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RUBBER – POTENTIAL YIELDS AND STRATEGIES TO ACHIEVE IT IN TRADITIONAL AND MARGINAL AREAS

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The clones recommended for the rubber growers by the Rubber Research Institute of Sri Lanka for large scale planting has a yield potential of around 2500 – 3000 kg/hectare/year. Nevertheless, it should be emphasized that such clones need to be adopted by the growers together with other recommended agro-climatic and agro-management practices required to achieve the potential yields of such clones. If otherwise, corresponding declines from the potential yield are inevitable. The yield potentials of clones recommended for large scale planting and the best practices to realize it are briefly described below.

Yield curve

The clones in the Group 1 of the clone recommendation for the Plantation Sector and those recommended to the Smallholders (Annexure 1) are capable of giving a mean yield of around 40 gramms of dry rubber per tree per tapping (g/t/t) during its entire tapping cycle of 24 years (Annexure 2).

Under best management practices the above clones will reach the tappable standards at the end of the fifth year after planting. Therefore, tapping could be commenced from the sixth year. The g/t/t of any clone varies with the year of tapping more or less in a similar manner and is illustrated in Fig. 1.

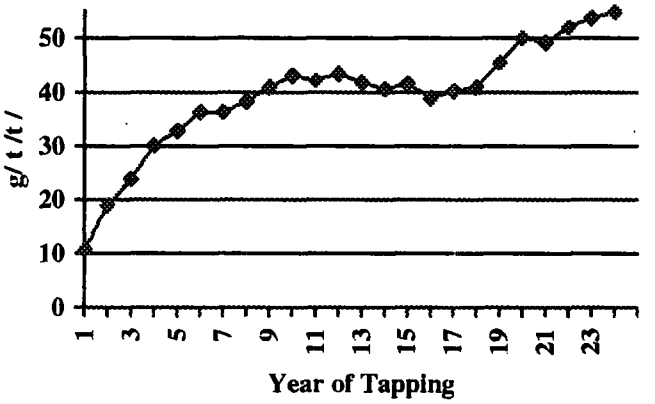


Fig. 1. The yield curve of clones recommended for large scale planting

Conditions needed to achieve above yield curve

In order to achieve the yield curve described above at commercial level in both plantations and smallholdings it is imperative that the recommended clones and the package of agronomic practices recommended are correctly adopted. The extent to which individual agronomic practices implicate the yield curve differs and any gap in technology adoption will result in a down word shift in the yield curve.

Recommended agronomic practices

Though rubber can be grown in a wide range of agro-climatic and agro-management conditions the performance, i.e. latex and timber yields will vary. According to prevailing competitiveness of the world NR industry it is mandatory that any commercial planting is established to obtain the highest performance. The agro-climatic condition and agro- management practices needed and recommended by the RRISL for realizing such a high performance from commercial level rubber cultivations are listed below.

Climate

Rubber can be grown in almost the entire wet zone and in certain regions of the intermediate zone. The climatic factors of importance for the successful establishment and subsequent growth of rubber are listed below:-

Rain Fall : The Ideal annual rainfall for rubber fall within the range of 1650 to 3000 mm and should be reasonably distributed throughout the year.

Temperature and altitude: A mean annual temperature within the range of 23° – 28° C would be ideal for rubber. The temperature decreases at about 0.6°C per 100 m increase in altitude and *Hevea* grows rapidly below 200 m elevation. Planting of rubber above 300 m elevation is not normally advisable due to poor growth rates and the potentially damaging disease *Oidium* leaf fall.

Humidity: High relative humidity favours crop growth. Nevertheless, in clones susceptible for common leaf diseases, incidence of such diseases can be a problem for growth and yield under high humid conditions.

Sunshine: The optimum annual sunshine requirement for rubber is about 2000 hours at the rate of around six hours per day in all months.

Land

A soil having a pH of about 4.5, a depth of about 100 cm, a water table deeper than 100 cm with medium levels of all major and micro nutrients is suitable for rubber. The terrain needs to be gently sloping or rolling with slopes between 0 - 20%. In lands having a slope of 20 – 45% recommended soil management practices should be strictly followed to grow rubber.

Land preparation

Land clearing, preparation and cultivation methods employed should not disturb or compact the soil. At earliest after land clearing, soil and moisture conservation methods should be implemented on sloping lands. Also, during land preparation recommended procedures for prevention of white root disease need to be adopted. Generally, the various operations have to be timed to fit in with seasonal variations in rainfall.

Clones

The clones recommended for both plantation and smallholder sectors are given in Annexure 1. The growers should use as many clones as possible in their plantations. Also when issuing planting material to the smallholders planning is necessary to achieve a healthy distribution of clones in different rubber growing areas.

Planting material

In order to achieve the potential yield curve of different clones at commercial level of planting quality planting material must be used. The use of vigorous stock plants and quality budwood to raise planting material are essential for this. Further, at different stages of raising the planting material weak plants should be culled and only the potential high yielders should be used for establishing commercial clearings.

Field Establishment

The quality planting material raised need to be hardened prior to field establishment. During planting correct techniques have to be followed to prevent any sort of disturbance to the plant. It is important that planting is done at the correct time of the planting season to ensure the full quota of rainfall to the plant.

Further, an additional 10% of the number of plants planted should be established as trench plants to replace dead and weak plants in subsequent years to maintain the stand/hectare with quality and vigorous plants.

Immature up – Keep

After planting, through proper up-keep a stand of uniform and vigorously growing plants should be achieved. At five years after planting, more than 80% of the trees should have a girth of 50 cm or above at a height of 120 cm from the bud union and also the stand should be over 480 plants/hectare. The recommendations on following need to be adopted to achieve these standards in commercial rubber cultivations.

a. Soil and moisture conservation.
b. Fertilizer use
c. Infilling weak and dead plants with vigorously growing advanced planting material.

d. Maintaining tree architecture.
e. Prevention, identification and control of leaf and root diseases.
f. Prevention of animal damage.

Exploitation

The adoption of recommended tapping practices contribute significantly towards achieving the potential yield curves of individual clones. Some important recommendations to be followed with regard to exploitation are listed below:-

1. Criteria for commencement of tapping a new rubber cultivation.
2. Tapping systems recommended for different clones to achieve potential yields.
3. Recovery tapping to minimize tapping days lost due to rain.
4. Use of Rainguards to minimize tapping days lost due to rain.
5. Low frequency tapping with stimulation to minimize crop losses due to shortage of tappers.
6. Technically correct tapping and correct use of tapping utensils.

Mature up – Keep

During the mature phase of rubber fertilizer applications using correct mixtures, quantities and methods are essential to sustain high yields. Soil and moisture conservation at this stage as well is important for efficient use of chemical fertilizers.

Replanting cycle

The recommended replanting cycle for rubber is 30 years. This is made up of the immature phase, *i.e.* 5-6 years and the mature phase, *i.e.* 24 years. Accordingly the annual replanting extent of an estate should be 3.3% of the total extent. Hence, at a given time an estate should have equal extents of 1 to 30 year old cultivations.

Potential land productivity

The land productivity (YPH) should be high for economic viability of rubber cultivations and it is determined by the parameters shown in the following equation.

$$\text{YPH} = \frac{\text{g/t/t} \times \text{stand} \times (\text{tapping days} \times \% \text{ tapper out-turn})}{1000}$$

Where,

YPH	= Dry rubber yield (kg) per hectare per annum.
g/t/t	= The mean yield (g) per tree per tapping of the stand.
Stand	= Tappable trees per hectare.
Tapping days	= Tapping days per tree possible per annum.
Tapper Out-turn	= Number of days tapped out of all possible tapping days as determined by tapper availability.

If best cultivation and management practices are adopted the following levels of the parameters identified above can be achieved.

g./t/t = as per yield curve (Fig. 1)
Stand = 480/Ha during panel BO -1
460/Ha during panel BO -2
440/Ha during panel BI -1
420/Ha during intensification of tapping.

Tapping days : 150 days/tree/annum.
Tapper out-turn : 100%

With realizing of above standards by adopting best cultivation and management practices the land productivity levels shown in Fig.2 can be achieved. According to the land productivity curve the mean for the entire tapping cycle is about 2600 kg/ha/year. Since an estate should have equal extents of 1st to 24th year of tapping areas the mean productivity of an estate should also be around 2600 kg/ha/years.

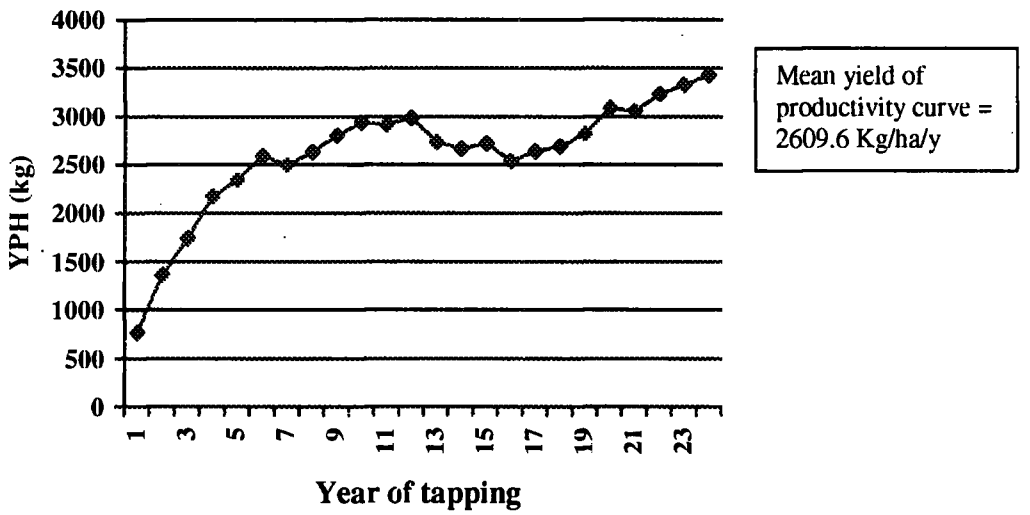


Fig. 2. Potential land productivity of clones recommended for large scale planting.

The impact of Agro-climatic conditions at Moneragala/Bibile on recommended agronomic practices and yield potential.

Agro-climatic conditions at Moneragala/Bibile differs from that in traditional areas. Such differences and the impact of same on potential yields are discussed below:

Rainfall

Moneragala/Bibile regions receive rainfall through the second intermonsoonal and northeast monsoonal rains. The average annual rainfall is 1500 - 2000 mm and it is distributed during the period October to February each year.

The relatively low total rainfall and number of wet days during a year. than in the traditional areas will negatively affect the field establishment and the early growth rates of plants. This could prolong the immature phase of rubber cultivations by about two years whilst increasing the capital cost by *ca.* 20%.

Nevertheless, such weather conditions will help to achieve about a 20% more number of tapping days per year than in the traditional areas. Another advantage of relatively dry weather in the Moneragala/Bibile region will be a lesser incidence of leaf diseases and abnormal leaf fall. The yield advantage due to this is clone dependent and could be in the range of 0 - 10%.

Other climatic factors

Temperature, relative humidity and number of sunshine hours are generally higher in the Moneragala/Bibile region than in the traditional areas.

The soils in the Moneragala/Bibile areas (Red - Yellow Podzol) are much deeper and fertile than in the traditional rubber growing areas of the country. The terrain is partly undulating.

The other climatic factors and soil conditions discussed above could improve the growth and yield of rubber than in the traditional areas. Further, the expenditure on soil conservation will also be less.

The negative impact of the relatively low total rainfall and poor distribution of it within a year on the immaturity period and capital investment in the Moneragala/Bibile region highlighted previously in this report could be partly overcomed by the other climatic and soil conditions favourable for growth of rubber. Therefore, the net impact of the agroclimatic conditions in the Moneragala/Bibile areas will be about a years increase in the immaturity period with ca. 10% increase in capital investment, over the traditional areas.

Agro-management practices

The agro-management practices recommended to the traditional areas will be applicable to Moneragala/Bibile areas as well. Anyhow, deviations are necessary with regard some practices in order to improve the performance under the agroclimatic conditions prevailing in the Moneragala/Bibile areas.

Such deviations are highlighted below:

Planting material

The use of polybagged planting material is mandatory to obtain a higher field establishment and a satisfactory growth rate.

Field establishment

This should commence with the on-set of North-east monsoonal rains and completed as early as possible. The number of trench plants needed to replace weak and dead plants need to be ca. 15% of the total planted. Hardening of nursery plants prior to field establishment will also be mandatory for Moneragala/Bibile areas. Deep planting may also be practiced to improve the rate of field establishment in these areas.

Immature up-keep

Since soil moisture could be a limitation mulching around the rubber plants using suitable material is essential especially during the immature phase. Precautions need to be taken to prevent fire damages prevalent in Moneragala/Bibile areas.

Exploitation

In each tapping day, tapping should commence as early as possible since the yield drop with the time of day will be much more significant due to the dry conditions in the Moneragala/Bibile areas.

Institutional support

The number of field and supervisory/managerial staff needs to be strengthened to cater to the needs of the growers. For the year of planting an action plan should be drawn - up to suite the climatic conditions in the Moneragala/Bibile areas and the relevant institutions should coordinate to carry out the activities accordingly.

Annexure 1

RRISL Planting recommendation for the estate sector

Group 1 – each clone up to 10% of the extent

1a. For areas having an annual rainfall of less than 3750 mm.
RRIC 100, RRIC 102, RRIC 121, RRIC 130,PB 28/59

1b. For areas having an annual rainfall of more than 3750 mm
RRIC 100, RRIC 102, RRIC 121, RRIC 130

Group II - each clone to be planted up to 3% of the extent

RRIC 117	RRISL 203	PB 235
RRIC 131	RRISL 205	PB 260
RRIC 133	RRISL 206	BPM 24
	RRISL 210	
	RRISL 211	
	RRISL 215	

Group III – each clone up to 2 ha.
Estate/RRI collaborative clone trials

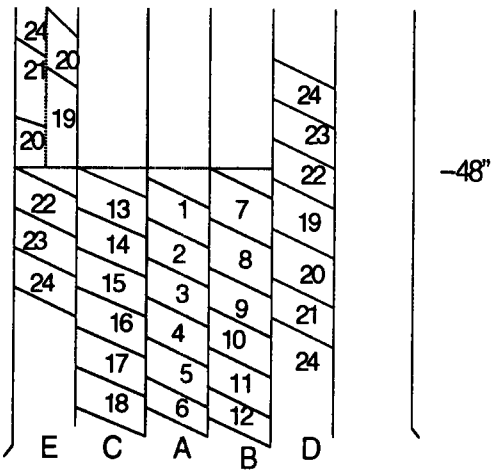
RRISL 201	RRISL 225	PB 255	RRISL 2000
RRISL 204	RRISL 226	PR 255	RRISL 2001
RRISL 208	RRISL 227	PR 305	RRISL 2003
RRISL 217	GPS 1	RRII 105	RRISL 2004
RRISL 218			RRISL 2005
RRISL 219			RRISL 2006
RRISL 220			
RRISL 221			
RRISL 222			

RRISL Planting recommendation for Smallholder sector

RRIC 100, RRIC 102 and RRIC 121

Annexure 2

Tapping chart for widely planted clones



Year	Tapping systems
1-18	1/2S d/2
19-21	1/4S (↑) + 1/2S (↓) d/2
22-23	1/4S (↑) + 1/2S (↓) d/2
24	4 × 1/2S (↑↓) d/2