Bulletin of the Rubber Research Institute of Sri Lanka, (2009) **50**, 12-16

SUCCESSFUL ESTABLISHMENT OF RUBBER PLANTATIONS: LESSONS FROM 100 YEARS

P Seneviratne and M K P Perera

Year 2009 marks the centennial year of the Rubber Research and development in Sri Lanka. It is a wonderful opportunity to take stock of things that has taken place over this one hundred years. One can obviously notice that many factors have remained unchanged, as far as rubber industry is concerned. One such factor is the lesson learnt by Sir Henry Wickham himself, in 1876. The practical difficulty he experienced in transporting short lived rubber seeds and the lack of knowledge on storing them as viable seeds is still true for this species. He ultimately was successful in transportation of rubber seedlings to South East Asia leaving that deadly disease, South American Leaf Blight behind. Fresh rubber seeds commence to germinate in ca.7 days and older seeds in about 14 days time. Those do not find a proper medium till 21 days will lose viability. What is emphasized here is that the rubber seeds have been successfully transported long distances of thousands of kilo meters in 1876 and today with all kinds of transportation facilities we should be able to transport seeds collected in the dry areas of Sri Lanka to nurseries in the wet zone quite easily without losing their viability. Seed collection plays an important role in plant production. Unless seeds are collected in the early seed fall, it is an unavoidable fact that a mixture of old and fresh seeds are collected. This prevents proper selection of vigorous seeds. Unless the vigorous seeds are selected effectively in the germination bed, the entire process of producing good quality budded plants is adversely affected.

With 46 chromosomes in the rubber plant the variation is very high among the individuals of any seedling population, a phenomenon that can not be changed or influenced. This emphasizes that importance of selection of vigorous plants possessing a direct and positive correlation with the germination time. Vigorous seeds can be harvested, if one selects only the 50% of early germinates of a batch of seeds (Fig. 1).

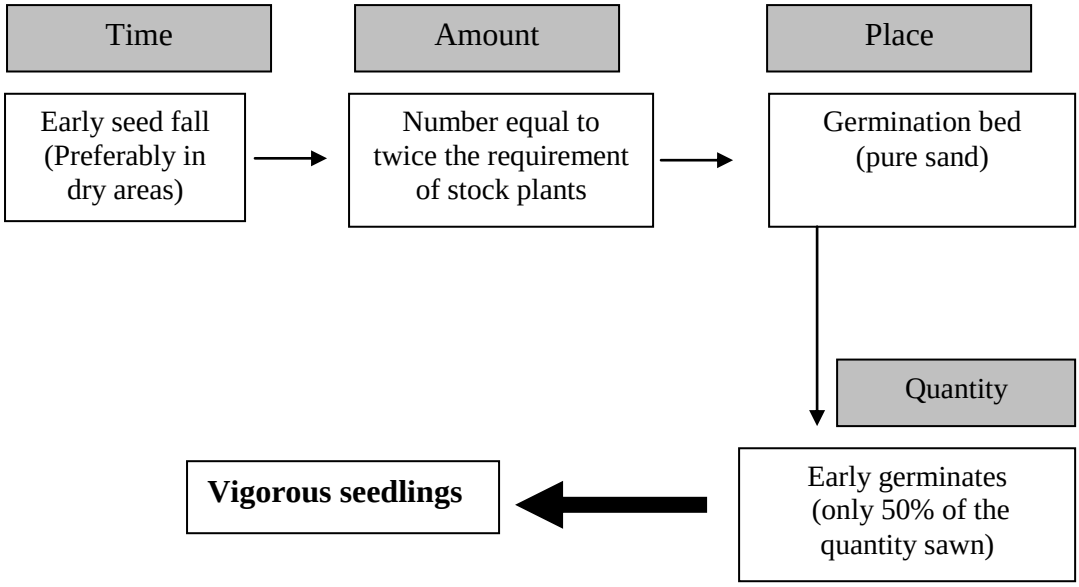

Fig. 1. Procedure to raise vigorous stock plants

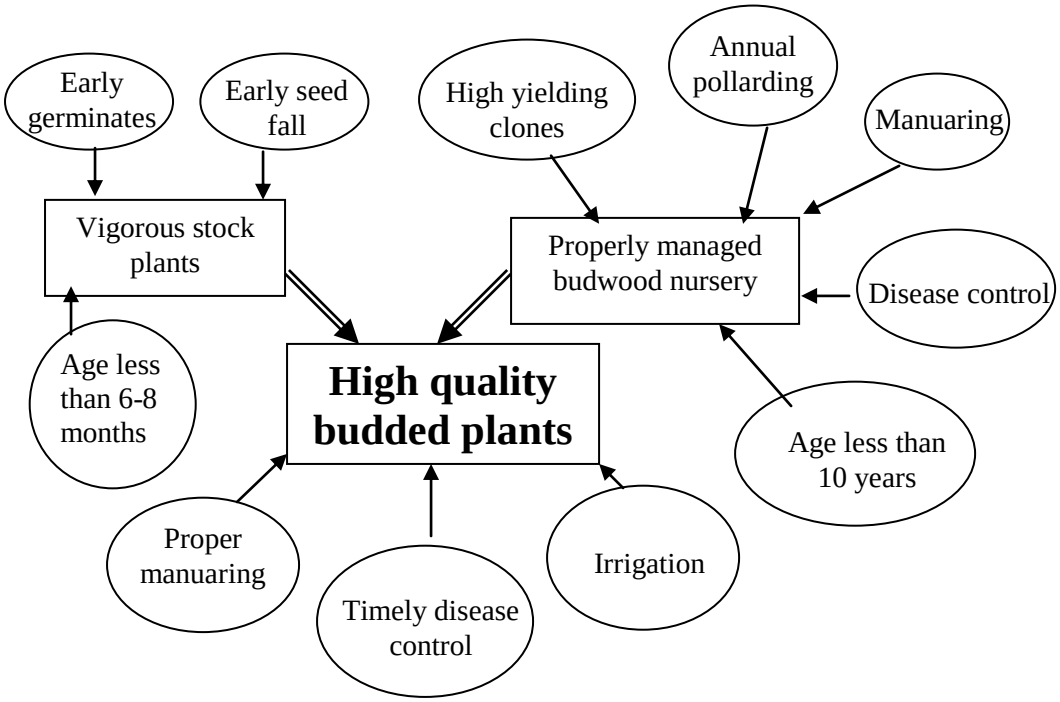

Fig. 2. Factors governing the quality of budded plants

The rest will also germinate if the seeds are fresh, but they should not be used for bud grafts as they are weak plants. This has been researched by many scientists in

the world during the past one hundred years and the nurserymen should make use of this very important selection criterion.

Rubber planters as well as researchers around the globe have experienced and learnt many factors with regard to the developments in the planting material during the past 100 years. The earliest planting material for rubber was unselected seeds, but later selected seeds were used for this purpose in order to minimize the variation.

The development of bud grafting technique for rubber was a major break through which made the planters establish clearings of high yielding clones. With the realization of the disadvantages of brown budded stumps, the green budding technique was initiated. In order to avoid the disadvantages in bare root budded stumps, they were first planted in poly bags which were then field planted at 2-3 leaf whorl stage. Later, the germinated seeds from the germination bed were directly planted in poly bags and bud grafted them in the bag. This technique is called young budding and, one important aspect of this technique is to maintain the rootstock nursery in poly bags. When grown in bags, the competition among plants is minimum and therefore the growth rate is high and plants can be bud grafted in 4-5 months. As the germinated seed selected from the germination bed is transferred to the bag directly, the root system of young budding is uninterrupted. Bags should be filled with a suitable medium to support the fast growth. Soil high in clay or sand is not suitable, but any kind of soil can be improved by mixing with compost, coir pith or saw dust in suitable proportions. It is equally important that the recommended fertilizer mixture for young budding should be used throughout according to the recommended frequency. It took almost one hundred years to ban the use of bare root budded stumps in Sri Lankan plantations which we consider a big step towards improving productivity. The important factor is that what has been learnt in raising high quality plants over the past century should be adopted in every rubber nursery.

The rubber tree host many pathogens and generally nursery plants are prone to various foliar diseases. This is severe if the seedling population had not been selected properly for vigour in the germination bed. However, adhering to the spraying schedule recommended by RRISL and using the correct fungicides from the beginning would ensure a nursery free of diseases. The most important requirement in a nursery is the water supply. Sprinkler irrigation systems have been found to perform well and enhance the growth of the plants.

Budwood nurseries which play a vital role in the quality of budded plants, are established with budded plants of superior clones. Early days, buds taken from high yielding trees were used to raise budded plants to be used to establish nurseries. Later on, new varieties were developed by the method of artificial pollination which are at all times superior. The most important practice in budwood nursery management is to maintain the budwood nursery in such a way that different clones are separately planted and labeled. They should be pollarded annually and manured according to the age. These plants should be replanted every 10 years. The age of budwood has a direct relationships with the growth rate of the budded plant, in addition to all other clonal characteristics they carry. Budded plants produced by the young budding technique are the best planting material available to-date for the rubber growers.

Yet there are some important factors the planters must adhere to. One such factor is the stand of the clearing. The number of trees per unit land area and the spacing system have also been changed over the time. Though lower planting densities and ad hock spacing were used at the inception currently a stand per hectare of 510-520 is recommended. To achieve this stand 3 spacing systems can be used depending on the terrain of the land. It is now recommended to plant young buddings with the bag intact and only the base of the bag is removed carefully (Fig. 3). These are technological advancements that have been achieved during the past hundred years through Research and Development activities.

Fig. 3. A young budded plant planted with the bag

Further, plants can be buried up to the first whorl of leaves (Fig. 4) in order to make sure that the root system is well established deep in the soil and there would be no formation of elephant foot due to soil erosion in latter years after planting.

Fig. 4. A deep planted plant

Use of improved new clones is the way to improve the productivity with no additional cost. This activity has always been lagging behind in Sri Lanka and the benefit that can be achieved by using new clones had not been fully achieved in the past. This is an area where more focus is necessary as we enter the second 100 years of research on rubber.

Immature period of the plantation is one of the main concerns of any rubber planter. Contrary to all other developments and improvements that have been achieved over the century, this seems to have moved in the opposite direction. In fact, this cannot be reduced from what is applicable to seedlings which is 4½ - 5 years. Though it is possible to exploit rubber trees in 4½ years, some times it gets extended up to 8-10 years. When the minimum required girth is achieved after such a long period implies that the condition or the quality of plants and the clearing in general are very poor. As the situation cannot be changed at that stage, it should be planned in a way that only high quality planting material of high yielding new clones are used and also the recommended agro management practices are adopted.

As far as the extent under rubber in Sri Lanka is concerned, it has come down from 200,000 ha. in 1970s to 119,00 ha. at present. However, though the extent has come down, production shows an increase mainly due to the improved conditions in the clearings along with the use of high yielding clones. The condition of the clearing is a combination of all factors such as planting material, soil condition, agro management etc. However, failing one factor would result in poor condition leading to uneconomical productivity levels. Soil deterioration over the past 100 years is something irreversible, but research and development during the past has given rise to technologies to manage the soil effectively while saving on manure by site specific fertilizer recommendations.

In a satisfactory plantation, trees should girth at minimum of 10 cm a year during the immature phase. Research and Development work during the last century has led to development of new clones with a growth potential of 15-20 cm a year. When the plants are good and well maintained under optimum conditions they grow straight with no side branches on the lower part of the trunk. Also if the trees would not branch above 8-10 feet height, branches should be artificially induced. This seems to be related to the clone and these practices have always improved the growth of the trees. Important message here is that all these practices can be performed only until trees are three years old. The ideal canopy architecture thus is a straight trunk with no lower branches but having well spread balanced canopy resembling the seedlings planted 100 years back.

Rubber Research industry has not only benefited the past experience, but also from genetic and agronomic improvements achieved over the past century. More than tenfold yield increase has been secured, compared to the first trees produced from Wickham's original seed collection in 1876. So far, very few plantation crops have a similar record of influencing the economy of the nation. We must continue to learn from the past and move towards a higher productivity, a challenge in front of us, for the next century of research.