

The Effectiveness of Plant Quality Monitoring Programme on the Condition of the Rubber Clearings

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Abstract

The rubber tree (*Hevea brasiliensis* Muell. Arg.) is an important plant not only for world economic strategies but also for the use of living of humankind. At present new cultivations of rubber would be qualified for carbon trading as it is directly involved in mitigating the green house effect with sequestering atmospheric CO₂. Rubber Research Institute of Sri Lanka (RRISL) is involved in developing rubber nurseries through nursery inspection program with the objective of producing high quality budded rubber plants. This monitoring program was commenced in 2004. The objective of this study was to evaluate the effectiveness of plant quality monitoring program on the condition of the rubber clearings. Four rubber estates were selected from Kegalle and Ratnapura districts. Primary data were collected using structured questionnaire and girth of rubber trees were measured as a direct measurement. Hapugastenna and Edarapola estates have been categorized to have good nurseries and nurseries at Moraliyoa and Sunnycroft estates are categorized as bad according to the RRISL recommendation. According to the results, there is a significant difference in achieving the tappable girth before and after the commencement of nursery monitoring programme. Furthermore, RRISL recommended management practices have been applied by these estates. However, tapping has not been possible even after 6 years in any of these estates. By using the proper management practices, the present condition of the fields can be improved.

Keywords: Rubber, *Hevea brasiliensis*, Nurseries, Clearings, Quality monitoring

Introduction

The rubber tree (*Hevea brasiliensis* Muell. Arg.) belongs to family Euphorbiaceae and commonly it is known as the Brazilian rubber tree or the para rubber tree and gives natural rubber, one of the key industrial raw materials.

In commercial plantations, the economic life span of rubber tree is about 30 years. Tree can be exploited for latex only after they reach a certain growth level, and the period that is needed to reach tappareability is referred as immature phase. At the beginning of the commercial plantations, seedlings were used as planting material (Panikkar *et al.*, 1980). According to Seneviratne *et al.* (1998) and Panikkar. (1980), a high variation among

individuals can be seen in such plantations. Therefore, the initial step to produce bud grafted plants has performed first by Van Helton in 1916 (Panikkar *et al.*, 1980) was a remarkable achievement.

Rubber Research Institute of Sri Lanka (RRISL) has introduced several rubber clones, *i.e.* RRIC 100 series, RRISL 200 series, RRISL 2000 series *etc* (Centennial Publication, 2009) inherited with improved vigour and yield. The potential yield of such clones is over 1500kg/ha/yr. However, the average yield of the area under rubber in both estate and smallholder sector are still below the above level. In year 2004, the average productivity of rubber in both estate and smallholder sector was 1,064kg/ha/yr (Annual report, Central

bank of Sri Lanka, 2005). Therefore, this yield gap should be eliminated by increasing productivity of rubber plantations. Moreover, a rubber field with one particular clone which maintain under recommended agro management conditions, the yield variations among individuals are very high (Seneviratne *et al.*, 2008).

Better management of immature rubber plays an important role in this regard as it is a key factor in obtaining a good rubber plantation, which gives maximum yield when tapping is commenced. Furthermore, the stand of uniform and vigorously growing plants of immature rubber should be achieved by adopting recommendations of the RRISL, in order to reach tappable standards at the end of the fifth year after planting.

Materials and Methods

This research was conducted at the Department of Plant Sciences, Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatte from June to November 2012. Four estates were selected based on the information available on reports of nursery monitoring program. According to these reports, Hapugastenna and Edarapola estates have good nurseries and Sunnycroft and Moraliyoa estates have bad nurseries. Simple random sampling method was used to select these four estates.

In immature clearings tree girth was measured at the height of 120 cm and in mature clearings at the height of 150 cm from the bud union using a measuring tape.

Table 1. Percentage of tappable and non tappable trees after and before nursery monitoring programme of rubber clearings in Hapugastenna estate

Girth class (cm)	Number of tappable trees (%) before conducting monitoring programme	Number of tappable trees (%) after conducting monitoring programme
≥50	32.23	48
<50	77	52

Chi-squared test was applied under following hypothesis,

H₀ - Plant quality monitoring system does not contribute the condition of the clearings.

H₁ - Plant quality monitoring system contributes the condition of the clearings.

Numbers of runts in the clearing was also counted. Ten % of trees from 1ha were selected from every clearing from 2004 to 2012 using systematic sampling technique. In addition, a clearing from each estate planted before 2004 was used as the control treatment as nursery monitoring program commenced systematically from year 2004 by RRISL. Primary data were collected using structured questionnaire which consists of information on the clearings such as extent, initial stand, present stand and stand per hectare. Stand maintenance, planting distance, cover crop, weeds, fertilizer application, wind damages, number of weak plants *etc.*

Secondary data collection was done from other resources such as Bulletins of Rubber Research Institute, newspaper articles, journals, annual reports of Central Bank, research papers and websites. Past records of girth measurements of the selected clearings were also collected from the books available on estates. Data were analyzed by using one sample z-test and Chi-squared test in Minitab package.

Results and Discussion

According to the RRISL recommendations, tapping can start when 60% of the trees become 50 cm or above girth, at 120 cm from the highest point of the grafted union (Nugawela, 2002).

Table 1 shows the effectiveness of the plant quality monitoring programme of the clearings planted in

1996 and 2006 years and number of tappable trees (%) after five years.

According to the results of chi-squared test there is significant difference ($p=0.014$) in the percentage of tappable trees between before and after the commencement of nursery monitoring programme. Moreover, nursery monitoring programme has been contributed to increase percentage of tappable trees by 15.2%. Further, RRISL recommended management practices have been applied by this estate. Standard nursery practices such as use of early fallen seeds and early germinated seedlings, removing weak plants, use of good quality bud wood and use of proper planting materials will lead to production of high quality rubber plants. Accordingly, at Hapugastenna estate, the growth of rubber trees derived from a good nursery was better than the growth of trees derived from a nursery which was not monitored by RRISL inspection group.

These tappable trees in the field were planted in year 2001 and 2006. These data were recorded in 2006 and 2011 after five years of field planting.

It was observed a significant ($P<0.05$) difference of percentage of tappable trees between before and after the commencement of nursery monitoring programme in Moraliyoa estate. However in Moraliyoa estate, the percentage of tappable trees was higher at clearings which derived from bad nurseries than trees derived from good nurseries. The reason is, Moraliyoa nursery is categorized as a bad nursery by RRISL team.

When comparing Hapugastenna and Edarapola estates highest number of tappable trees (girth ≥ 50 cm) were in Hapugastenna estate. But, tapping was not commenced even after 6 years, due to shortage of tappable trees percentage. Further clearings at Moraliyoa estate showed higher number of trees with

recommended girth level (≥ 50 cm) than those at Sunnycroft estate where both estates practiced bad nursery practices. Yet, Moraliyoa estate also did not commence tapping even after 6 years due to less number of tappable trees by the year 2012. Not only good quality planting materials all other field practices and climatic conditions of the area also have significant effect on growth of rubber plant especially during immature period. As an example, the stand per hectare was not in satisfactory level in those selected estates except for few clearings. Refilling of vacancies had not been carried out to maintain the required recommended stand (515-520 plants/ha).

After checking association between average mean girth with the expected girth, P - value was 0.000 for every clearings. There was a significant difference from the expected value for all estate. Girth is uneven and poor than expected values in most clearings. This will lead to poor tappable stand of clearings and delay in opening up the clearings. Plants established in 2010 Edarapola estate and 2011 Hapugastenna and Edarapola estate showed satisfactory growth with respect to their age.

Conclusions

According to the results obtained in this study nursery monitoring programme conducted by RRISL has significant effect on time taken to tappable girth in rubber clearings. Therefore, this programme can be categorized as an effective programme. However, not only nursery monitoring programme, all other RRISL recommendations especially during immature period also contribute to achieve proper growth standards.

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