SUCCESSFUL EXTENSION OF LOW FREQUENCY TAPPING IN DIFFERENT AGROCLIMATES AND REPORT ON HIGH YIELD UNDER 1/2S D/6 6D/7 TAPPING

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Abstract Ever since recommending fourth daily (d/4) and weekly (d/7) frequencies of tapping these systems have been extended successfully to many estates in India covering different agroclimatic conditions. Fourth daily tapping has been adopted in more than 20,000 hectares. Three medium estates have completely shifted to weekly tapping. Five onfarm trials comprising 46 blocks are in the third year of weekly tapping without any yield reduction. In one demonstration plot, dry rubber yield for 12 months during 2003-2004 season was 4120 kg/400 trees which is the highest ever reported under weekly tapping of a half spiral cut. Fourth daily and weekly tapping with rainguarding was successful in Kulasekharam region of India where rainguarding is traditionally not practiced due to low rainfall compared to other parts.

INTRODUCTION

Success of low frequency tapping without reduction of yield was reported earlier (Vijayakumar *et al.*, 2001; 2002a, b; 2003a, b; Karunaichamy *et al.*, 2001; Rajagopal *et al.*, 2003; 2004). They reported annual dry rubber yield of 5-6 kg/tree under 1/2S d/4 6 d/7 and 1/2S d/3 6d/7 systems of tapping with varying levels of stimulation of high yielding clones. Wei Xiaodi (2003a) reported good performance of ½S d/4 frequency of tapping in China. Wei Xiaodi (2003b) also reported promising yield under ½S d/5 system of tapping. Vijayakumar *et al.* (2002b; 2003a) presented data on high yield from many clones of *Hevea* (RRII 105, PB 260, PB 235, PB 5/51, PB 217 etc under weekly (d/7) frequency of tapping. Based on the extensive experiments conducted, ½S d/4 and 1/2S d/7 frequencies of tapping were recommended in India in 2001. These recommendations were for the traditional rubber growing regions with rainguarding. By adopting the recommendations, most of the estates in India covering 20,000 ha. shifted successfully to low frequency tapping of ½S d/4 system with stimulation.

Three small estates shifted completely to weekly frequency of tapping. Onfarm trials and demonstration plots on weekly tapping were started in five locations. In the southern tip of India (Kulasekharam region), rainguarding is traditionally not practiced due to low rainfall. In this region productivity under fourth daily tapping was found to be not satisfactory due to the absence of the practice of rainguarding (Vijayakumar *et al.*, 2001). In 2003 exploratory trials were laid out in this region with 1/2S d/4 6d/7 and 1/2S d/7 systems of tapping under rainguarded condition. Field performance of low frequency tapping systems are discussed.

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MATERIALS AND METHODS

The new RRII recommendations on low frequency tapping are given in Table 1. List of estates, which adopted the new recommendations and frequencies of tapping, are shown in Table 2. Number of tapping blocks under weekly tapping in the three small estates are given in Table 3. Onfarm trials on weekly tapping was laid out with clone RRII 105 in 6 tapping blocks each at Koyipathody estate in Calicut (11° 15'N; 75° 47'E), Balanoor estate in Perinthalmanna (11° 05'N; 76° 20'E), Manikal estate, Mundakkayam (9° 39'N; 76° 51'E), 4 blocks in Vijayadri estate, Kottayam (9° 35'N; 76° 36'E) and 9 blocks at Kulappadam estate at Mannarcadu (11° 00'N; 76° 30'E). Two demonstration plots with weekly tapping were initiated in the Central Experiment Station (CES) of RRII ((9° 24' N; 76° 49' E) with clone RRII 105. At the time of commencement of weekly tapping, one plot (1987 planting) consisting 296 trees was in the first year of tapping in panel BO-2 and the other plot of 178 trees (1993 planting) was in the second year of tapping panel BO-1. In the onfarm trials at Koyipathody and Kulappadam estates frequency of stimulation for weekly tapping was monthly interval. In the 1987 plot at CES frequency of stimulation was monthly while in 1993 planting the frequency of stimulation was once in three weeks during 2002- 2003 and monthly during 2003-2004. Frequency of stimulation in the newly opened blocks at Balanoor, Manikal and Vijayadri plantations was fortnightly. For weekly tapping in estates the schedule of stimulation after 2nd year of opening was as follows:

RRII 105 : Before every 5th tapping

PB 260, PB 235 : Before every 6th tapping

RRIM 600 : Before every 4th tapping

Exploratory trials on fourth daily tapping in clone RRII 105 in the Kulasekharam region (8°25'N; 77°14'E) with introduction of rainguarding was started in 2003 with four tapping blocks in Hariharaputhra estate (1989 planting; panel BO-2) with recommended doze of stimulation. In the adjoining Kanthimathi estate, weekly tapping was started with rainguarding in 7 tapping blocks (1986 planting) of clone RRII 105 with monthly frequency of stimulation (Panel BO-1).

Generally the task size is 400 trees. In the northern region it is 350 trees.

RESULTS AND DISCUSSION

Yield performance of fourth daily tapping in Plantation Corporation of Kerala (PCK) in 4550 hectare is given in figures 1 and 2. Production and productivity has in fact increased under low frequency tapping. This can be attributed to the earlier practice of third daily tapping without stimulation. Lower productivity in general is due to lower stand and predominance of low and medium yielding clones. On per tree basis, yield was around 4 kg per year in 2003-2004.

In Ambanad estate at Punalur region (9°05N; 77° 00' E) of Travancore Rubber and Tea (TR & T) company also there was increase in production and productivity during 2002-03 and 2003-04 (Figures 3 & 4). The increase could be attributed to regular tapping and absence of extra tapping. Overall lower yield is due to high elevation in one of the two divisions of the estate. It was observed that d/4 frequency of tapping was useful in overcoming the low d.r.c. problem experienced in the high elevation, mainly due to low temperature. In this region weekly tapping is being tried for further improvement of d.r.c..

In Manikal estate of TR & T company in Kottayam region where 1/2S d/4 6d/7 system was strictly implemented without extra tapping, there was increase in production (Figures 5 & 6).There was slight decrease in productivity during 2002-2003 whereas considerable increase was observed in 2003-2004. Overall low productivity is due to the unscientific tapping practiced earlier in the estate.

At Kottayam region (9°32'N; 76°36'E) results of newly opened trees (clone RRII 105) under weekly tapping in the first two years for Manikal estate and Vijayadri estate are given in Tables 4 & 5. These trees were subjected to fortnightly stimulation. Data shows success of weekly tapping in the newly opened trees. Performance of weekly tapping in the demonstration plots at Central Experiment Station (9°24'N; 76°49'E) of RRII (Kottayam region) is presented in Tables 6 & 7. These data also shows success of weekly tapping with yield stimulation at monthly intervals. Very high yield of 4120 kg (10.3 kg/tree) during 2003-2004 is the highest ever reported under weekly tapping of a half spiral cut. The unusually high yield can be attributed to 2nd year tapping in panel BO-2. It will be worthwhile to examine whether the increased yield under panel change will last for more duration under low frequency tapping. Rajagopal *et al.*, (2003; 2004) reported high yield of dry rubber in the first year of tapping in clones PB217 and RRII 105 in panel BO-2 under fourth daily and third daily frequencies of tapping.

Performance of different clones to weekly tapping at Kulappadam Estate in Palakkad district (severe summer) is presented in Table 8. Data shows success of weekly tapping in Palakkad region (11°0'N; 76°30'E). Per tree yield of clone RRII 105 ranged from 4.93 – 5.55 kg. Yield of PB clones ranged from 4.36 – 4.92 kg/tree. Response of clone RRII 105 to d/3, d/4 and d/7 frequencies of tapping in four estates of Young India Group at Nilambur region is presented in Tables 9 &10. Balanoor estate is located on the southern slope of a hill where dry spell is severe. In all the estates in this region winter temperature is higher than in the surrounding places. Productivity of clone (RRII 105) under d/3, d/4 and d/7 frequencies of tapping are comparable. Lower productivity in R 91, R 92 and R 94 fields of Balanoor estate under weekly frequency of tapping is because of the fact that these are newly opened trees and also due to non-cooperation by labours. In this estate trees in some fields remained unopened for quite some time due to labour problem. Our experience in this estate showed that, even if the trees are overgrown due to delay in opening high intensity stimulation (at fortnightly interval) is needed for achieving satisfactory yield under weekly frequency of tapping.

At Calicut (11°15'N; 75°47'E) in PK plantation the overall productivity under weekly tapping (Tables 11 & 12) during 2003-2004 was same as that under d/4 frequency of tapping during 2002-

2003. In 2003-2004 clone RRII 105 gave more than 5 kg/tree yield of dry rubber under weekly tapping frequency. Clones PB 235 and PB 260 gave 4.18 and 4.66 kg/tree respectively. At Koyipothady estate (Table 13) in Calicut, performance of clone RRII 105 under weekly tapping was good with annual yield of 5.04 kg/tree in 2002-2003 and 5.09 kg/tree in 2003-2004. In the case of clones RRIM 600, GT 1 and PB 235, yield under d/4 frequency of tapping was good. These fields were under alternate daily tapping till 2002.

At Appella estate in Karnataka (12°52'N; 75°47'E), performance of clone GT 1 (slow starter) under d/4 frequency of tapping was satisfactory for panel BO-1(Table 14). Clone RRIM 600 also showed good yield in the renewed bark under fourth daily tapping. This region has heavy rainfall and severe summer.

At Kulasekharam region in Kanyakumari district (8°25'N; 77°14'E) rainguarding is not practiced due to low rainfall (Vijayakumar *et al*, 2002). Results of d/4 frequency of tapping with rainguarding in Hariharaputra estate in the region is presented in Table 15. Yield obtained in 9 months is around 5 kg/tree. Per tapper yield ranged from 9kg to 40kg. DRC % was in the range of 32.8 to 44.3% (Table 15). In this estate success of rainguarding in the initial months led to adoption of rainguarding in the non experimental fields also in the same year.

At Kanthimathi estate (Table 16) in the above region mean yield of 7 blocks under d/7 frequency of tapping with rainguarding was 2334 kg/400 trees for 11 months showing success of weekly tapping with rainguarding. Per tap yield and DRC % showed considerable monthly variation. Per tapper yield was in the range of 26 kg to 72 kg and DRC% was in the range of 36 to 41% (Table 16). There was failure of monsoon rain and total rainfall received during the study period was only 46 cm (Table 16), which is less than that of semiarid condition.

CONCLUSIONS

Results presented here show success of low frequency tapping, upto weekly frequency of tapping in different agro-climates in India. Success of weekly tapping with rainguarding in the southern tip of India with low rainfall indicates that weekly tapping with rainguarding can be adopted in other countries also.

REFERENCES

Vijayakumar, K.R., Thomas, K.U., Rajagopal, R. and Karunaichamy, K. (2001). Low frequency tapping systems for reduction in cost of production of natural rubber. *The Planters' Chronicle*, 97 (11): 451 – 454.

Vijayakumar, K.R., Thomas, K.U., Rajagopal, R. and Karunaichamy, K. (2002 a). Status of Exploitation Research in India. Paper presented on joint workshop on Plant Breeding, Agronomy and Socio-Economics. Organised by International Rubber Research and

Development Board (IRRDB). Kuala Lumpur, Medan, Palembang, 29 August – 10 September 2002.

Vijayakumar, K.R., Thomas, K.U., Rajagopal, R. and Karunaichamy, K. (2002 b). Advances in exploitation research of Hevea in India. In: Global competitiveness of Indian Rubber Plantation Industry: Rubber Planter's Conference, India.(Ed. C. Kuruvilla Jacob). Rubber Research Institute of India, Kottayam, November 21-23, 2002. pp. 155-162.

Karunaichamy, K., Vijayakumar, K.R., Thomas, K.U., Rajagopal, R., and Anil Kumar, D. (2001). Response of rubber *(Hevea brasiliensis* Muell. Arg., Clone RRII 105) to low frequency tapping systems. *Indian Journal of Natural Rubber Research,* 14(2): 79-87.

Rajagopal, R., Vijayakumar, K.R., Thomas,K.U. and Karunaichamy, K. (2003). Yield response of *Hevea brasiliensis* (clone PB 217) to low frequency tapping. Paper presented on International Workshop on ExploitationTechnology, Kottayam, India, 15-18 , December 2003.

Rajagopal, R., Vijayakumar, K.R., Thomas, K.U. and Karunaichamy, K. (2004). Effect of judicious ethephon application on yield response of *Hevea brasiliensis* (clone RRII 105) under 1/2S d/3 6d/7 of tapping system. *Journal of Rubber Research,* 7(2):115-124

Vijayakumar, K.R., Thomas, K.U., Rajagopal, R. and Karunaichamy, K. (2003 a). Response of *Hevea* clones to Low Frequency Tapping. Paper presented on International Workshop on Exploitation Technology, Kottayam, India, 15-18 December 2003.

Vijayakumar, K.R. (2003 b). Low frequency tapping to reduce cost of natural rubber production. *International Rubber Journal*, 70: 41-42.

Wei Xiaodi, Xiao Xianzhou and Chen Qiubo (2003a). Rubber exploitation technology in China. Paper presented on International Workshop on Exploitation Technology, Kottayam, India, 15-18 December 2003.

Wei Xiaodi, Xiao Xianzhou and Chen Qiubo (2003b). Low frequency tapping system (d/5) for rubber trees. Paper presented on International Workshop on ExploitationTechnology, Kottayam, India, 15-18 December 2003.

Table 1. Tapping and stimulation recommendations of Rubber Research Institute of India

Clone	Tapping system	Schedule of stimulation (ET2.5%Pa)
High yielding		
RRII 05	1/2S d/3 6d/7	Apr., Sept., Nov.
RRII105	1/2S d/4 6d/7	Apr., Jun., Aug., Sept., Nov., Dec.
RRII105	1/2S d/6 6d/7	All months*
PB217	1/2S d/3 6d/7	Apr., Sept., Nov. (No stimulation in the initial two years)
PB217	1/2S d/4 6d/7	Apr., Jun., Aug., Oct., Dec.
Medium yielding		
GT1	1/2S d/3 6d/7	Apr., Aug., Oct., Dec
GT1	1/2S d/4 6d/7	Mar., Apr., Jun., Aug., Oct., Dec., Jan.
RRIM600	1/2S d/3 6d/7	Apr., Aug., Oct., Dec.

*Fortnightly stimulation for two years in newly opened trees

Note: 1. Diluent-palm oil/coconut oil. 2. 5% lace application before third tapping after opening. 3. All the above recommendations are applicable under rainguarded condition (except d/3 frequency in Kulasekharam). 4. Stimulation may be done between 48-72 hours before tapping.5. Do not stimulate when drc falls below 30%.

Table 2. Estates which adopted low frequencies of tapping

Name of estate	Frequency of tapping
PCK (8 estates)	d/2 and d/3 ⇒ d/4
Harrisons Malayalam Limited (11 estates)	d/2 and d/3 ⇒ d/4
TR & T company (5 estates)	d/2 and d/3 ⇒ d/4
SFCK Ltd. (5 estates)	d/3 ⇒ d/3 + ET
Kulappadam estate	d/2 ⇒ d/3 ⇒ d/4 ⇒ d/7
Koyipathody estate	d/2 ⇒ d/4 and d/7
Young India group (4 estates)	d/2 and d/3 ⇒ d/3 + ET. d/4 and d/7
P.K. Plantation	d/2 ⇒ d/4 ⇒ d/7
Appella estate in D.K. Dist.	d/2 ⇒ d/3 ⇒ d/4
Kadamackal estate	d/2 ⇒ d/3 ⇒ d/4
Koojamala estate	d/2 ⇒ d/3 ⇒ d/4
Kerala estate	d/2 ⇒ d/3 + ET and d/4
Hariharaputhra estate	d/2 ⇒ d/3 ⇒ d/4
Neria estate (D.K. Dist)	d/2 ⇒ d/3 ⇒ d/4 and d/7
Palampara	d/3 ⇒ d/3 + ET
Vijayadri estate	d/2 ⇒ d/4 and d/7
Marigold estate	d/4
Kanthimathi	d/4 and d/7 with RG

Table 3. Medium estates which shifted to weekly tapping frequency

Balanoor Estate	47 blocks
Kulappadam Estate	24 blocks
P.K. Plantations	41 blocks

Table 4. Monthly dry rubber yield (kg/400 trees) of Hevea (clone RRII 105) under 1/2S d/6 6d/7 system of tapping in the 1st year of tapping in panel BO-1 in Manikal estate, Mundakkayam and Vijayadri estate, Kottayam during 2002-2003

Month	Manikal estate (Mean of 6 blocks)	Vijayadri estate (Mean of 5 blocks)
June	96	100
July	123	151
August	130	205
September	175	195
October	95	70
November	190	150
December	239	214
January	208	149
February	96	112
March	102	125
Total	1454	1471

Stimulation: Fortnightly interval – ET 2.5% Pa

Table 5. Monthly dry rubber yield (kg/400 trees) of Hevea (clone RRII 105) under 1/2S d/6 6d/7 system of tapping in the 2nd year of tapping in panel BO-1in Manikal estate, Mundakkayam and Vijayadri estate, Kottayam during 2003-2004

Month	Manikal estate (Mean of 6 blocks)	Vijayadri estate (Mean of 5 blocks)
April 03	122	119
May	160	155
June	192	216
July	238	319
August	173	287
September	160	294
October	105	250
November	193	278
December	220	321
January 04	106	210
February	51	110
March	62	92
Total	1782	2651

Stimulation: Fortnightly interval – ET 2.5% Pa

Table 6. Monthly dry rubber yield (kg/400 trees) of Hevea (clone RRII 105) in field 87A (1st year of panel BO-2) and field 93C (2nd year of panel BO-1) under 1/2S d/6 6d/7 system of tapping during 2002-2003- Central Experimental Station, RRII.

Month	87A	93C*
June	164	78
July	431	135
August	325	173
September	306	280
October	63	191
November	148	344
December	364	502
January	403	218
February	82	85
March	119	111
Total	2405	2117

*Stimulation: once in three weeks – ET 2.5% Pa

Table 7. Monthly dry rubber yield (kg/400 trees) of Hevea (clone RRII 105) in field 87A (2nd year of panel BO-2) and field 93C (3rd year of panel BO-1 under 1/2S d/6 6d/7 system of tapping during 2003-2004 – Central Experimental Station, RRII.

Month	87A	Kg/tap	93C*	Kg/tap
April 03	40	13.4	47	15.5
May	218	43.6	102	25.6
June	331	82.9	246	49.2
July	783	156.6	348	87.0
August	682	170.5	363	90.7
September	478	119.6	526	105.1
October	447	89.3	182	45.4
November	419	105	398	100
December	315	79	395	99
January 04	248	50	140	35
February	87	22	77	19
March	72	18	93	15
Total	4120	-	2917	-
Mean		79.1		57.2

* Stimulation May 03 onwards monthly – ET 2.5% Pa

Table 8. Effect of weekly tapping (1/2S d/7 7d/7) on yield performance of different clones at Kulappadam estate, Mannarcadu during 2003-04

Field	Clone	Dry rubber yield (Kg/400 trees)	Yield/tree (kg)
1978	RRII105	2091	5.23
1987	RRII105	1972	4.93
1989	RRII105	2219	5.55
1988	PB311	1821	4.55
1988	PB235	1747	4.37
1989	PB260	1745	4.36
1989	PB235	1968	4.92

Table 9. Annual dry rubber yield (kg/400 trees) under Low Frequency Tapping (LFT) in clone RRII 105 (1991 RP) -Nilambur region (Young India Group)

Estate	Area (ha)	Tapping frequency	02-03	03-04	Kg/tree
Badra	6.14	1/2S d/3 6d/7	2324	2428	6.07
Pandallur	9.88	1/2S d/4 6d/7	2408	2512	6.28
Gokul	8.07	1/2S d/4 6d/7	2118	2540	6.35

Table 10. Annual dry rubber yield under weekly tapping (1/2S d/6 6d/7) in clone RRII 105 during 03-04 at Balanoor Estate, Perinthalmanna (Young India Group)

Field	Area (ha.)	Number of trees	Kg/400 trees	Kg/tree
R 88	4.54	1650	2284	5.71
R 90	11.35	4000	2025	5.06
R 91	3.83	1400	1552	3.88
R 92	15.29	5600	1510	3.78
R 94	10.52	3850	1486	3.71

Table 11. Annual dry rubber yield (Kg) under Low Frequency Tapping (LFT) in P.K. Plantation, Calicut

Clone	No of trees	2002-2004	2003-2004
RRIM600 RRII105 PB235	7829	31248 1/2S d/4 7d/7	31243 1/2S d/7 7d/7

*Table 12. Effect of weekly tapping on yield performance of different clones under weekly tapping (1/2S d/7 7d/7) at P.K. Plantation, Calicut during 2003-04**

Field	Clone	Dry rubber yield (Kg/400 trees)	Yield/tree (kg)
1978	RRII 105	2618	7.00
1987	RRII 105	2115	5.29
1987	PB 235	1674	4.18
1989	PB 260*	1866	4.60
1988	RRIM 600	1456	3.64

* for 10 months

Table 13. Annual dry rubber yield under 1/2S d/4 7d/7 and 1/2S d/7 frequencies of tapping at Koyipathody estate, Calicut

Clone	No. of estates	Dry rubber yield (kg)/tapping frequency			Yield per tree (kg)		
		2001-02	2002-03	2003-04	2001-02	2002-03	2003-04
RRII105	355	14956 (d/3)	17944 (d/3 & d/6)	18106 (d/4 & d/7)	4.2	5.04	5.09
RRIM600 GT1 PB235	8500	26017 (d/2)	30764 (d/4)	34480 (d/4)	3.06	3.62	4.06

Table 14. Performance of clones RRIM 600 and GT 1 under 1/2S d/4 6d/7 system of tapping in Appella estate in Karnataka

	01-02			02-03			03-04		
Clone	YOP	Kg/tree	Kg/block	Kg/400	Kg/tree	Kg/block	Kg/400	Kg/tree	Kg/block	Kg/400
RRIM600	1972	4.82	1696	1929	5.69	2001	2276	5.17	1677	2070
GT1	1984	3.48	1302	1394	4.38	1637	1752	4.55	1629	1822
GT1	1988	3.22	1092	1292	3.78	1279	1513	4.42	1480	1769
GT1	1989	3.21	1084	1286	3.9	1315	1560	3.87	1338	1548
GT1	1990	2.97	990	1189	3.75	1253	1504	3.69	1271	1479

Table 15. Monthly yield of dry rubber and associated parameters in clone RRII 105 (PanelBO-1) under 1/2S d/4 6d/7 system of tapping with rainguarding in Hariharaputhra Estate, Kulasekharam

Month	kg/400 trees	kg /tap	kg /trees	Scrap%	DRC%
June 03	264	40.4	0.66	25.1	44.3
July	221	33.8	0.55	34.8	36.5
August	253	38.8	0.63	33.0	40.0
September	136	23.3	0.34	32.0	43.9
October	265	43.9	0.71	28.4	39.0
November	340	45.1	0.85	29.9	35.5
December	243	35.9	0.61	23.1	35.8
January 04	173	25.6	0.43	21.8	32.8
February	46	8.6	0.12	25.2	33.6
Total	1961	-	4.90	-	-
Mean	218	32.8	-	28.2	37.9

Table 16. Monthly yield of dry rubber and associated parameters in clone RRII 105 (Panel BO-1) under 1/2S d/7 7d/7 system of tapping with rainguarding in Kanthimathy Estate, Kulasekharam

Month	kg /400 trees	kg /tap	kg /trees	Scrap%	DRC%	Rainfall (cm)
May 03	93	26.0	0.23	13.6	37.5	6.8
June	204	49.0	0.51	19.9	40.3	3.7
July	261	59.3	0.65	24.8	36.9	3.08
August	229	52.7	0.57	23.3	38.5	1.75
September	208	50.2	0.52	27.1	40.0	0.54
October	241	62.9	0.60	21.7	40.9	21.59
November	310	72.4	0.78	33.1	36.4	4.60
December	247	55.8	0.62	29.9	36.9	2.44
January 04	216	48.6	0.54	22.5	37.6	Nil
February	181	43.5	0.45	21.5	39.0	1.64
March	144	32.7	0.36	17.3	40.2	Nil
Total	2334	-	5.84	-	-	46.19
Mean	212	50.3	-	23.2	38.6	-

Figure 1. Total production of dry rubber in the estates of Plantation Corporation of Kerala after introduction of 1/2S d/4 system of tapping

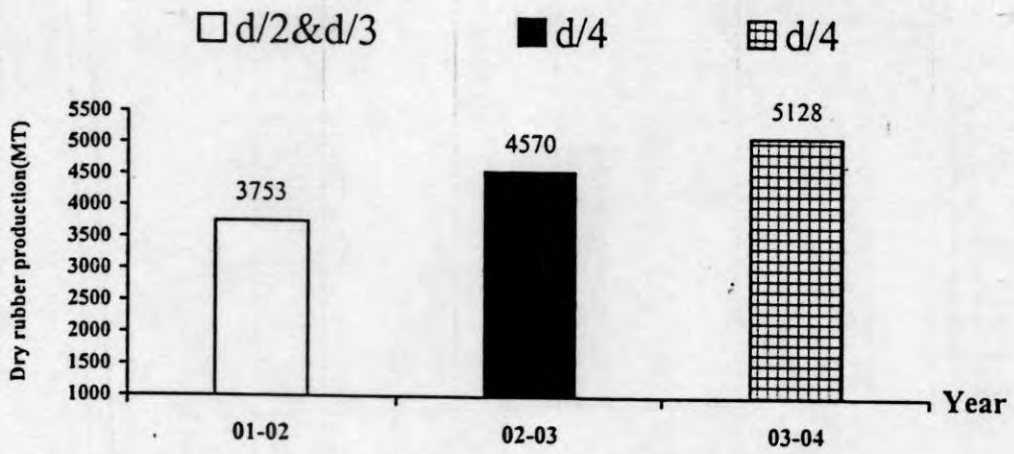

Figure 2. Mean productivity of the estates of Plantation Corporation of Kerala after introduction of 1/2S d/4 system of tapping

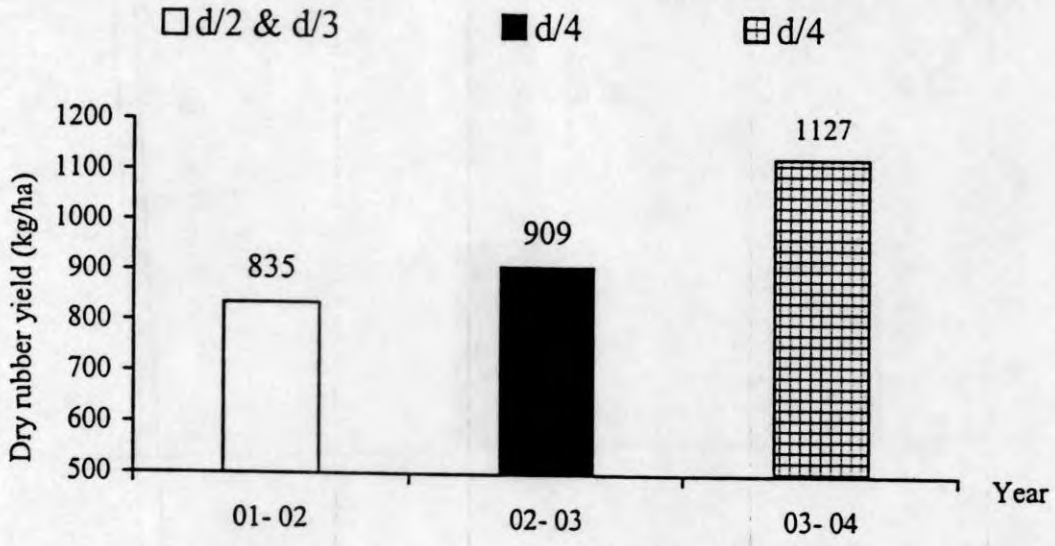

Figure 3. Production of dry rubber in Ambanad estate of TR & T company after introduction of 1/2S d/4 system of tapping

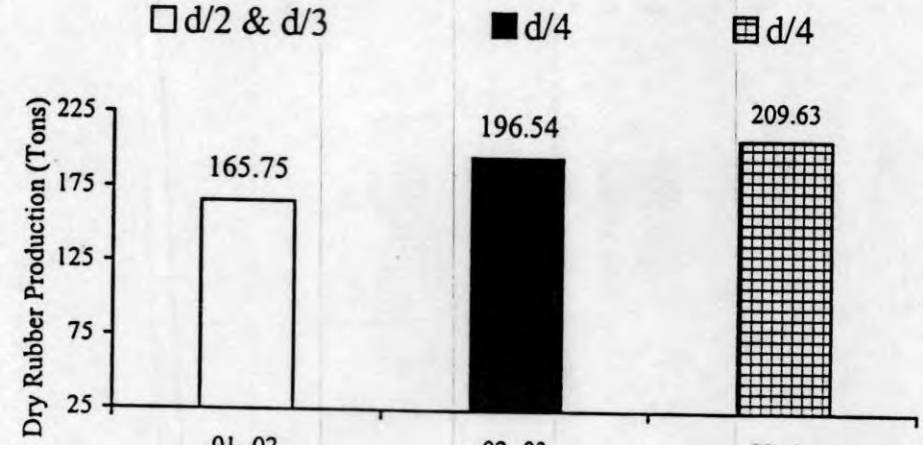

Figure 4. Productivity of Ambanad estate of TR & T company after introduction of 1/2S d/4 system of tapping

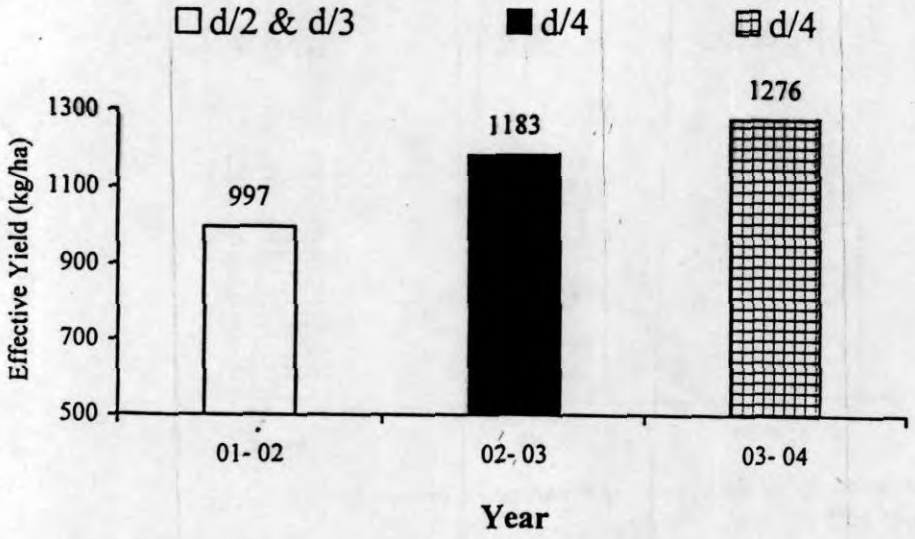

Figure 5. Production of dry rubber in Manikal estate of TR & T company after introduction of 1/2S d/4 system of tapping

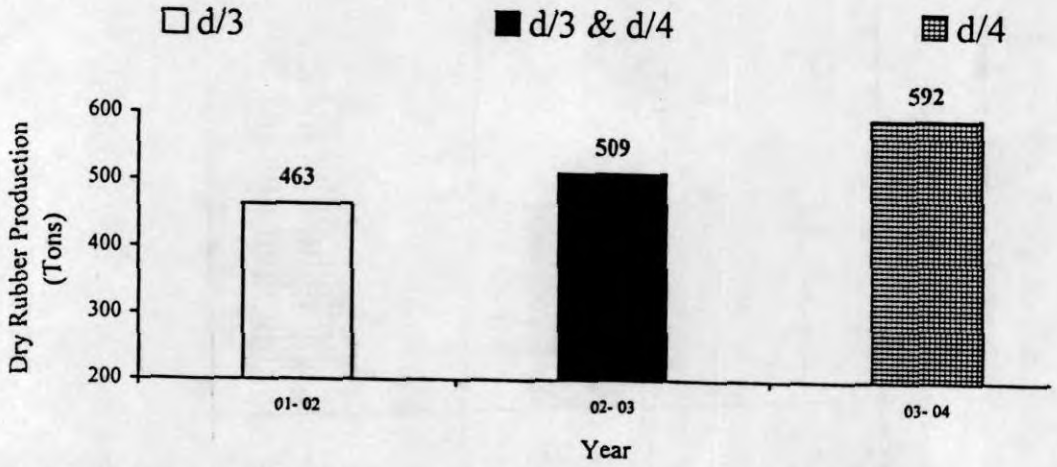

Figure 6. Productivity of Manikal estate of TR & T company after introduction of 1/2S d/4 system of tapping