Extension of modern exploitation techniques in small holdings

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Abstract

In India more than 88 percent of rubber is grown in small holdings and their share in NR production is 87 percent. Above 90% area in small holding has the Indian wonder clone RRII 105. Though the tapping frequency recommended for this clone is 1/2S d/3 6d/7, more than 90% small holders follow higher frequencies. Due to the high frequency of tapping and associated incidence of TPD, economic life in small holdings is restricted to 13-15 years resulting in a very high cost of production.

Under d/3 frequency, crop realized from RRII 105 is lower than optimum. Hence, mild yield stimulation (3/y) was recommended to optimize yield. On farm trials and lab to land programs of RRII in various locations are in agreement with the recommendation. Almost all small holders make payment of wages based on number of trees tapped irrespective of production. But, a newly introduced production linked incentive proved to be beneficial for both the tapper and the grower.

Prolonged immaturity phase, 6-7 years (to attain tappable girth of 50cm) is also a problem in small growers field. Mini/reduced spiral cuts with appropriate yield stimulation can successfully be adopted for early opening (1-1 ½ years early), when the trees girth is 43cm or more. The crop realized is more than 80% of standard (1/2S d/3) tree of 50cm girth, and with better girth increment.

Adoption of mini/reduced spiral cuts for early opening, subsequent practice of d/3 frequency tapping with mild stimulation, and high panel exploitation under CUT (with periodic panel change) is ideal for small growers. This enables them to have longer exploitation, better production and to reduce cost of production, considerably. Results of on farm trials, and problems faced in extending the new techniques are discussed.

Industry in all developing countries are facing problems associated with globalization. Rubber plantation industry is not an exception to this. The way out for rubber grower is to make his product more cost effective (Vijayakumar et al, 2002). This can be achieved by increasing productivity or reducing cost of production. Four fifth of world rubber plantation is in holdings, but only half of the rubber production come from them, indicating low average productivity. In India, 88 percent of rubber is grown in holdings of which size of 83% holding is less than 2 hectare. Above 90 percent area in these holding have the Indian wonder clone RRII 105 (Rubber Board,1999).

Small holders tap their trees according to convenience due to socio-economic reasons. Due to this, they follow high frequency tapping with or without rainguarding, irrespective of the clone. This results in damaged panels, poor yield, unsuitability of renewed bark, poor tree growth and above all high incidence of tapping panel dryness (TPD). Tapping standard is also poor and economic life is over much earlier (13-15 years) than targeted. The recommended tapping system in India is 1/2S d/2 6d/7 for medium yielding clones, and 1/2S d/3 6d/7 for high yielding clones like RRII 105 (Vijayakumar et al, 2000). But, crop realized from this clone under d/3 frequency was much lower compared to d/2 frequency.

Earlier, 46 percent of small growers were practicing daily tapping on same cut with tapping rest during rainy season (Rajasekharan and Haridasan, 1992). Over the time, this practice has come down. Now 14 percent of them are on daily tapping, 77% on alternate daily (d/2) and only 5% on third daily (d/3) tapping for the clone RRII 105. Though little late, now a package of exploitation practices, d/3 with mild stimulation, d/4 and weekly tapping, is available to the growers assuring sustainable high yield (Rubber Board, 2002). Small growers are very often compelled to follow high frequency tapping on account of higher dependence on

hired labour. However, 19% utilize either family labor alone or combination of both. This percentage is likely to go up further in the years to come. These are the best target group for extension of modern exploitation techniques. Clone RRII 105 when tapped on d/3 frequency, three annual stimulation with 2.5% ethepon (panel application) ensures optimum yield. Almost all small growers make payment of wages based on number of trees tapped irrespective of the days crop. This can create negative approaches by the tapper such as preplanned absenteeism or shallow tapping after stimulation. Introduction of production linked incentive system is the best approach to ward off such problems.

Another reason for high cost of production is prolonged immaturity phase of 6-7 years in traditional region, and 9-10 years in the non traditional region to attain the tappable girth of 50cm. When trees were opened on half spiral cut at lower girth, it leads to poor growth and high TPD in subsequent years.

Taking into account all the situations in holdings, RRII conducted various onfarm and lab to land programmes in representative areas with a view to extent modern exploitation techniques in holdings.

I. Extension of d/3 frequency tapping with mild stimulation (3/y) in clone RRII 105

Since the performance from various holdings in the program was similar, a representative case is presented. The holding has 4.8ha planted in 1986 with clone RRII 105 and the trees were opened for tapping in 1992. In the initial years, tapping frequency was alternate daily (d/2) without rainguarding. As a result tapping was irregular during the monsoons (Sugunanada,2002). Moreover, there was no tapping during summer months due to very low yield. Yield under d/2 frequency was 1.5 tonnes/ha. Exploitation practice was changed to d/3 frequency tapping with rainguard. In order to convince the grower, only in 3.2 ha (4 task), mild stimulation (3/y) with 2.5% ethepon was carried out whereas 1.6ha was retained as control

without stimulation. The annual yield increased to 2.1tonnes/ha under regular d/3 frequency tapping without stimulation (Table 1). By mild stimulation (3/y) the yield was further increased to 2.7 tonnes/ha. The yield increase was stable throughout. Though stimulation was given only thrice a year, yield of ethepon applied blocks were higher in other months as well. Regular tapping under d/3 frequency helped to realize high yield even during summer months (15 to 20kg/tap/ha). Hence, there is no need of tapping rest during summer months. Annual average dry rubber content was 40 percent in control and 38.3 percent in stimulated tasks. The drop under mild stimulation was only 1.7 percent, and the cumulative TPD was less than 4 percent.

The system of wage payment for tapper was based on number of trees tapped. The wage of tapper was fixed at Rs120/400 tree (US$ 2.67) irrespective of the production. Compared to no work during monsoon and summer season under d/2 frequency, regular work and income under d/3 made the workers happy. However, to avoid extra yield and related sheet processing under stimulation, workers followed shallow tapping. Moreover, the scrap percentage was on the higher side due to early collection. To minimize this, a production linked incentive system was introduced in consultation with grower and the tapper (Table.2). Tapping wage was reduced to Rs 100/400 tree (US$2.22), but with an incentive system of 60 paise for each sheet (600g) made from his daily latex was introduced. This practice helped to increase the number of sheets to 50 from the earlier 35. Thus the incentive to the tapper is Rs30/- raising his daily wage to Rs130 (US$2.89). For this, the tapper reach the block early and wait till the flow stops, as the incentive is only for sheet rubber. This helped to increase the crop and reduce scrap. For the grower, the crop which was earlier realized as scrap also got converted to sheet in the new system, and benefited by the price advantage of sheet over scrap (Rs125/ha/day i.e. US$2.78). Thus, the new incentive system proved to be beneficial for both grower and his tapper. The cost benefit analysis of introducing d/3 frequency in the growers field indicated a net additional income of Rs 82074

(US$ 1823/ha) in control area and Rs 161366 (US$ 3585/ ha) in the mild stimulated field , for the four year period (Table 3).

The grower is still continuing the practice. He has reduced the control block to one task. The success story of this grower was widely publicized by the print and electronic media. Many growers visited him and after getting first hand information, shifted to the new system. This or further lower frequencies of d/4 and weekly will be more beneficial for growers who use family labour.

II. Experiments with mini/reduced spiral tapping in clone RRII 105

The experiment was laid out in a newly opened area of clone RRII 105. All the trees were opened for tapping at height of 125cm above bud union, and panel width varied from 5cm to half spiral according to the treatments. The tapping frequency was d/3, but stimulation dose and frequency varied (Thomas et al,.2002). The results of the experiment for four years is presented (Table.4). Yield of trees under reduced spiral cut of 10cm stimulated with ethepon (2.5% applied on panel) at fortnightly interval is comparable to that of trees tapped under 1/2S d/3 6d/7 stimulated thrice a year. Girth increment under reduced cut was 62 percent higher compared to 1/2S tapping cut.

A trial on clone GT 1 was conducted in farmers field to evaluate adoption of reduced spiral cut with 10 cm length for early opening. In this location the immaturity period is 10 years. 400 trees with an average girth of 44 cm were opened with 10cm cut during April 2002. Yield stimulation was carried out at fortnightly interval with 2.5% ethepon (panel application). Another group of 400 trees of 50cm girth were tapped on conventional 1/2S tapping (opened during November,2001) with standard stimulation recommendation (7/y) served as the control. The dry rubber yield obtained from task of reduced spiral trees was 82 percent of the control

(Table 5). Girth increase in conventional tapped tree was only 2.7cm, . whereas the reduced spiral tapped trees reached the average girth of 51cm in one year,i.e. increase of 7 cm. In April 2003 these trees were converted to 1/2 spiral by extending the length of tapping cut. Thus adoption of the reduced spiral system helped the grower to get reasonable income and also to open the trees one year earlier than expected.

In another location, during April 2003, seven tasks were opened in which 40 percent trees are of 50cm girth whereas remaining 60 % trees are in the girth range of 43-45cm. Trees with girth of 50cm and above were tapped on 1/2 spiral tapping cut, and 43-45cm with reduced spiral cut and fortnightly stimulation. This enable them to have reasonable crop from under girth trees, compact area for tapping and ultimately early opening.

The number of growers adopting d/3 frequency with stimulation is likely to increase. Inspite of all advantages, some growers are likely to continue the high frequency tapping. For such growers 1/3S d/2 with rainguard or 1/3S d/1 without rainguard, without stimulation, may be a better option as it ensures less incidence of TPD and more years of exploitation compared to 1/2S d/2. In two long term trials of RRII with clone RRII 105 and RRII 203, the yield under 1/3S was more than 2 tonnes/ha (>5kg/tree) and incidence of TPD in the acceptable limits. Moreover, there will be a third virgin panel for exploitation, resulting in longer economic life. There was no island effect in the third panel (Vijayakumar et al, 2000).

Thus by adoption of reduced spiral tapping for early opening, d/3 frequency or further lower frequency of tapping with stimulation and long term controlled upward tapping, the productivity as well as the economic life of rubber trees in holdings can be substantially increased from the existing. The approach will surely help them to reduce cost of production and face the present challenges of globalization.

References

1. Rajasekharan, P and Hardidasan, V. 1992. Diffusion and adoption of innovations in rubber small holdings. Indian Journal of Natural rubber research. 5 (1&@), 188-194.
2. Rubber Board, 1999. Indian rubber statistics. Vol.23. Rubber Board, Kottayam, India, 1-87.
3. Rubber Board, 2002. Rubber and its cultivation. Rubber Board, Kottayam, India, 28-31.
4. Sugunananda, S, 2002. Once in three days tapping with mild ethepon application: My experience. Presented in planters conference, 2002, Rubber Board, Kottayam, India
5. Thomas, K U, Vijayakumar,KR, Rajagopal, R and Karunaichami, K 2002. Performance of mini and reduced spiral tapping cuts in *Hevea brasiliensis* . Plantation crops research and development in the new millennium, 126-130.
6. Vijayakumar, K R; Thomas,K U and Rajagopal, R. 2000. Tapping. In: Natural Rubber. Agromanagement and Crop processing. (Eds.George,P.J and Jacob,K.C) Rubber Research Institute of India, Kottayam, India. 215-238.
7. Vijayakumar, K R; Thomas,K U , Rajagopal, R and Karunaichami,K. 2002. Status of exploitation research in India. Paper presented in IRRDB workshop on plant breeding, Agronomy and Socio-Economics, KualaLumpur 2002.

Table.1. Dry rubber yield (kg/ha-46 months) under d/3 frequency tapping in clone RRII 105

Year	Control	Stimulated
1999-00	2109	2500 (2/y)
2000-01	2091	2900 (3/y)
2001-02	2178	2599 (2/y)
2002-03	2040	2691 (3/y)
Cumulative yield-kg	8418	10690
Mean annual yield-kg	**2105**	**2673**
Yield increase -%		27
Annual mean drc%	40.0	38.3
Summer yield range - kg	12.8 (April) to 16.3 (May)	15.6 (April) to 20.1(May)

Table: 2 .Details on special incentive system introduced based on sheet production

Old Practice	400 Numbers
Tapping trees/ block	Rs 120/- (US$ 2.67)
Daily wage @ 30Ps/Tree	35 Numbers
Average sheets/day/ Hectare (600 g)	
New Practice	
Daily wage @ 25Ps/Tree	Rs 100/- (US$ 2.22)
Incentive/ sheets	60Ps
Average sheets/day/ Hectare (600 g)	50 Numbers
Amount of incentive	Rs 30/-
Total wages	Rs 130/- (US$ 2.89)
Additional amount received by the tapper/ block	Rs 10/- (US$ 0.22)
Additional amount to the grower/ hectare	15 sheet x 600g = 9Kg 9Kgx Rs 40 = Rs 360/-
Price of 9Kg scrap (@ Rs 25/Kg)	Rs 225/-
Net additional income to the grower/ hectare	Rs 360 – (Rs 225 + Rs 10) = Rs 125/-(US$ 2.78)

Table.3 : Cost benefit analysis of adopting d/3 frequency tapping with and without stimulation (with rainguard) in comparisons to d/2 tapping for 4 years

Item	Unstimulated	Stimulated
Increase in Rubber production over d/2 (Kg/ha)	**2502**	**4774**
Income (@ Rs 40/ Kg sheet + Rs 25/Kg scrap	+ 94,455 (US$ 2099)	+ 1,80,220 (US$4005)
Cost of processing (@ Rs 3/Kg)	- 6,381 (US$142)	-12,174 (US$271)
Cost of yield stimulation (Rs/-)	0	- 680 (US$15)
Cost of Rainguarding (Rs)	- 3,000 (US$ 67)	- 3,000 (US$67)
Additional tapping wages for 25 taps (Rs)	- 3,000 (US$ 67)	- 3,000 (US$67)
Total cost (Rs)	-12,381 (US$ 276)	-18,854 (US$420)
Net – income (Rs)	+ 82,074 (US$1823)	+1,61,366 (US$3585)
Additional advantage of yield stimulation (Rs)		**+ 79292 (US$1762)**

Assumption – 1 US $ - Rs 45/-

Table.4: Dry rubber yield (kg/400 trees) and growth under various tapping systems in clone RRII 105 during 1999-2003

Tapping and stimulation practice	Cumulative yield Kg/ 4 year	Annual mean yield (kg)	Girth increment (cm) and % of control
1/2S d/3 6d/7 ET 2.5% Pa 3/y	10842	2710	12.1 (100)
Mc5 d/3 6d/7 ET 2.5% Pa 24/y	7914	1979	18.6 (154)
Mc5 d/3 6d/7 ET 5.0% Pa 12/y	6751	1688	21.2 (175)
S/R10 d/3 6d/7 ET 2.5% Pa 24/y	**10804**	**2701**	**19.6 (162)**
S/R10 d/3 6d/7 ET 5.0% Pa 12/y	9765	2441	14.3 (118)
1/4S d/3 6d/7 ET 5.0% Pa 12/y	11638	2910	14.3 (118)
1/3S d/3 6d/7 ET 5.0% Pa 12/y	12871	3218	13.0 (107)

Table.5: Dry rubber yield (kg/400 trees) and growth under various tapping systems in clone GT 1 during 2002-2003

Tapping and stimulation practice	Dry rubber yield (kg/400 tree)	Girth at opening (cm)	Girth after one year and increment (cm)
1/2S d/4 6d/7 ET 2.5% Pa 7/y	998 (100)	50	52.7 (2.7)
S/R10 d/3 6d/7 ET 2.5% Pa 24/y	**816 (82)**	**44**	**51 (7.0)**