

ASSESSMENT OF THE USE OF RRIC 100, RRIC 102 AND RRIC 103 AND THEIR PERFORMANCE IN THE ESTATE SECTOR

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SUMMARY

The clones RRIC 100 and RRIC 103 have gained fair popularity as clones for a greater replanting in recent years. However, their acceptance took a considerable time, after they were first recommended for large scale planting. RRIC 102 has not yet become a popular clone.

RRIC 100 has performed better in the estate sector than PB 86 in immature vigour and yields, but has not done as well as in experimental plantings.

INTRODUCTION

During the early stages of rubber cultivation in Sri Lanka seedlings were used as planting material. Later, bud grafting made vegetative propagation on a large scale possible, and led the way to plant breeding to improve planting material (Chandrasekera, 1971). Early selections among seedlings in commercial estates during the period of 1926 — 1935 resulted in the cloning of high yielding material (De Silva, 1953 b). Since then the development of new clones has come a long way and the introduction of hand pollination has contributed much to it.

During the initial phase of 1935 — 1945 the sole aim of the *Hevea* breeding programme of Sri Lanka was to increase yields, but later emphasis was shifted to considering other economically important characters such as disease resistance and shorter immature period. As a result of this the clones RRIC 100, RRIC 102 and RRIC 103 were bred and recommended for large scale planting (Jayasekera and Fernando, 1981).

RRIC 100 was first recommended for small-scale experimental planting in 1968 (RRIC, Bulletin Vol 3 1968) and for large scale planting in 1977 (Fernando, 1977). RRIC 102 was first recommended in 1972 (Chandrasekera, 1972) and for large scale planting in 1977 (Fernando, 1977). RRIC 103 was directly recommended for large scale planting in 1977 (Fernando, 1977). It has recently (1986) been withdrawn from the list of recommended clones because of its high susceptibility to *Corynespora* leaf spot disease.

Some of the economically important characters and experimental yields for the three clones are given below :

Character		RRIC 100	RRIC 102	RRIC 103
Yield	Early	High	High	High
	Mature	High	Very High	Very High
Agroclimatic adaptability	Yield	Good	Good	Good
	Growth	Good	Good	Good
Disease resistance	Colletotrichum	Resistant	Slightly susceptible	Resistant
	Oidium	Slightly resistant	Very resistant	Resistant
	Bark-Phytophthora	Resistant	Resistant	Resistant
Brown bast reaction		Mild	Mild	Mild
Girth increment after tapping		Average	Above average	Above average
Renewed bark		Thick	Thick	Thick
Latex	Colour	White	Slightly yellow	White
	Storage	Good	Average	Good

(Source : RRISL Bulletin Vol. 16 Page 24)

Experimental yields (kg/ha)

Clone	Year of tapping						
	1	2	3	4	5	6	7
RRIC 100	764	996	1558	2066	2488	2657	2493
RRIC 102	725	1258	2071	1956	1818	2186	2234
RRIC 103	438	1539	1706	2129	1952	2983	2358

(Source : Recommended planting material 1985)

Experiments have shown that RRIC 100 and RRIC 103 could be opened for tapping at the age of 4.5 and 5 years, respectively (Jayasekera and Fernando, 1981).

There have been studies on the use of these clones in smallholdings (Herath and Jayasena 1984 ; 1986) but there is no information of their use in the estate sector. Therefore, this study was carried out to assess the extents of these clones planted, and their yields, in the two large Government Estate Corporations, the Janatha Estate Development Board (JEDB) and Sri Lanka State Plantation Corporation (SLSPC).

MATERIALS AND METHODS

A questionnaire was sent, requesting details on replanted extents of rubber since 1970, to all rubber growing estates of JEDB, in the regions of Kegalle and Avissawella and of the SLSPC in Horana, Ratnapura and Galle. Extents planted with different clones in each year were calculated and expressed as a percentage of the total extent replanted in that year.

A second questionnaire was sent to estates to get information on yields. These estates were asked to send details on : (a) stand per hectare (ha), (b) number of trees tapped per ha, (c) tapping system, (d) tapping intensity, (e) yield in kilogrammes (kg) per ha, for each year since commencement of tapping.

Estates were selected based on the information gathered from the first questionnaire. Estates with fields planted during or before 1975 with any of the clones, RRIC 100, 102, 103 and PB 86, were requested to send the above information on those fields.

This ensured that the fields from which information was obtained had been tapped for at least 3 years. Yields of the 100 series clones were compared against those of PB 86.

Yield comparisons could be done only between RRIC 100 and PB 86 because large enough samples from RRIC 102 and RRIC 103 could not be drawn

RESULTS AND DISCUSSION

Out of the 159 estates to which the first questionnaire was sent, 124 replied giving details of replanted extents ; 12 estates sent in nil returns as they had no fields planted with RRIC 100, 102 or RRIC 103. The rest did not respond at all (Table 1).

Table 1. Details of response to questionnaire sent to estates

Region	Horana	Ratnapura	Galle	Avissawella	Kegalle	Total
No. of estates to which questionnaires were sent	33	29	34	33	30	159
No. of estates which sent in details	25	22	23	30	24	124
No. of estates which sent in nil returns	1	2	5	—	4	12
No. of estates not replying	7	5	6	3	2	23

Extent of the use of RRIC 100, RRIC 102 and RRIC 103

Table 2 gives the extents (ha) planted with different clones and their percentage out of the total extent planted, for each year from 1971 to 1985.

It was observed that, it was only after 1983 that a major part of the replanted areas were planted with the two clones, RRIC 100 and RRIC 103. Before that most of the replanting was with PB 86. From 1974 to 1983, PB 86 had been planted on more than 50% of the replanted areas, and from 1975 to 1982 on more than 70%, with a maximum of 88% in 1978. These figures may underestimate the true picture in the field ; because there were several nil returns and non-respondents. PB 86 had been recommended for large-scale planting as far back as 1953 (De Silva, 1953a) and remained so till 1984, after which it was removed from the RRISL recommendations (RRISL 1985). But PB 86 has been reintroduced, for large scale planting, to replace *Corynespora* susceptible RRIC 103. This and its latex quality which is ideally suitable for crepe production (Perera, et al., 1979), which is the main product of most Sri Lankan rubber estates, may be the reasons for its popularity.

Table 2 Extent (ha) planted with clones PB 86, RRIC 100, RRIC 102 and RRIC 103 during each year from 1971 — 1985

Year	PB 86		RRIC 100		RRIC 102		RRIC 103		TOTAL	
	Ext.	%	Ext.	%	Ext.	%	Ext.	%	Ext.	%
1971	238.36	33.1	26.17	3.6	0.00	0.0	10.15	1.4	717.99	100
1972	275.48	34.0	62.27	7.7	2.02	0.2	0.00	0.0	811.07	100
1973	243.66	38.5	90.31	14.3	7.25	1.1	7.16	1.2	633.41	100
1974	424.78	55.5	122.08	15.9	39.65	5.2	12.33	1.6	765.51	100
1975	636.48	70.1	156.16	17.2	5.42	0.6	5.28	0.6	907.56	100
1976	699.19	71.2	126.31	12.9	15.56	1.6	6.07	0.6	981.66	100
1977	866.02	84.4	39.07	3.8	9.68	0.9	10.03	1.0	1,026.56	100
1978	1,397.33	88.0	117.97	7.4	0.00	0.0	23.55	1.5	1,589.35	100
1979	1,543.81	87.2	99.58	5.6	0.00	0.0	71.08	4.0	1,770.01	100
1980	1,407.52	75.4	295.64	15.8	23.02	1.2	69.67	3.7	1,867.47	100
1981	1,226.20	76.9	174.50	10.9	43.31	2.7	64.89	4.1	1,594.64	100
1982	878.60	70.4	192.75	15.5	20.15	1.6	65.25	5.2	1,247.14	100
1983	688.73	55.0	193.31	15.5	28.50	2.3	226.38	18.1	1,249.85	100
1984	421.21	33.3	427.53	33.6	39.60	3.1	276.25	21.7	1,272.95	100
1985	184.83	14.2	548.41	44.8	37.37	2.9	392.52	30.1	1,304.82	100

Before 1974 the extent replanted with PB 86 has been around 35% of the total extent replanted. This may be because of the higher number of clones planted during these years (Table 3).

Table 3

Year	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
No. of clones planted in each year	21	18	17	12	10	10	8	7	6	7	7	8	10	7	9

It is also noted that the number of clones recommended has come down to 9 in 1985 (RRISL, 1985) from 44 in 1968 (RRIC, 1968). This may have contributed to the fact that the number of clones planted during the period 71 — 73 was high. During this period clones RRIC 45, PB 28/59 and RRIM 600 have accounted for a fair share of the replanted extents (Table 4). RRIC 45 was recommended for large scale planting, PB 28/59 upto 20 acres within an estate and RRIM 600 for small-scale experimental planting during this period (RRIC, 1968 and Chandrasekera, 1972).

Table 4

Year of Planting	RRIC 45		PB 28/59		RRIM 600	
	Ext. (ha)	%	Ext. (ha)	%	Ext. (ha)	%
71	57.63	8.0	53.95	7.5	63.30	8.8
72	62.82	7.7	82.56	10.2	60.94	7.5
73	98.4	15.5	39.99	6.3	—	—

The decrease in the extent PB 86 replanted after 1983 is mainly because of the shift to RRIC 100 and RRIC 103. It is seen that after 1983 the extent and proportion planted with these two clones have been steadily increasing and the extent planted with PB 86 has been steadily decreasing (Figure 1). The extents replanted with RRIC 102 are not yet significant. In all years from 1971 — 1985 it has been less than 50 ha (Table 2).

Although RRIC 100 and RRIC 103 have been replanted on a larger scale during recent years, the two accounting for more than 50% of the replanted extents in 1984 and 1985 (Table 2), it has taken some time to reach this level, almost 7 years from 1977, when these clones were recommended for large scale planting, with experimental evidence of their superiority over PB 86, in immature vigour and yields. It is not all planters who would decide on speculative planting of a clone as soon as it is recommended, and as shown in Table 2 only limited extents of these clones were planted until very recently. Feedback of information from those who selected them early is important, and the lack of information on their performance in commercial plantings would have been a drawback in their selection for replanting. Although the Rubber Research Institute of Sri Lanka carries out large-scale field trials on clones before they are recommended for large-scale planting (Senanayake and Wijewantha, 1968), supplementary information of this nature is important to encourage planters to use new clones in replanting. The quality of crepe produced from the latex of these clones could also have had an effect on their selection; because new clones should give latex qualities suitable for crepe. This may be the reason why RRIC 100

Table 5. Extents (ha) planted with material coming under different recommended groups and the percentage of each for the years 1971 to 1985

Year	1		2		3		Recommendation groups*				Total	
	Ext.	%	Ext.	%	Ext.	%	Ext.	%	Ext.	%	Ext.	%
1971	326.3	45.4	84.02	11.7	60.38	8.4	171.26	23.9	76.03	10.6	717.99	100
1972	348.36	43.0	140.69	17.3	38.59	4.8	210.64	26.0	72.79	9.0	811.07	100
1973	354.50	56.0	73.65	11.6	162.30	25.6	—	—	42.96	6.8	633.41	100
1974	445.01	58.1	65.50	8.6	227.37	29.7	—	—	27.63	3.6	765.59	100
1975	642.40	70.8	250.90	27.6	—	—	—	—	14.26	1.6	907.56	100
1976	762.75	77.8	204.04	20.8	—	—	—	—	14.07	1.4	980.86	100
1977	872.72	85.0	139.50	13.6	—	—	—	—	14.79	1.4	1,026.56	100
1978	1,571.87	98.9	17.48	1.1	—	—	—	—	—	—	1,589.35	100
1979	1,753.64	99.1	11.02	0.6	—	—	—	—	5.39	0.3	1,770.05	100
1980	1,801.35	96.5	17.31	0.9	—	—	—	—	48.81	2.6	1,867.47	100
1981	1,578.10	99.0	6.00	0.4	—	—	—	—	10.54	0.6	1,594.64	100
1982	1,196.83	96.0	34.77	2.8	—	—	—	—	15.54	1.2	1,247.14	100
1983	1,172.92	94.2	39.06	3.1	2.7	0.2	—	—	30.17	2.4	1,249.85	100
1984	1,167.65	91.7	76.83	6.0	—	—	—	—	28.47	2.2	1,272.95	100
1985	994.71	76.2	91.67	7.0	4.1	0.3	—	—	214.34	16.4	1,304.82	100

* Recommended group Discription
 1 — Large scale planting
 2 — Upto 10 ha per clone
 3 — Upto 5 ha per clone
 4 — Small scale experimental planting upto one tapping task
 5 — Not recommended

This discription applies for Table 6 as well.

and RRIC 103 have been selected in preference to RRIC 102. The yellowish crepe produced from latex obtained from RRIC 102 and its further discolouration on storage would have militated against their selection by estates. In fact Perera, *et al* (1979) do not recommend latex of this clone for crepe manufacture. Nonavailability of budwood to meet the demand, until sometime after a clone is recommended for large scale planting; may also delay its use in replating.

According to Table 5 over 70% of the replanted extents from 1975 have been planted with clones recommended for large scale planting, by the RRISL, and since 1978 they have covered more than 90% of replantings, except in 1985 when they were limited to only 76.2% but of the 16.4% area that has come under unrecommended planting material the majority has been PB 86 (Table 2), a clone recommended for large scale planting upto 1984 deleted in 1985 (RRISL 1985) but reinstated in 1987 (RRISL 1986). This indicates that, at present, planters are cautious in selecting clones for replanting and are unwilling to take risks by planting clones during their early stages of recommendation. This could pose problems in upgrading clones for large scale planting, since very little information on their performance in commercial plantings is available. This situation is further aggravated when a large proportion of the replanted extent comes under one clone, as in the case of PB 86 during the period 1975 — 82 (Table 2).

The planting of one clone over large extents could have other unfavourable effects, such as in times of disease outbreaks, where the entire area planted with susceptible clone can be affected. Therefore, it would be beneficial to have the area replanted distributed among several clones. Table 2 shows that, in the recent past, this has been the practice, which is satisfactory.

Table 6 shows that a major proportion of the extent planted with one particular clone, has been planted during the period it had been recommended for large scale planting. This too emphasizes on the fact that planters are rather reluctant to go in for speculative planting.

Table 6. Percentage of total extent planted at different stages of clones PB 86, RRIC 100, RRIC 102 and RRIC 103

Rec. GP.*	PB 86	RRIC 100	RRIC 102	RRIC 103
1	98.3	76.7	70.7	95.85
2	—	12.0	11.3	—
3	—	8.0	17.3	—
4	—	3.3	—	—
5	1.7	—	0.7	4.15

*Rec: GP — Recommended group

The total extents replanted with the different clones from 1971.— 1985 in the five regions from which information was collected are given in Table 7. In all regions much of the replanted extents have come under PB 86.

Table 7. Total extents (ha) replanted with clones PB 86, RRIC 100, RRIC 102, RRIC 103 in the different regions from 1971 — 1985

Region	PB 86		RRIC 100		RRIC 102		RRIC 103		Total Ext.
	Ext.	%	Ext.	%	Ext.	%	Ext.	%	
Horana	2,718.46	76.5	354.53	10.0	70.91	2.0	328.02	9.2	3,553.00
Ratnapura	2,006.09	68.4	666.86	22.7	19.64	0.7	146.13	5.0	2,933.12
Galle	1,671.89	63.1	856.00	32.3	10.2	0.4	52.33	2.0	2,649.81
Avissawella	2,878.89	66.3	630.81	14.5	81.78	1.9	497.98	11.5	4,344.22
Kegalle	1,788.96	78.3	161.88	7.1	89.24	3.9	201.20	8.0	2,285.25
Total	11,064.29	70.2	2,670.08	17.0	271.59	1.7	1,225.66	7.8	15,765.40

PERFORMANCE

Growth

It was observed that the average age at tapping for RRIC 100 was 6.2 years whereas for PB 86 it was 7.4 years. This indicates that RRIC has an advantage of about 14 months over PB 86 in early bearing but it has yet to come up to the standards achieved in experiments.

Yield

The average yield for the first 8 yrs of tapping, the number of observations from which this average was calculated and the percentage increase in yield of RRIC 100 over PB 86 are given in Table 8. Yields in the first year of tapping were not statistically analysed as in some cases tapping had not commenced at the beginning of a calendar year.

Table 8. Comparison of commercial yields (kg/ha) of RRIC 100 with PB 86 (350 ← No. of trees/ha)

Year of tapping	PB 86		RRIC 100		t-test*	% yield increase
	No. of fields	Avg. yield	No. of fields	Avg. yield		
1	42	449	32	597	—	—
2	42	673	32	824	2.2	22
3	43	811	33	980	2.6	21
4	41	1003	32	1170	2.2	17
5	36	1172	29	1323	ns	13
6	21	1137	22	1464	3.4	29
7	15	1274	12	1590	ns	25
8	11	1292	7	1736	4.8	34

* Since the variances were homogenous (for test at each year of tapping) there was no necessity for an approximate 't' test. Simple (usual) 't' test was used in each case.

It was observed that in all years RRIC 100 gave a higher yield than PB 86. The percentage increase ranges from 13% to 34%, but in the 5th and 7th year of tapping there isn't enough statistical evidence to say that the yield increase is significant. This is because of the high variation in yields and the small sample size.

Although RRIC 100 has given a higher yield than PB 86 it has not reached its potential levels as shown by the differences between the experimental yields and the commercial yields. The difference sometimes being as much as 47% (Table 9).

Table 9. Comparison of experimental yields and commercial yields

Year of tapping	Expt. yield	comm. yield	% difference
1	764	597	22
2	996	824	17
3	1558	980	37
4	2066	1170	43
5	2488	1323	47
6	2657	1464	45
7	2493	1590	36

There could be many factors, such as environmental, socioeconomic, management, and poor technology transfer which could account for RRIC 100 not achieving its potential growth and yield on commercial estates. Further studies are needed to enable commercial plantings to achieve the potentials of RRIC 100 series clones.

Figure 2 gives the yield variation of the two clones up to the eighth year of tapping. It shows that the yield of PB 86 has a tendency to level off after the 8th or 9th year of tapping, but RRIC 100 yields might increase further before reaching a maximum. This too emphasises that RRIC 100 performs better than PB 86 on commercial estates.

CONCLUSION

A large proportion of the replanted areas on estates, during the recent past, has come under RRIC 100 and RRIC 103, but the adaptation of these clones has been slow. This may be due to the reluctance of planters to go in for speculative planting, lack of information on their performance in commercial plantings and the nonavailability of budwood. The use of RRIC 102 in estates has been low. It could be attributed to the low quality crepe produced from the latex of this clone.

The performance of RRIC 100 is superior to that of PB 86 in its shorter immature period (6.2 years compared to 7.4 years of PB 86), higher yields (an increase of 13—34% in the first 8 years of tapping), and its yield pattern. Further studies should be carried out to bridge the gap between the potentials and the actual performance in commercial estates of the RRIC 100 series clones.

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Fig. 1. Cumulative % extent planted with the different clones since 1970

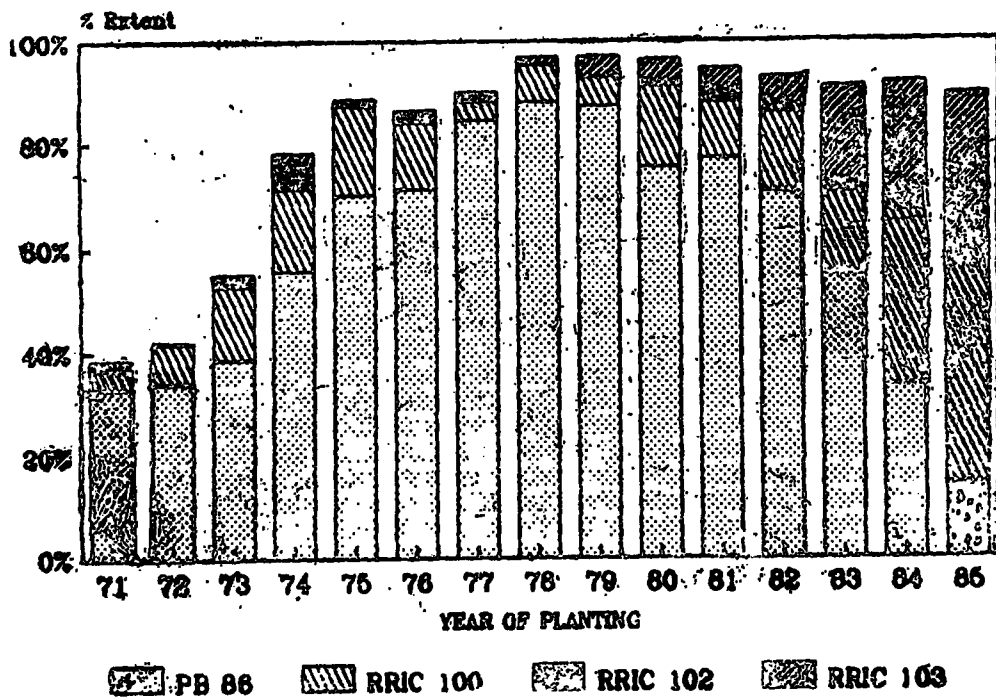


Fig. 2. Commercial yields (kg/ha) of PB 86 and RRIC 100

