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YIELD DECLINE IN PLANTATIONS - CAN EXCESSIVE DOUBLE TAPPING BE A CAUSE?

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It is reported that productivity of some estates are declining. To findout the possible reasons for this relevant information were collected from such an Estate and were compared with an estate having relatively sustainable yield levels.

The yield per hectare recorded by the estate with declining yields (Estate 1) and by the estate with sustainable yields (Estate 2) are given below.

	Year				
	1992	1993	1994	1995	1996
Estate 1	828	860	930 (100)	857 (92)	721 (78)
Estate 2	740	918	1012 (100)	928 (92)	953 (95)

It appears that the YPH is declining since 1994 in Estate 1. The YPH recorded in 1995 and 1996 is 92 and 78% of the 1994 figure respectively. In a given year, the YPH of an Estate is determined by the following parameters.

a). Clones
b). Stand
c). Yield/tree/tapping (g/t/t)
d). Tapping days
e). Tapper out-turn
f). Tapping utensils
g). Tapping quality

Therefore, any variation in YPH could be due to that of one or more of the above parameters. The variation in these parameters with regard to Estate 1 is discussed below.

Clones

The clonal composition for the years concerned are given below.

Clones	Year and Hectarage		
	1994	1995	1996
PB 86	198.65	198.65	208.77
RRIC 100	31.79	31.79	31.79
Mixed	369.89	380.54	385.55

No significant change in clonal composition has taken place from 1994 to 1996.

Stand

The mean stand per hectare in the mature extent was calculated as follows;

$$\text{Mean stand} = \frac{\text{Task size x Tapping blocks}}{\text{Mature Extent (Ha)}}$$

The mean stand calculated as above for different years are given below.

	Year		
	1994	1995	1996
Stand	300 (100)	294 (98)	297 (99)

There is no significant change in the stand during the period concerned.

Yield per tree per tapping (g/t/t)

The mean yield per tree per tapping (g/t/t) for a given year was calculated as follows.

$$\text{g/t/t} = \frac{\text{Mean intake per tapper}}{\text{Task size}}$$

The g/t/t calculated for different years are given below.

	Year		
	1994	1995	1996
g/t/t	19.9 (100)	18.2 (92)	16.1 (81)

From 1994 to 1996, there is a significant decline in g/t/t. For years 1995 and 1996 it is 92 and 80% of the 1994 figure respectively.

Tapping days

The different types of tapping days and the total number of tappings per tree for the different years are given below.

	Year		
Tapping days	1994	1995	1996
1. Normal	177	188	194
2. Late	76	71	65
3. Double	42	34	27
4. Rain interference and washouts	5	2	6
5. No	107	147	146
6. Tappings/Tree	150 (100)	148 (98)	146 (97)

The number of tappings per tree is 2 and 3% less in years 1995 and 1996 respectively.

Tapper out-turn

The tapper out-turn during a year was calculated as follows.

$$\text{Tapper out-turn} = \frac{\text{Tapper Requirement - Vacant Blocks}}{\text{Tapper Requirement}} \times 100$$

(Tapper requirement = Tappers/day x Tapping days)

The tapper out-turn for years 1994, 1995 and 1996 is given below.

	Year		
	1994	1995	1996
Tapper out-turn (%)	92 (100)	95 (103)	94 (102)

The tapper out-turn has not declined in years 1995 and 1996.

Tapping utensils

Lack of quality tapping knives, collecting cups, cup hangers and spouts could also result in poor yields. Nevertheless, information on these for years concerned are not available.

Tapping quality

Poor tapping also results in poor yields and information on this is also lacking.

The variation (percentage) in parameters that govern the YPH, during the years concerned are summarised in Table 1.

	Year and percentage change		
Parameter	1994	1995	1996
1. YPH	100	92	78
2. Clones	-	-	-
3. Stand	100	98	99
4. g/t/t	100	92	81
5. Tapping days	100	98	97
6. Out-turn	100	103	102
7. Utensils	-	-	-
8. Quality	-	-	-

It is apparent that the g/t/t has contributed significantly to the decline in YPH. The changes in the stand and tapping days may also have contributed to it marginally.

Decline in g/t/t

A rubber tree could be less productive resulting in lower g/t/t if the tree becomes weak due to factors such as incorrect manuring and incidence of leaf diseases. Further, the adoption of wrong tapping practices will also result in a lower g/t/t. Poor quality tapping and lack of tapping utensils discussed earlier can also lower the Estate g/t/t.

Among the possibilities discussed above, it is more likely that wrong tapping practices may have led to a decline in g/t/t and hence the YPH.

Total crop harvested/Year (TCH)

The total crop harvested per year (TCH) in an Estate can be calculated by the formula, YPH x Mature Extent (Method 1). This could be also estimated using the following formula (Method 2).

TCH = IPT x [%TO.T] x TD

where,

TCH = Total Crop Harvested/Year
IPT = Average Intake/Tapper
%TO = percentage Tapper Out-turn
T = Tappers/day
TD = Tapping days.

The TCH for years 1994, 1995 and 1996 calculated from the two methods described above are given below.

	Year and TCH		
TCH (kg)	1994	1995	1996
Method 1	558,307	523,610	451,425
Method 2	490,549	458,873	411,790
Variation	67,758 (12%)	64,737 (12%)	39,635 (9%)

The method 1 gives the actual TCH in the Estate. Ideally, by using method 2 we should estimate the same correctly. Nevertheless, TCH estimated from Method 2 is significantly less.

The TCH determined by these two methods for the Estate, with sustainable yield levels (Estate 2) are given below.

	Year and TCH		
TCH	1994	1995	1996
Method 1	146,099	155,140	159,256
Method 2	159,594	154,039	159,671
Variation	13,495 (9%)	1,101 (0.7%)	415 (0.3%)

The crop estimated from method 2 is in agreement with the actual TCH. Therefore the method 2 is also accurate in calculating the Total Crop Harvested.

Hence it appears that information given on either one or more of the parameters *i.e.* IPT. %TO, T and TD used in Method 2 to estimate TCH is inaccurate in the case of the Estate concerned. It may be that information given on tapping days is incorrect.

The average crop harvested per tapping is given by IPT x [% TO x T]. If the variation in crop is divided by the crop harvested per tapping it will give the additional number of tappings required to bridge the variation in crop (Table 2).

Table 2. *The average crop harvested per tapping and the additional tappings required to bridge the crop variation*

	Year		
	1994	1995	1996
Crop/Tapping (kg)	1,653	1,555	1,410
Variation in crop (kg)	67,758	64,737	39,635
Additional tappings required	41	42	28

Therefore there is evidence that the number of tappings made on a tree is higher than what is indicated. This may be in the form of double tapping. Double tapping when done excessively leads to daily tapping and hence to a lower intake/tapper. In this situation there will be no significant variation in the IPT between the cropping and non-cropping months of a year.

The average intake per tapper during cropping and non-cropping months in Estate 1 and in Estate 2. In Estate 2 only the recommended number of double tappings have been carriedout is given below.

Year	Estate	Cropping Period and IPT (kg)			Mean
		Feb-May	June-Sept.	Octo-Jan.	
1994	1*	4.9(100)	5.8 (118)	6.0 (122)	5.6
	2**	5.0(100)	5.9 (118)	7.4 (148)	6.2
1995	1*	4.6 (100)	5.2 (113)	5.5 (120)	5.1
	2**	4.4 (100)	6.2 (141)	7.3 (166)	6.3
1996	1*	4.1 (100)	4.6 (112)	4.9 (120)	4.5
	2**	4.9 (100)	5.8 (118)	6.9 (141)	6.1

(Task size - *275 **250)

The percentage increase in the intake/tapper during cropping months is relatively less in Estate 1 than in 2. Further the annual mean IPT has gradually declined in Estate 1 since 1994 to 1996. These observations give further evidence for excessive double tapping in Estate 1. Therefore it appears that decline in yield is due to gradual drop in g/t/t due to excessive double tapping. Though the total number of double tapping days per annum will not be excessive, it may be excessive in certain months, *i.e.* cropping months with dry weather, *eg.* August, December and January. During these months the tapping intensity can exceed 100%, resulting in lowering of the yield potential of trees. Therefore, to avoid this situation double tapping days should be well distributed among the possible months as recommended by the Rubber Research Institute.