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Rubber/timber intercropping systems and their impact on the performance of rubber

V H L Rodrigo*, T U K Silva*, L S Kariyawasam* and E S Munasinghe*

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Abstract

Current low productivity levels of rubber cultivations could practically be addressed by intercropping techniques. Obviously, there is an increasing demand for timber, hence this study aimed to investigate the feasibility of growing timber crops with rubber under three different systems, i.e. *timber species are grown a) in between rubber rows b) on the boundary and c) in vacant patches of rubber clearings (as a means of infilling). Four different timber species and two different spatial arrangements of planting rubber were tested to assess the system 'a' and* in situ *assessments were done for the rest. Alstonia could be established together with rubber compromising the growth and yield of rubber crop. Also, Alstonia could not be established properly under the shade given by five-year old rubber planted in the traditional single row system.. The shade provided by the rubber canopy has mitigated the stem borer attack on Mahogany, hence the establishment of Mahogany was successful with five year old rubber. Paired row planting system of rubber was preferred over the traditional single row planting system for the better establishment of both Alstonia and Mahogany with five year old rubber. Timber trees could be planted along the boundaries and in the vacant patches of rubber clearings with no adverse effects on growth and yield of rubber.*

Key words: intercropping, rubber, timber

Introduction

Rubber crop covers an extent of *ca.* 156 thousand hectares presently in Sri Lanka (Plantation Sector Statistical Pocket Book, 2001) and provides employments to over 500,000 people (Sri Lanka Council for Agricultural Research Policy, 1992). Although it is an important crop both in social and economic aspects, the area under rubber cultivation tends to be declining over past few years, probably due to urbanisation resulted from increased population (particularly in the wet zone where most of rubber is grown), poor market prices of rubber and high production cost hence low profits. On average during 1990s, the extent of rubber dropped at a rate of *ca.* 2.5% annually (Plantation Sector Statistical Pocket Book, 2001). In Sri Lanka, the area under forest cover is less than 20% (Bandaratillake, 1999) which is far below the figure (57%) recorded for Malaysia, a major rubber growing country. With urbanization, the demand for timber increases, hence the forest cover is under continuous threat. Since

* Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka

timber plants require a long period to generate income, people in general, are reluctant to use their commercial lands for growing timber crops. Rubber has proven itself as a quality source of timber once treated. This however, needs extremely expensive treatment plants which are lacking in Sri Lanka.

Intercropping as a means of increasing land use efficiency, has successfully been applied to rubber crop in Sri Lanka (Chandrasekera, 1984; Rodrigo *et al.*, 1997; Rodrigo *et al.*, 2000; Rodrigo *et al.*, 2001a). However, most of these intercropping systems of rubber have been limited. to the immature phase of rubber and only a few crops were able to sustain under the mature rubber canopy. Timber crops appear to be one of those and if timber species are interplanted with rubber, they will boost the total income from rubber lands together with increased production of timber which would undoubtedly release the pressure on the natural forest cover.

Spatial advantages are apparent in many intercropping systems and it may be achieved from the more efficient use of light in heterogeneous than in homogeneous canopies (Tournebize & Sinoquet, 1995; Rodrigo, 1997; Rodrigo *et al.*, 2001b). Use of improved spatial arrangements for planting crops, would further facilitate to have less inter-specific competition. and also result in efficient light use in the system. Also, it may be possible to have spatial advantage in the edaphic environment due to differences in root distribution of component crops in intercropping systems. Timber crops are not generally manured, hence may compete with rubber, if grown in combination. However, the ecosystem made by the rubber/timber system may provide improved recycling of nutrients and soil conservation with added litter from deep rooted timber crops [*i.e.* by means of nutrient pumping (van Noordwijk *et al.*, 1996)]. Therefore, timber species may be incorporated into the rubber crop in such a way that inter-specific competition would be minimal. Unlike most of other crops, advantages of timber crops are such that timber crops require little attention and can even be grown on marginal lands.

Having understood the importance of both rubber and timber crops cultivations, this study aimed to investigate the feasibility of growing timber species as rubber based intercrops. Objectives were threefold, *i.e.* to assess the rubber/timber system where timber species were grown a) in between rubber rows b) on the boundary of the rubber plots and c) in vacant patches of rubber fields (*i.e.* as a method of infilling).

Materials and Methods

The study comprised of three types of experimental materials in order to fulfill the objectives. A small scale field experiment was laid down in 1992 in two sites in order to assess the feasibility of growing timber species in between rubber rows. Locations where timber species had already been planted on the boundaries of rubber crops and to fill vacant rubber plants, were selected for *in situ* evaluations. All sites were located in the low-country wet zone of Sri Lanka.

Growing timber in between rubber rows

Two types of planting systems (spatial arrangements) for rubber were used for the study, *i.e.* a) the single row planting system which is traditionally used for intercropping, 2.4m × 8.1m (SR), b) a paired row system with a spacing of 2.4m × 2.4m within the paired rows and 13.8m between the paired rows (DR). Four economically important timber species, *Alstonia macrophylla, Tectona grandis, Swietenia macrophylla* and *Beriya cordiforlia* [locally referred as Havarinuga/Alstonia, Teak, Mahogany and Halmilla, respectively], were planted with a control plot (*i.e.* without timber plants) in above two systems of rubber on split plot statistical design (spatial systems were main plots, whilst planting of timber species were done in sub plots). In the system SR, timber crops were planted in a single row between two rubber rows and in DR, in three rows between two double rows of rubber. Planting distances of timber trees were 4.5m apart along the row and for the DR system, equal distances were kept between rows across the transact. In addition to these intercropping systems, two high densities of rubber, which were equal to the total crop densities (rubber plus timber) in both single and double row systems of rubber, were established (HDS and HDD systems, respectively). Two commercial estates namely, Ambetenna and Uskvalley, were selected for the study. however, each estate had only one set of replicates due to the limited land size with one hectare for a main plot. Treatments were laid randomly in the experimental area. The initial establishment of Teak and Halmilla was completely unsuccessful in the Ambetenna estate, hence those were replaced by Mahogany and Alstonia, respectively in this estate 5 years after planting (YAP) rubber.

Growth of rubber with respect to girth at the height of 90 cm was monitored throughout the experimental period of 8 years. Majority of rubber plants became tappable during the 7^{th} YAP and daily latex yields were recorded. In addition, bark thickness at 150 cm height of the trunk of rubber was measured with a bark gauge.

Growth of timber on the boundary of rubber crop

A preliminary survey was conducted to find estates where timber plants were grown on the boundary of the rubber crops. Technical and research staff of the Rubber Research Institute of Sri Lanka (RRISL) who visited commercial estates for different experimental activities, were interviewed for this purpose. Four sites in three selected commercial estates (*i.e.* Kiriwanaketiya, Miriswatta and Clyde) were identified. Timber species grown were *Alstonia macrophylla* and *Artocarpus heterophyllus* (locally referred as Alstonia and Jack, respectively). Site details are given in the Table 1. Growth and yield parameters of rubber. *i.e.* girth at 150 cm height, bark thickness at 150 cm height and yield of rubber, were assessed. As these sites had not been planned for research at the beginning, proper control treatments for comparison, *i.e.* without timber crops under similar situations, could not be found in all cases. Therefore, the effect of timber trees on rubber was assessed along the three rows of rubber from timber plants with the assumption that competitive effects of timber plants on rubber should diminish within such distance.

Use of timber plants for infilling the vacant rubber plants

A commercial estate (Devalakanda) where timber species, Alstonia and Mahogany, had been planted in order to fill the gaps resulted from dead rubber plants, was selected for the assessment. The area comprised five rubber clearings planted in 1975, 1980, 1989, 1990 and 1991. Timber species were planted in 1998. The study was conducted when these clearings were at 25, 20, 11, 10 and 9 YAP, respectively. Also, age of the timber plants was *ca.* 2 years at the time of the study and plant height, the girth at 90 cm height and the rate of field establishment were recorded. The effect of timber plants on the growth and yield of rubber was assessed by measuring

Table 1. *Site details of different locations where timber trees were grown on the boundaries of rubber clearings*

Location	Site 1	Site 2	Site 3	Site 4
Rubber				
Clone	RRIC 100	RRIC 121	PB 86	PB 86
Year of planting	1986	1986	1985	1979
Extent (Ha)	8.5	5.75	6.25	13
Planting distance (m)	4.5 × 4.8	4.5 × 4.8	4.6 × 4.9	3.6 × 6
Timber Crop;				
Type	Alstonia	Alstonia	Alstonia	Jack
Year of planting	1986	1986	1985	1979
Number of trees	10	11	16	16
Mean girth (cm)	81.7	87.1	58.13	96.93
Standard Error of Mean girth	5.44	3.85	3.9	5.53
Planting distance along the timber row (m)	2.2 - 9.0	3.4 - 9.4	1.3 - 5.3	2.4 - 4.5
Mean value for the above (m)	5.55	6.40	3.28	3.45
Distance to timber from rubber plants (m)	1 - 6.8	1.1 - 5.5	1.6 - 3.3	1 - 5.7
Mean of the above (m)	3.9	3.28	2.45	3.35
Distance to any crop on other side of the timber row (m)	2.8 - 9.0	8.0 - 16.0	8.3 - 9.7	9 - 10.4
Mean value for the above (m)	5.9	12	9	9.7

girth and bark thickness at 150 cm height and latex yield per tree per tapping (g/t/t) of surrounding rubber plants. Similarly, those parameters of rubber plants of the same site with no timber trees grown close by, were also assessed.

Crop management

The management of rubber in all experimental sites was done by the respective estates following the general recommendations given by the RRISL. No fertilizer was applied to timber plants and general management was fully extensive.

Results

Growth of timber species between rubber rows

Establishment of timber crops

Girth of Alstonia was greater than that of other timber species tested (Table 2). However, the mean girth was based on the plants survived and so, it did not truly represent the plants grown successfully. Therefore, in order to determine successful growth of timber species, apart from girth and the number of plants survived, pest and pathogen infections and plant height were considered. Healthy plants over the height of 4 and 2 meters were considered as success, for plants established initially and subsequently, respectively. Initial establishment of Alstonia was successful in both sites and in both planting systems of rubber with a mean success rate of 93.6%, followed by Mahogany (mean success rate of 51.6%). However, success of other timber species was not encouraging, particularly in Ambetenna estate (Table 2). The principal reason for the poor early establishment of Mahogany was the damage done by the shoot borer as reported by the Forest Department of Sri Lanka. Occasional theft damages had been a problem for Teak since it was scarce in the area concerned and also, considered as a good timber crop by the community. Planting material of both Alstonia and Mahogany was freely available, so no such incidents were recorded. Establishment of Halmilla was very poor in both sites.

Halmilla and Teak in both SR and DR systems were replaced by Alstonia and Mahogany, respectively at Ambatenna estate in 1997 (at 5 YAP of rubber). However, the establishment of Alstonia was successful only in DR system (12.5% and 62.5% in SR and DR systems, respectively). Nevertheless, it was not the case for Mahogany which gave a success rate over 50% in both SR and DR systems.

Effect on growth and yield of rubber

In general, growth of rubber measured as the girth of the trunk at 90cm height showed a linear increase in all treatments up to sixth years after planting with an average rate of 7.6cm per year. However, rubber grown with Alstonia in both SR and DR systems, showed the lowest girth thereafter, particularly after the six years of planting (Fig. 1). Since Alstonia was the only crop that established successfully at the early stage of the experiment, the competition of this crop was assessed

Table 2. *Summary of the information on the growth and establishment of timber crops established between rubber rows. Halmilla and Teak in Ambetenna estate were replaced Alstonia and Mahogany, respectively at 5 years after planting of rubber (as denoted by *). In general, girth represents the mean plant girth measured at 90cm height, whilst success rate was determined by the % plants above 4m height with no severe pest infestation. However, for the cases denoted by *, girth measurements were taken at 10 cm height and % success was based on plant height at 2m. All measurements were taken at 8 years of planting of rubber. SR and DR represent the single and double row planting systems of rubber, respectively.*

Timber crop	Planting system	Ambatenna			Uskvalley		
		Girth (cm)	% Survived	% Success	Girth (cm)	% Survived	% Success
Halmilla	SR	-	-	-	8	100.0	27.20
	DR	-	-	-	8.0	82.1	10.70
*Alstonia	SR	3.8	68.8	12.5	-	-	-
	DR	14.3	70.8	62.5	-	-	-
Alstonia	SR	73.3	100.00	100.00	51.3	92.9	92.9
	DR	71.5	88.9	88.9	51.8	92.6	92.6
Teak	SR	-	-	-	41.7	100	7.7
	DR	-	-	-	27.2	72.4	17.2
*Mahogany	SR	4.9	91.7	50	-	-	-
	DR	6.7	100.0	77.8	-	-	-
Mahogany	SR	24.7	66.7	58.33	6.5	76.92	53.8
	DR	20.0	61.1	44.44	7.9	92.30	50.00

against a control (no intercrop) and high density rubber treatments (Fig.1c). Rubber with Alstonia in DR system has given the poorest performance, however, in general the performance of all other treatments was comparable showing similar girth values even at eight years after planting (YAP). The mean girth of rubber in Alstonia intercrops in DR system was 48.1cm at 8 YAP and 10.4% lower than the overall mean of other treatment, *i.e.* 53.7cm. Though not statistically significant, highest girth values of rubber at the end of the experiment was recorded in the sole SR system.

Ontogenetic increase in bark thickness was common to both SR and DR systems and in high density sole rubber crops (Fig. 2). On average, bark thickness has increased by *ca.*0.41mm during the two year period monitored. Although it is not statistically significant, bark thickness in SR system was greater than corresponding values of DR system with overall mean of SR differed by *ca.*7.6% from that of DR system at 8 YAP. Bark thickness of rubber grown with Alstonia was comparatively less among intercropped treatments and was comparable with values of HDS and HDD systems.

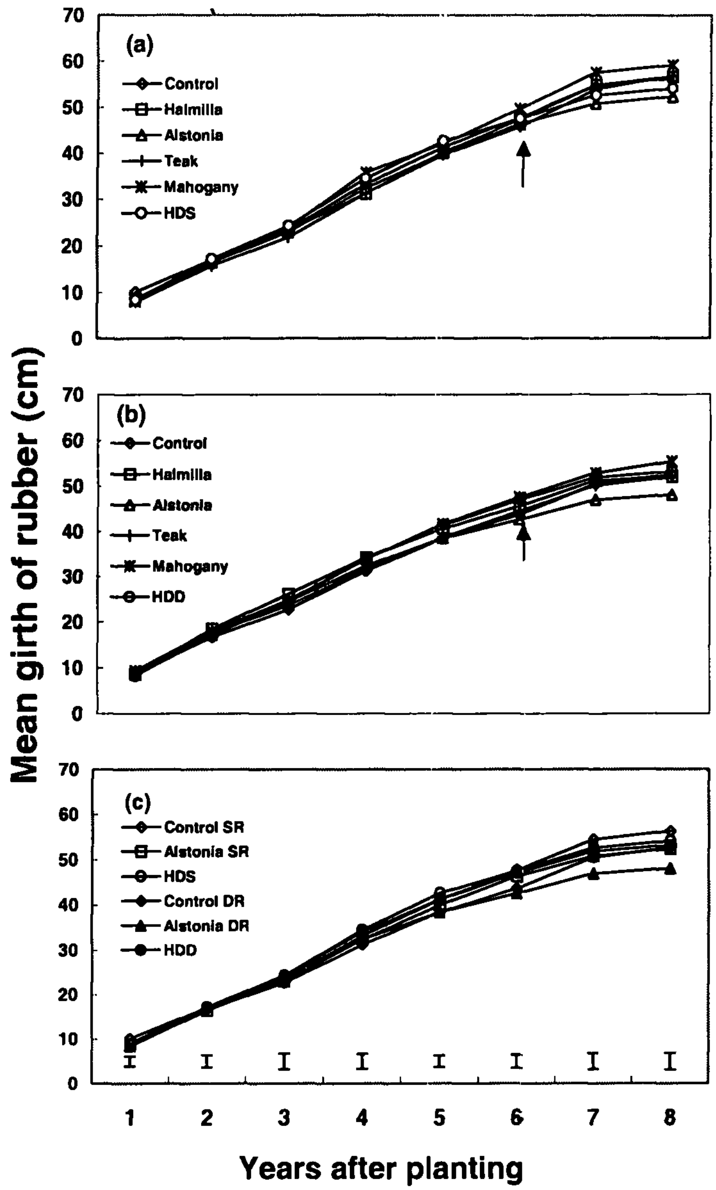


Fig.1. Treatment effect on girth development of rubber plants for single (a) and double (b) row planting systems and, in (c) data for rubber/Alstonia are presented in comparison with control (no intercrop) and high density treatments. Error bars in 'C' represents the LSD for the mean values at a given time point. Treatment codes SR and DR denote the single and double row planting systems of rubber, respectively, whilst HDS and HDD are for the high density rubber systems representing the total crop density in rubber/timber intercropping systems of SR and DR. At the time point shown by the arrow, Halmilla and Teak in UskVally estate were replaced by Alstonia and Mahogany.

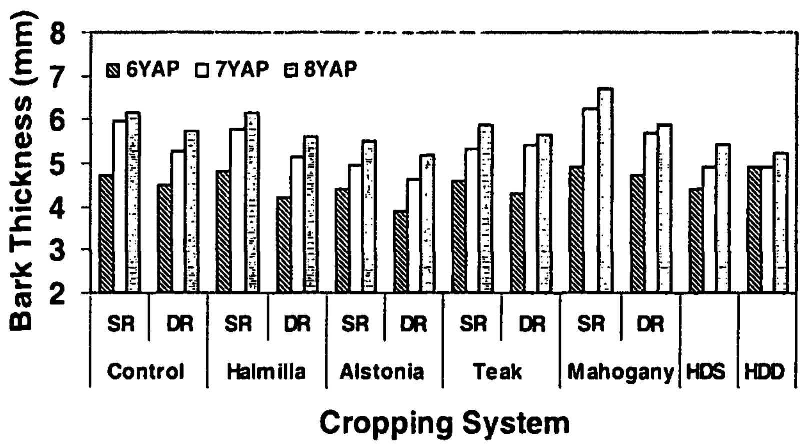


Fig. 2. Treatment effect on bark thickness of rubber plants during 6 to 8 years aftεr planting (YAP). Treatment codes SR and DR denote the single and double ro\ planting systems of rubber, respectively, whilst HDS and HDD are for the high dens..y rubber systems representing the total crop density in rubber/timber intercropping systems of SR and DR

Though not statistically significant, the % trees in tapping at 8 YAP was greatest in the SR system (with no intercrop) with all plants achieving the tappable girth. It was least in the Alstonia intercrop irrespective of the planting system (*i.e.* SR and DR) and in the HDS system (Table 3). The yield per tree per tapping (g/t/t/) of rubber was lowest in the Alstonia intercropped DR system and it was significantly ($P<0.05$) lower than that of the sole cropped DR system (Table 3). Similar difference was observed in the SR system and, the overall mean of g/t/t of the SR was greater than that of DR. The mean g/t/t of rubber in Alstonia intercrop for both SR and DR systems recorded a value of 17g and that was the lowest (significantly at $P<0.05$) among the intercropping systems tested. Similar to the response of g/t/t, the estimated yield per hectare per annum (YPH) which was based on tree yield per annum and % trees in tapping, showed poor performance in Alstonia plots with a mean of 710 kg/ha/yr, whilst in all other intercropping systems YPH was at or above 900 kg.

Growing timber on the boundary of rubber crop

In general, values for girth, bark thickness and g/t/t of rubber were more or less similar across the row position (*i.e.* with respect to timber row) of rubber, hence there was no evidence to confirm that rubber plants grown close to the boundary, have been affected by growing timber crops along the boundary in all four sites studied (Table 1 and Fig. 3). However, low values for girth, bark thickness and latex yield in the rubber row in the boundary (*i.e.* adjacent to timber trees) were recorded in the site 3 where planting of timber

Table 3. *Summary of the yield and yield components of rubber in the on-station experiment where timber crops were planted in between rubber rows. Values are for the eight year after planting of rubber. Mean yield per day (grams per tree per tapping) is shown by g/t/t and estimated yield per hectare per annum by YPH. SR and DR denote the single and double row planting systems of rubber, respectively, whilst HDS and HDD are for the high density systems representing the total crop density in rubber/timber intercropping systems of SR and DR*

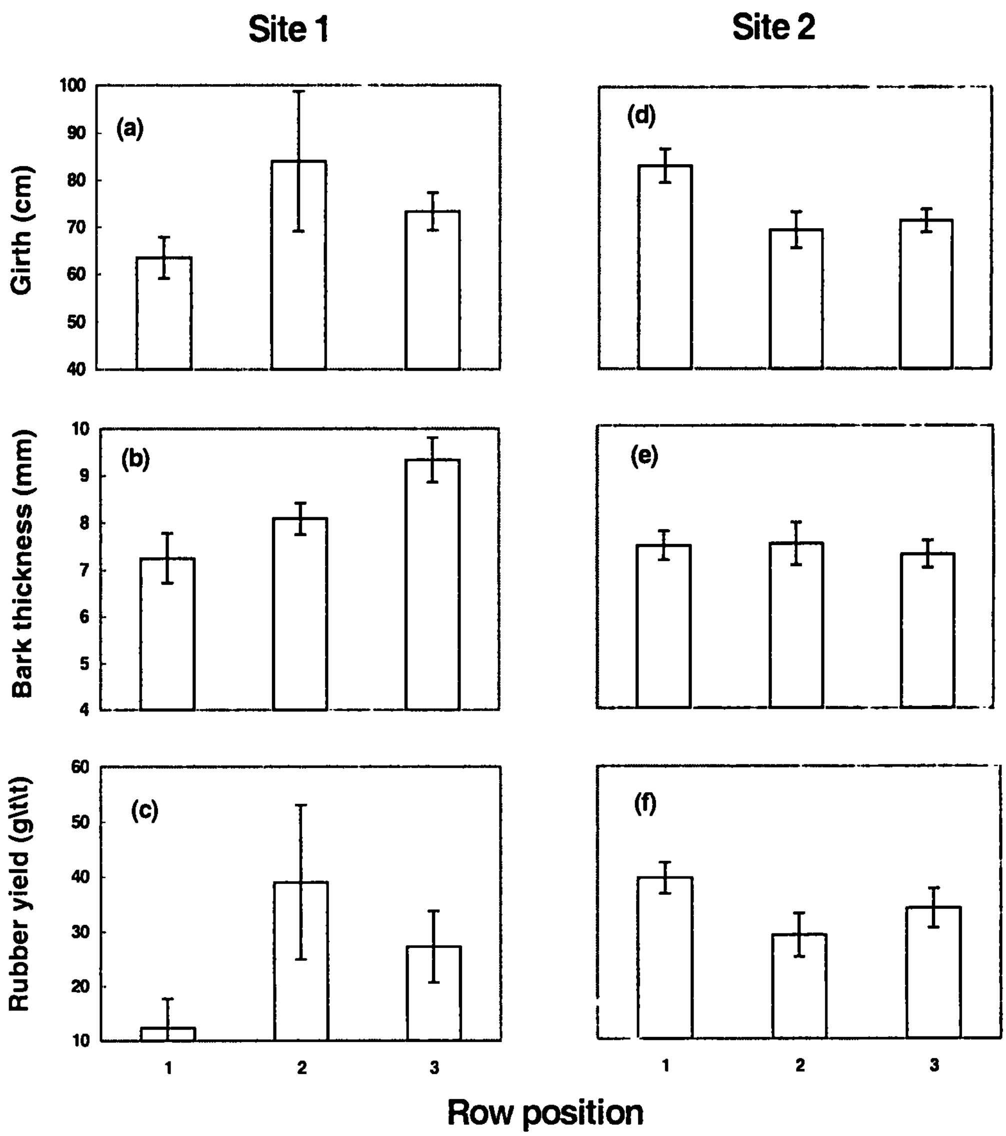
Planting system	Timber crop	% Trees in tapping	Mean g/t/t	Estimated YPH (kg/ha/yr)
SR	No timber	100.00	22.05	1068
SR	Halmilla	85.00	20.04	863
SR	Alstonia	80.77	19.50	828
SR	Teak	95.00	22.85	1062
SR	Mahogany	93.75	25.61	1180
DR	No timber	85.63	19.42	814
DR	Halmilla	89.20	21.78	935
DR	Alstonia	80.91	15.22	593
DR	Teak	91.67	18.68	848
DR	Mahogany	90.27	22.21	963
HDS	No timber	78.98	19.84	1461
HDD	No timber	88.22	20.35	1411

trees was done very close to rubber (*ca.* 2.5 m) and in the site 1 where a very limited gap was available to the next rubber crop on the other side of the boundary (mean of 5.9m with a median distance of 5m). Also poor girth values of timber trees were recorded in these two sites indicating that close planting of rubber and timber in the boundary might have an ill effect on either crop.

Use of timber plants for infilling the vacant rubber plants

The effect of timber plants on rubber trees was assessed in terms of girth and bark thickness at the height of 150cm and mean daily latex yield (g/t/t) of rubber plants around the timber trees in each clearing and data are presented in the Figure 4.

Also for the purpose of comparison, those measurements were done on rubber trees where timber trees were not grown close by. However, no such comparison could be done in the rubber clearing of R25 (25 years old clearing) since infilling of the whole clearing had been completed with Alstonia. In general, irrespective of the year of planting and the type of timber crop, none of the growth and yield parameters of rubber were affected by planting timber crops with values comparable in both categories, *i.e.* those of rubber plants close to timber trees and not. Growth of Mahogany was comparable in three locations (*i.e.* clearings) studied (Fig. 5). In contrast, performance of Alstonia was better in 25 years old rubber clearing compared to that in 20 years old.



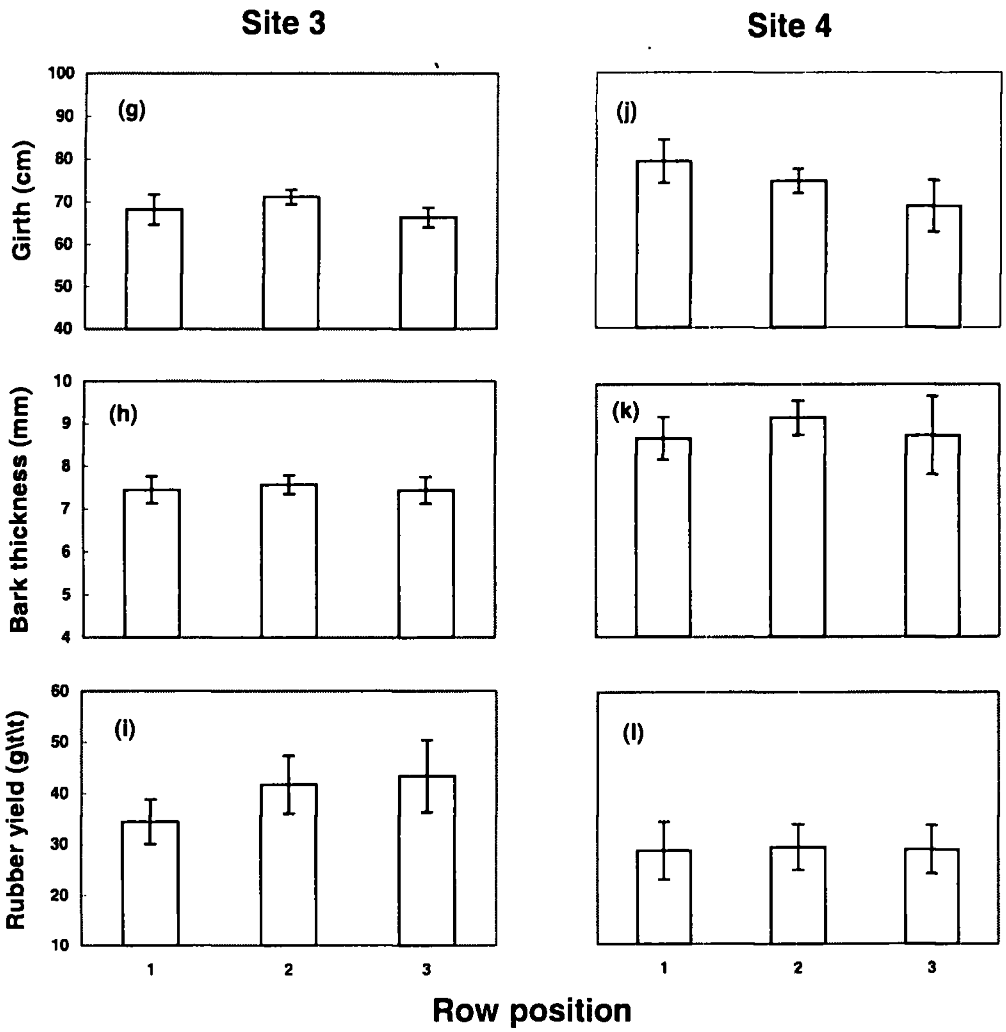


Fig. 3. Summary of the growth and yield parameters of rubber in four sites where timber crops had been planted on the boundary of rubber clearing. B.T. and g/t/t are for the bark thickness measured at the height of 150 cm and mean tree yield (grams per tree per tapping). Of site 4, jack had been planted and Alstonia was in the rest. Row position represents the position of rubber row from the boundary (*eg*. 3 for third rubber row from the boundary). Error bars represent the Standard Error Means.

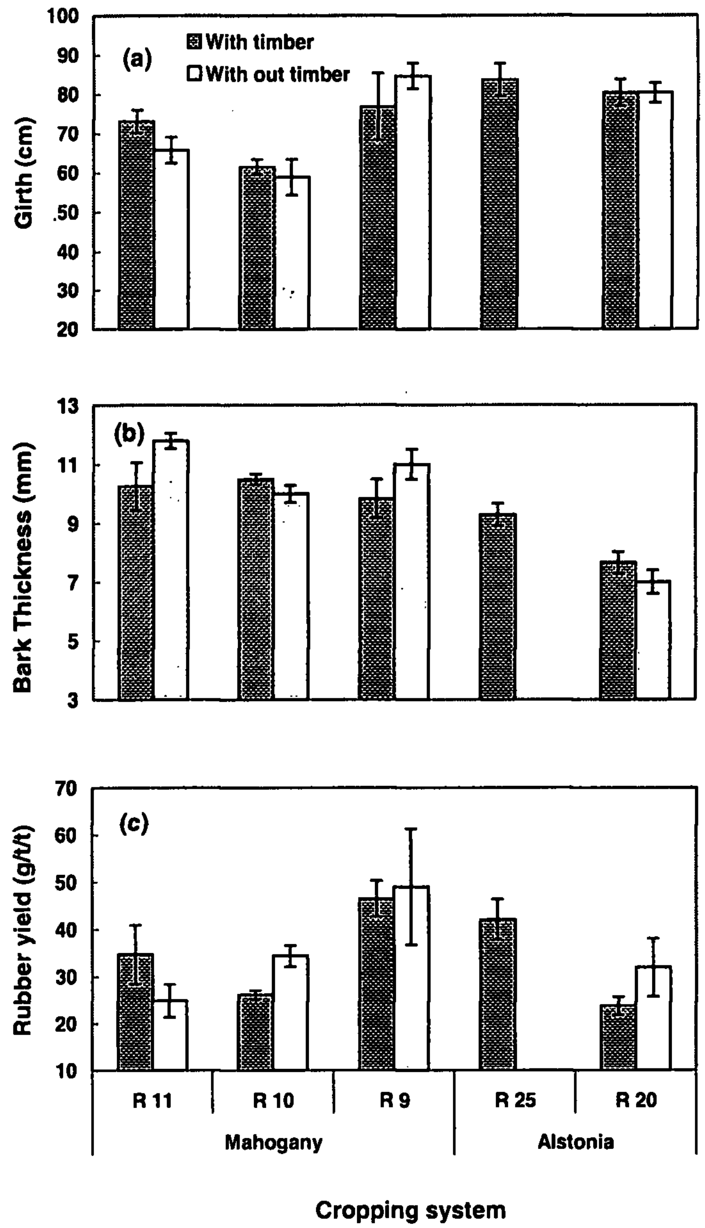


Fig. 4. Effect of planting timber crops on growth and yield parameters of rubber under conditions where timber crops were used for the purpose of infilling the casualties in mature rubber clearings. The R<number> indicates the age of the rubber clearing at the time of the study. No area without timber crop was found in R25 clearing. Error bars represent the Standard Error Means.

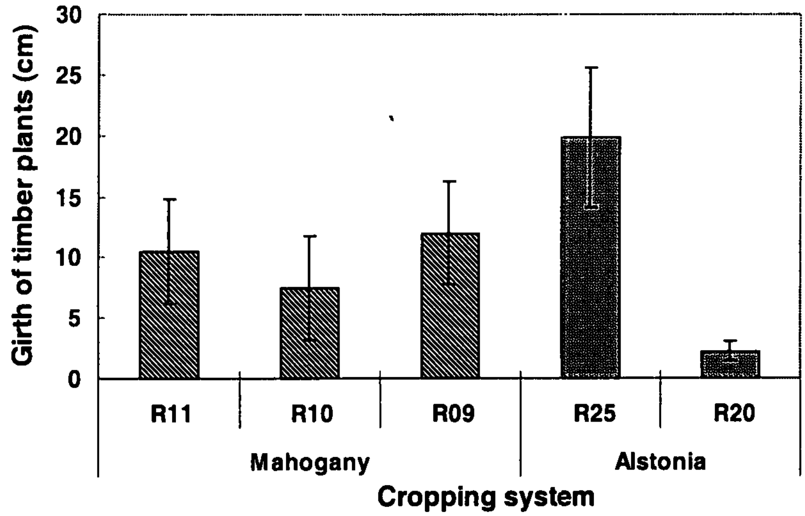


Fig. 5. Growth of timber crops planted for the purpose of infilling the casualties in mature rubber clearings. Girth measurements were taken two years after planting of timber crops. The R<number> indicates the age of the rubber clearing at the time of the study. Error bars represent the Standard Error Means.

Discussion

The present level of productivity together with poor market prices has resulted in a lack of motivation among rubber farmers to reinvest on rubber cultivation, hence declining trend in the rubber extent in the country during last 5-6 years (Plantation Sector Statistical Pocket Book, 2001). It is often argued that price of rubber is the prime factor that motivates farmers. However, if productivity can be raised with minimal cost, it will definitely improve the profitability. Further increase in potential productivity levels under sole-cropping systems has its own limitation due to the cost effectiveness of doing so. Heterogeneity nature of intercrops has proven to be more efficient in resource capture over the sole crops (Rodrigo *et al.* 2000; Rodrigo *et al.* 2001b), so provides an efficient way to raise the overall productivity and hence profitability. However, care must be taken to select the crops for rubber based intercrops in accordance with agronomic compatibility and the socio-economic needs of individual farmers. Growing timber crops with rubber involves minimal investments as the costs are only for planting materials and field establishment. However, a high return could be expected in the long run.

The present study revealed that Alstonia and Mahogani are some of feasible timber crops that could be interplanted with rubber. The rate of success of other timber crops, *i.e.* Teak and Halmilla was extremely poor; hence their suitability is dubious, unless improved techniques are adopted.

However, extra care increases the cost and does not motivate growers especially under a long-term return systems like cultivation of timber crops. As shown by growth and yield parameters of rubber, if Alstonia is planted at initial stage together with rubber, the competition given to rubber is increased. If Alstonia is introduced after establishment of rubber (*i.e.* after 5YAP), success rate becomes poor due to the shade of rubber in the standard planting system (*i.e.* SR). However, the wider spacing, *i.e.* DR system, has facilitated the late establishment of Alstonia, so could be the best option available. In contrast, establishment of Mahogani was not successful during the early stage of rubber growth due to the damages caused by shoot borer. However late planting of Mahogani under the shade of rubber alleviate the problem. Although late planting (at 5YAP) of Mahogani was successful under both SR and DR systems, the rate of success was greater in DR system suggesting that establishment of Mahogany in the SR system should have been done little earlier on, *i.e.* before too much shade given by rubber. Therefore, rubber clearings in the age of *ca.* 3-4 years could be considered as the best period for interplanting Mahogany.

Alstonia was the only crop which showed a competition to rubber when established together. Unlike Alstonia, establishment of other crops was poor explaining why they did not show such an effect. The data collected from high density planting systems (*i.e.* HDS and HDD) indicated the competitive effect of Alstonia on rubber to be greater than that of additional rubber plants. No timber crop was fertilized, whilst rubber was fertilized on plant basis as recommended. Therefore, high density rubber systems inevitably received greater amount of fertilizer than the rubber/Alstonia system despite the similarities in total crop density of both systems. Undoubtedly, there would have been a competition between two crops for light, however, this would suggest that competition for nutrient would be the principal factor to be considered, if timber crops are planted during the early establishment of rubber. However, it was evident that any adverse effect of such competition on rubber could be mitigated, if adequate time period is given for the proper establishment of rubber.

It is clear in the present study that timber trees could be grown along the boundaries of rubber crop without any adverse effect on rubber, however, care must be taken to keep a reasonable gap between two crops. Boundary trees are obviously exposed to additional resources such as light compared to rubber trees inside the clearing, due to extended gap to next crop (as given by roads, building sites *etc.*). Therefore, growing an additional crop along the boundary will harness the extra resources available without providing increased competition to adjacent rubber trees. If the case is such, instead of growing another crop, it could be argued that growing additional rubber row along the boundary would be more advantageous. Such an alternative could not be assessed within the limits of the present study, however, in the cases studied, timber trees were planted very close to rubber (Table 1) and there was no evidence of planting rubber rows so close even in high density systems of the present and previous (Westgarth and Buttery 1965; Rodrigo *et al.*, 1995) studies. Also, where rubber was planted closer, girthing of rubber becomes weaker (Westgarth and Battery 1965; Rodrigo *et al.*, 1995). Therefore, if an additional rubber row is incorporated at the boundary, it can be expected to retard the growth of boundary plants. Moreover, unlike rubber plants, timber plants were no fertilized, hence the practicality of growing timber tree, in term of convenience, is well established. Also, this would suggest that in addition to the extra resources available at the boundary, increased efficiency in resource capture resulted by improved crop architecture (with respect to root and canopy) in the rubber/timber crop combination contributed for lesser crop competition.

It has been well proven that infilled rubber plants cannot sustain the competition given by early established rubber plants of 3-4 years old rubber clearings. Therefore, planting timber trees on the vacant spots of mature rubber clearing is another practical option available for economical utilization of the resources otherwise being wasted. There was no indication of any adverse effect of timber plants on mature rubber crop in the present study; and, although the period under consideration (*i.e.* two years) would be too short to comment on this issue, the results of the on-station experiment on interplanting of timber crops between rubber rows showed very clearly that planting timber crops 5YAP did not make any competitive effect on rubber. In the process of infilling with timber crops, there is no increase in the crop density in which rubber is planted at the beginning, therefore it further rules out competitive effects.

In the Sri Lanka rubber is mostly (*i.e.* over 80%) confined to the wet zone of the country (Plantation Sector Statistical handbook 2001) where growers have become part-time farmers and depend more on off-farm income sources (Stirling *et al.*, 2002). Most intercropping systems require greater amount of inputs than sole cropped rubber with respect to labour and management, therefore number of intercropping farmers in the area are relatively less; even at smallholder level, the maximum percentage recorded for any district was 54 % (Rodrigo, 1997; Rodrigo, *et al.*, 2001a). In this context, being a low input system, the rubber/timber intercropping systems would undoubtedly be well suited and accepted by the community.

In addition to the agronomic feasibility of growing timber trees with rubber, such systems are always environmentally friendly with no adverse effect, but providing a long term carbon sink, binding soil against the erosion and relieving pressure on natural forests for sawn timber and firewood which have become a significant problem in Sri Lanka and elsewhere. Therefore, rubber growers have to be encouraged to practise rubber/timber systems. If Kyoto

Protocol is implemented, the importance of rubber/timber intercropping systems with respect to capturing and sequestering atmospheric CO_2 could be highlighted for monitory gains (Hamwey, 2000), hence such an encouragement would not be a difficult issue.

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Address for correspondence: Dr V.H.L. Rodrigo, Research Officer (Intercropping), Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka.
E-mail: dirrri@trader tsl.lk

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