, Tankeswar Gohain, Shankar Meti*, D. Chaudhuri and M.A. Nazeer***

Rubber Research Institute of India, Regional Experiment Station, Nagrakatta, Jalpaiguri-735 225, West Bengal, India

*Rubber Research Institute of India, Kottayam-686 009, Kerala, India

** Rubber Research Institute of India, North Eastern Research Complex, Guwahati-781 006, Assam, India

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An experiment was conducted to assess the eco-physiological sustainability of growing tea as an intercrop in rubber in the Dooars area of West Bengal and to identify the optimum spacing for both the crops. Four different combinations of rubber interplanted with tea, along with pure rubber and tea as controls were considered. Results proved that growth of rubber was better under intercropped plots than pure crop. Girthing of rubber (5 x 5 m, one row) intercropped with tea (1 x 0.6 m, 10 rows) was significantly higher than that in the pure rubber stand (5 x 5m). Higher girth of tea was observed in pure crop stand (1 x 0.6m) followed by paired rows (18m x 3x3) interplanted with tea (1 x 0.6m, 18 rows). Yield of green tea leaf was found to be higher in pure tea stand than in the other treatments. The remunerative index worked out for up to sixth year of planting indicated the beneficial effect of rubber intercropped with tea.

Key words: Girth, Intercropping, Rubber, Tea, Yield.

Integration of an intercrop with rubber during the immature phase of its cultivation can be useful for maximum land use efficiency. It also generates income so that a farmer can sustain his family during the unproductive period. Banana, pineapple and coffee are reported to be good intercrops during early growth phase of rubber (Chandrasekhara, 1984; Rajasekharan, 1989; Rodrigo *et al.*, 1997; Jessy *et al.*, 1998, Roy *et al.*, 2001; Pathiratnam and Perera, 2002). Timber trees like teak and mahagony are also reported as intercrops with rubber (Rodrigo *et al.*, 2002).

In the Dooars area of North Bengal, rubber cultivation is found to be promising though the land is only marginally suitable (Rao *et al.*, 1993). Tea cultivation is dominant in this area due to the favourable agroclimatic conditions like high rainfall, low soil pH and high relative humidity. Tea prices are often fluctuating and the growers get very poor returns when prices are low. Rubber is suggested as a suitable intercrop as a source of additional income and an insurance against low tea prices. Interplanting tea with rubber is reported to be suitable cultural practice in Sri Lanka for

Correspondence: Gitali Das (Email : gitalidas@rubberboard.org.in)

smallholders (Yogaratnam and Iqbal, 1998; Iqbal *et al.*, 2005). In China, rubber-tea intercropping is reported as one of the most desirable crop combinations among different systems tested (Lin *et al.*, 1994; Deng, 1994). Different spacings of rubber and tea was studied to assess the appropriate spacing for their combination.

The experiment was laid out in the Regional Experiment Station of Rubber Research Institute of India at Nagrakatta in northern West Bengal (Fig. 1). The annual rainfall in the region is around 3500 mm and the mean temperature ranges between 17.2 (minimum) to 29.6°C (maximum). Soil is acidic (pH 4 to 4.5) with high organic carbon content.

Fig. 1. Rubber-tea intercropping

Six treatments using different spacings between rubber and tea were considered. Experiment was laid out in randomized block design with four replications. The plot size was 45 x 20 m. Rubber (RRII 105) and tea (TV-23) were planted during 1999 and 2000 respectively. The treatments are shown in Table 1.

Standard package of practices for rubber (Rubber Board) and tea (Tea Research Association) were followed. The girth of rubber and tea were recorded at quarterly intervals for seven consecutive years. Harvesting of tea was initiated after two years planting. Remunerative index (RI) was calculated based on the formula suggested by Willey and Osiru (1972).

$$RI = \frac{\text{Average girth of rubber in mixture}}{\text{Yield of intercrop (tea) in mixture}} + \frac{\text{Average girth of rubber in pure-stand}}{\text{Yield of intercrop (tea) in pure-stand}}$$

The effect of different treatments on growth of rubber and tea is shown in Table 2.

Table 1. **Details of treatments**

Treatment No.	Treatment	Rubber			Tea		
		Spacing (m)	No. of plants per ha.	Share of recommended density (%)	Spacing (m)	No. of plants per ha.	Share of recommended density (%)
T1	Rubber	5 x 5	400	100	-	-	-
T2	Rubber +Tea	10 x 2.5	287	72	10x1x0.6	11690	70
T3	Rubber +Tea	12 x 2.5	246	62	12x1x0.6	12024	72
T4	Rubber +Tea	18x (3x3)*	272	68	18x1x0.6	12024	72
T5	Rubber +Tea	10 x 5	140	35	10x1x0.6	11690	70
T6	Tea	-	-	-	1x0.6	16667	100

*Paired row

Table 2. **Growth of tea and rubber**

Treatment	Tea					Rubber	
	Girth at 7th year (cm)	Annual girth increment from 6th to 7th year (cm)	Number of branches/plant (at 7th Year of growth)			Girth at 8th year (cm)	Annual girth increment from 7th to 8th year (cm)
			Primary	Secondary	Tertiary		
T1 (Rubber)	-	-	-	-	-	49.01	9.94
T2 (R + T)	13.97	7.30	3	12	27	48.81	10.03
T3 (R + T)	13.53	7.77	3	13	26	52.57	8.98
T4 (R + T)	14.72	8.03	3	13	27	47.62	9.61
T5 (R + T)	14.67	6.86	3	12	27	56.91	9.65
T6 (Tea)	15.20	9.71	3	14	30	-	-
CD (0.05)	NS	NS	NS	NS	NS	4.73	NS

The girth of the individual rubber trees after 7 years in the treatment (T5) was significantly higher than that of the pure rubber (T1), which may be due to the wider spacing of rubber reducing the competition between the rubber plants. However, the stand was only 35 per cent of T1. The annual girth increment from seventh to eighth year was not significantly different among the treatments. However, earlier observation (first year) from the same experiment showed that the annual girth increment of T1, T3 and T5 were similar, while T2 and T4 were significantly lower than T1 (Gohain *et al.*, 2002 & 2004). In another experiment on rubber–tea intercropping in Sri Lanka, the intercropped rubber showed better girthing than pure rubber after eight years of growth (Yogaratnam and Iqbal, 1998). There was no significant difference between the girth of tea in different treatments. No significant difference was noticed in the primary, secondary and tertiary branches per plant also. The result indicates that the intercropping of tea with rubber did not adversely affect the growth of tea.

Deng (1994) observed that the fresh and dry weight, total length and total surface area of feeder roots of rubber trees in the 0-10 cm soil layer under rubber + tea intercropping were significantly more than that of monoculture rubber. This highlights the beneficial effect of intercropping tea in rubber.

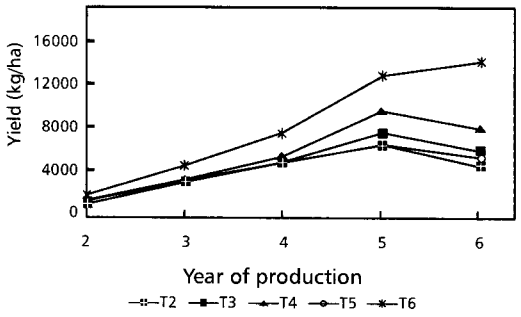

Fig. 2. Production of green tea leaf in consecutive years

The yield of green tea leaf (Fig. 2) was found to be significantly higher in pure tea stand in all the five years compared to that of the other treatments when calculated on the basis of actual plant population. The lower plant stand of tea per hectare in T2 (70%), T3 (72%), T4 (72%) and T5 (70%) was reflected as lower yield.

A progressive yield increase was observed for all the treatments till the fifth year, after

which there was a sharp decline for T2, T3, T4 and T5. In pure tea (T6) the increasing trend continued. The percentage of crop loss in the sixth year was 31, 22, 17 and 22 respectively for T2, T3, T4 and T5 over the previous year. In pure tea, the gain in yield in the sixth year was 10%. This indicates that tea is an economically viable intercrop during immature period of rubber. But when canopy of rubber closes, tea yield is affected adversely. As rubber was not in the yielding stage, the benefit: cost ratio for the intercropping system could not be calculated. Yogaratnam and Iqbal (1998) observed overall higher yield from rubber + tea intercropping and no difference in tea yield in the intercropped plots upto eight years from planting. However, the crop growth rate and dry matter conversion efficiency were more under wider inter-space. The presence of a root barrier in between the two intercrops improved the productivity of tea. Though tea as intercrop could not show significant beneficial effect over the monocrop of tea, when the crop productivity of both the crops were considered, it was promising (Iqbal *et al.*, 2005)

The remunerative index (RI) is used to quantify the beneficial effect of intercropped systems over main crop- where one crop is in immature stage while the other is in the yielding stage (Willey and Orisu, 1972). The RI was more than one in all the intercropped systems during sixth year of planting (Fig.3) indicating the beneficial effect of intercropping

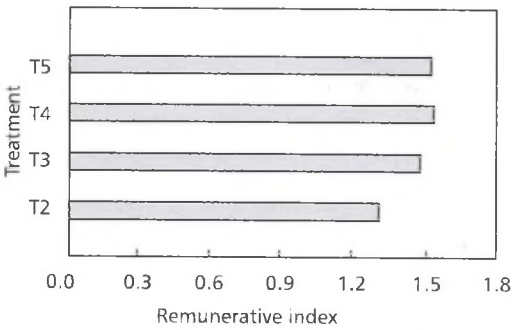

Fig. 3. Remunerative index of rubber plants

over monocrop. Higher RI values were observed for T4 (1.54) and T5 (1.53) indicating advantage of these systems of rubber + tea intercropping upto sixth year.

The intercropping of rubber with tea was observed to be beneficial in the early stages of growth of rubber. The yield of tea was not significantly affected in the different systems upto fifth year. As the rubber did not start yielding the overall economic assessment could not be made.

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