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RAIN GUARDING IS ESSENTIAL FOR INTRODUCING MODERN METHODS OF LATEX HARVEST TECHNOLOGY

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- RAIN FED CULTIVATION
- HUMID TROPICS :
- MORE THAN 5 WET MONTHS

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CROP LOSS DUE TO RAIN HAS INCREASED

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Increased Crop Loss Due to Rain

INCREASED PER TAP YIELD AND FLOW TIME

- Modern high yielding clones
- d3 frequency of tapping
- Yield stimulation
- Crop loss is more under d4 and d6 frequencies of tapping.
- Increased flow time from shrt tapping cuts (CUT and LTS)

INCREASED RAIN FALL DUE TO CLIMATE CHANGE

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HIGH INCIDENCE OF TPD, AS HIGH AS 30% OR MORE

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- High incidence of TPD under d2 frequency of tapping of high yielding clones without rain guard(PB 260, RRII 105, PB 235 etc.)
- High incidence of TPD on recovery/compensatory tapping, high frequency stimulation etc

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RAIN GURDING IS IS THE APROPRIATE TECHNOLOGY

- **TO OVERCOME CROP LOSS,**
- **TO REDUCE TPD TO LOW LEVEL**
  &
- **TO ELIMNATE UNCERTAINTY OF STIMULATION RECOMMENDATION WITH SUBSTANTIAL REDUCTION IN FREQUENCY**

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RAIN GUARDING IS NOT POPULAR IN MAJOR NR PRODUCING COUNTRIES

- In spite of many advantages , rain guarding is not popular in Indonesia, Malaysia and Thailand accounting 70% of N R production.
- No rain guarding in West Africa
- Rain guarding is popular in India, China and Vietnam.

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CROP LOSS IN HIGH RAIN FALL REGION OF INDIA

Recovery of crop loss due to rain by rain guarding or stimulation in clone RRII 105 under different frequencies of tapping (Dry rubber yield – kg/400 trees)

Treatments	97-98	98-99	99-00	Mean	Mean tappings
T1-S/2 d2 6d/7 with RG	2823 a	2994 a	2760 a	2859 a	146
T2-S/2 d2 6d/7 without RG	1577 cd	2302 cd	2014 b	1964 cd	78
T3-S/2 d2 6d/7.without RG- 3 stim	1738 c	2629 abc	1955 b	2107 bc	77
T4-S/2 d2 6d/7.without RG- 5 stim	1668 cd	2519 bc	1880 b	2023 cd	77
T5-S/2 d3 6d/7 with RG	2044 b	2861 ab	2052 b	2319 b	99
T6-S/2 d3 6d/7 without RG	1204 e	1996 d	1059 d	1420 e	53
T7-S/2 d3 6d/7.without RG- 5 stim	1483 d	2490 bc	1521 c	1831 d	52
T8-S/ 2 d3 6d/7.without RG- 7 stim	1464 d	2572 bc	1523 c	1853 cd	52
CD (P=0.05)	241	410	251	257	

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CROP LOSS OF 900 KG DRY RUBBER/ 400 TREES

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- Recovery of crop loss due to rain is not possible by stimulation under d/2 frequency of tapping. However, under d/3 frequency of tapping at least 50 percent of crop loss can be recovered by stimulation
- Crop loss under d3 tapping would have been more with the recommended 3 annual stmulations

CROP LOSS IN MODERATE RAIN FALL REGION OF INDIA

IN THE SOUTHERN PART WITH MODERATE RAIN FALL CROP, LOSS OF 500 KG DRY RUBBER WAS REPORTED (VIJAYAKUMAR, et al.,2004; RAJAGOPAL, et al., 2005)

Table 3. Monthly yield of dry rubber and associated parameters in clone RRII 105 (Panel BO-1) under S2 d4 7d/7 system of tapping without rain guarding in Kanthimathy Estate (2003-2004) Kulasekharam (Vijayakumar *et al*., 2004)

Month	kg /400 trees	DRC	Scrap%	kg /Tap	kg /Tr
May 03	203	37.2	11.7	33.8	0.50
June	108	34.8	11.0	24.0	0.30
July	291	36.8	13.9	37.5	0.70
August	185	36.4	19.1	35.2	0.50
September	156	40.7	21.1	26.4	0.40
October	46	37.5	15.8	16.8	0.10
November	110	36.1	13.1	25.5	0.30
December	283	33.9	18.4	36.3	0.70
January 04	217	35.1	14.8	33.2	0.50
February	192	37.5	8.7	24.8	0.50
March	107	37.9	11.2	17	0.30
Total	1898	-	6.26	-	4.70
Mean	173	36.7	14.4	28.2	0.40

Performance of weekly tapping with rain guarding in clone RRII 105 under S/2 d7 7d/7freqency of tapping at Kanthimathy Estate, Kulasekharam (2003-2004)

Month	Kg/400 trees	Kg/tap	Kg/tree	Scrap %	DRC %	Rain fall (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
Aug	229	52.7	0.57	23.3	38.5	1.75
Sep	208	50.2	0.52	27.1	40.0	0.54
Oct	241	62.9	0.60	21.7	40.9	21.59
Nov	310	72.4	0.78	33.1	36.4	4.60
Dec	247	55.8	0.62	29.9	36.9	2.44
Jan 04	216	48.6	0.54	22.5	37.6	Nil
Feb	181	43.5	0.45	21.5	39.0	1.64
Mar	144	32.7	0.36	17.3	40.2	Nil
Total	2334	-	5.84	-	-	46.19
Mean	212	50.3	-	23.2	38.6	-

NB: Total Tapping Days = 46

Table 5. Monthly yield of dry rubber and associated parameters in clone RRII 105 (Panel BO-1) under S/2 d7 7d/7 system of tapping with rainguarding in Kanthimathy Estate, Kulasekharam (2004-2005) (Vijayakumar *et al.*, 2005)

Month	kg /400 trees	kg /tap	kg /trees	Scrap%	DRC%	Rainfall (cm)
Apr 04	127.0	31.8	0.32	21.71	37.81	18
May	136.2	41.2	0.34	21.48	38.11	26.0
June	228.7	53.7	0.57	23.85	37.01	28.9
July	282.3	63.8	0.71	26.51	35.61	2.6
August	252.8	56.8	0.63	24.43	36.74	4.8
September	246.9	59.6	0.62	24.61	37.20	13.0
October	304.7	68.8	0.76	26.93	36.14	12.2
November	297.1	67.2	0.74	27.55	35.63	4.1
December	234.3	52.8	0.59	23.90	37.56	-
January 05	174.0	39.5	0.43	20.72	37.79	-
February	110.9	27.7	0.28	20.38	37.59	-
March	108.5	24.8	0.27	23.95	38.06	0.2
Total	2503.4	-	6.26	-	-	109.8
Mean	208	49.0	0.50	23.8	37.10	9.2

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500 Kg dry rubber /ha loss in small holdings

(Survey by author and student 1994)

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- **NO CROP LOSS STUDY UNDER d4 & d6 TAPPING**
- **NO CROP LOSS STUDY UNDER CUT**

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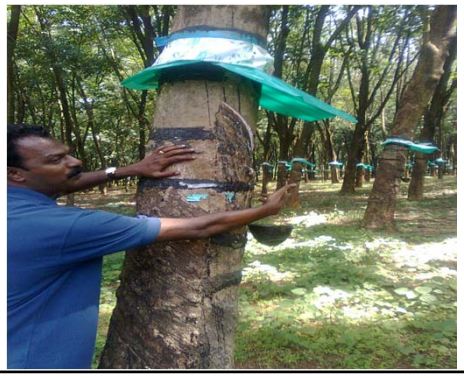
CROP LOSS WILL BE MORE UNDER

d4 AND d6 FREQUENCIES

- **NO CROP LOSS STUDY UNDER CUT (CONTROLLED UPWARD TAPPING)**



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CROP LOSS WILL BE MORE UNDER CUT

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DIFFERENT RAIN GUARDS

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PANEL GUARDS

Tapping shade

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CHANNEL GUARDS
&
CUP GUARDS

RAINGUARDING IN CHINA

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VIETNAM




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RAIN GUARDING OF HIGH PANEL CUT

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RAIN GUARDING OF HIGH PANEL

Rain guarding of high panel is problematic especially of panel guarding

Long polythene skirt is used In India.

Instead of lifting the rain guard, it is drawn to one side before tapping and placed back after tapping

RRII Exploitation Tech

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RRII Exploitation Tech

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CNTROLLED UPWARD TAPPING (CUT)

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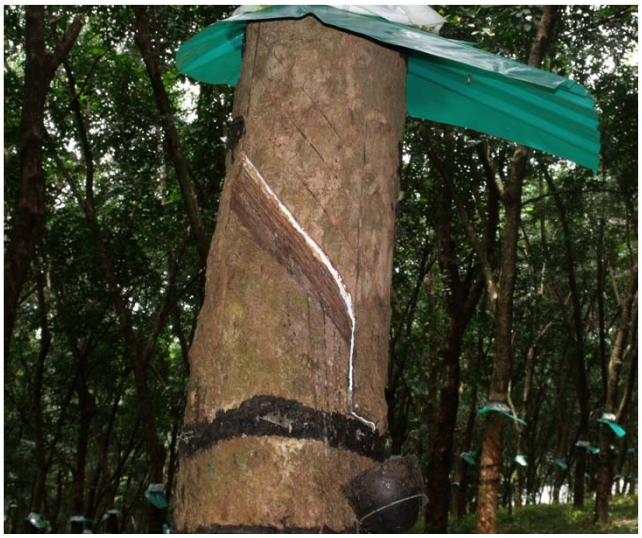
CNTROLLED UPWARD TAPPING (CUT)



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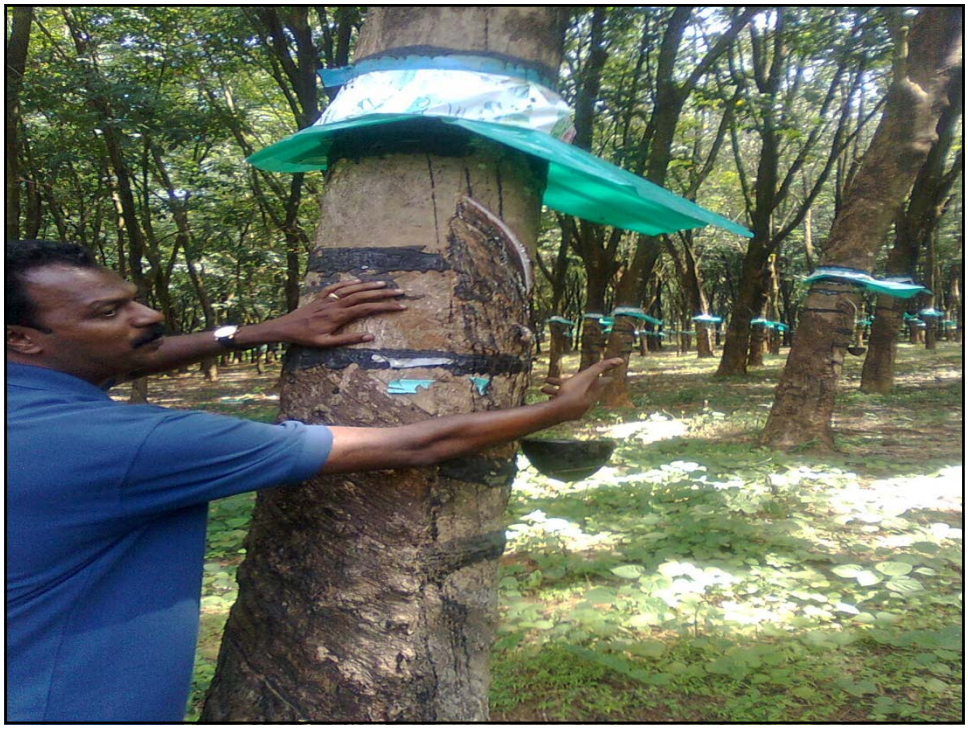

CNTROLLED UPWARD TAPPING (CUT)

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Yield (kg/tree) response of LFCUT with rainguards (Tapping shade and Skirt) in clone RRII 105 at CES, Chethackal

Treatments	04-05	05-06	06-07
T1- S/4U d/3 6d/7 skirt RG + monthly (ET5% La)	17.0	15.1	11.5
T2- S/4U d/3 6d/7 Tap. shade + monthly (ET5% La)	19.7	16.0	17.4
T3- S/4U d/4 6d/7 skirt RG + 3 weeks (ET5% La)	17.8	18.9	12.1
T4- S/4U d/4 6d/7 skirt RG + Fortnightly (ET5% La)	20.1	19.7	10.8
T5- S/4U d/4 6d/7 Tap.shade + Fortnightly (ET5% La)	20.3	14.8	20.0
T6- S/3U d/6 6d/7 skirt RG + 3 weeks (ET5% Ga)	16.6	15.9	14.7
T7- S/3U d/6 6d/7 Tap. shade + Fortnightly (ET5% Ga)	18.1	14.4	16.0
T8- S d/6 6d/7 skirt RG + Fortnightly (ET5% Ga)	17.6	15.0	9.6

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CNTROLLED UPWARD TAPPING (CUT)

Performance of CUT in a small holding of around 1000 trees with renewed bark unsuitable for tapping due to tapping injury. Tapping systems were S/4U d2, S/4 d3 and d4

Year	Tapping System	Annual dry rubber yield (kg)
2007-2008	S/4(RG) d2	5.50
2008-2009	S/4(RG) d3	5.00
2009-2010	S/4(RG) d4	6.25

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COMMERCIAL USE OF TAPPING SHADE FOR CUT

- THIRD YEAR OF CUT WITH TAPPING SHADE IN NEW AMBADI ESTATE
- SUCCESSFUL
- TASK COULD BE INCREASED FROM 300 TO 400 TREES

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HIGH COMMERCIAL YIELD YIELD FROM RAIN GUARDED CUT WITH TAPPING SHADE IN MODERATE RAIN FALL REGION

Table 10.Yield performance of CUT fields under S/4U d3 with rain guarding in New Ambadi estate

Field	Panel	No. of trees	Dry rubber yield (Kg/tree)	Avg./ tapper (Kg)/400 Trees	
				2011-12 HO-1 (1)	2010- 2011*
1980 GT 1	HO- 1 (2)	3360	7.06	31.89	35.83
1981 RRII 105	do	815	5.83	27.14	24.74
1981 GT 1	do	2850	7.77	37.07	31.82
1986 RRIM 600	do	5284	7.12	32.59	34.16
1981 Mixedd	do	1216	4.58	20.95	34.31
1982 GT 1	do	2458	9.78	38.69	46.+1
1982 RRII 105	Do	2862	7.24	29.53	34.79

* Labor strike for 75 days

Table 11. Yield performance of CUT fields with rain guarding in the third year of continuous CUT under S/4U d3 on panel HO2(1) (April- July 2012).

Field	No. of trees	Tapping Avg (Kg Dry rubber/ 400 trees)
1980 GT 1	3200	28.47
1981 RRII 105	800	23.40
1981 GT 1	2800	28.14
1982 GT 1	2421	31.39
1982 RRII 105	2421	28.08

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ADVANTAGES OF RAIN GUARDING

- Increased production of NR
- Stimulation is very effective
  - -Number of stimulations reduced drastically
  - - Good response to stimulation
- Rain guarding essential for success of low Frequency Tapping ,particularly d4 and d6

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HIGH YILED UNDER RAIN GUARDED TAPPNG IN MODERATE RAIN FALL REGION

(RAIN GUARDED BASE AND HIGH PANELS)

Table 8. Dry rubber yield in New Ambadi estate (Kg/ tree) and tapping average in 2011- 2012 under rain guarded tapping systems (S/2 d3 and S/2 d4).

Division	Number of trees	D ry rubber yield/tree (Kg)	Tapping Average (Kg /400 trees)
A	24504	5.73	25.27 (30.04)**
B	21630	5.89	25.76 (30.15)**
C	26440	5.92	31.08
D	54026	5.13	23.92
CH (S/2 d4)	3080	5.27	29.26
Total/ Mean	129234	5.53*	26.10 (27.23)**

*On excluding slaughter fields, dry rubber yield/tree = **5.69 Kg**

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STIMULATION BECOMES VERY EFFCTIVE AND EXACT

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- ONLY 3 STIMS/YR FOR S/3 d3 SYSTEMHIGH YIELDING CLONES
- 6 STIMS/YR FOR d4
- 12 STIMS/YR FOR d6

Clone	apping system	Stims .	Schedule
High yielding			
RRII 105	S/2(RG) d/3 6d/7	3	Apr,Sept,Nov
RRII 105	S/2(RG) d/4 6d/7	6	Apr,Jun,Aug,Sept,Nov,Dec
RRII 105	S/2 (RG)d/6 6d/7	12	All months*
PB 217	S/2(RG) d/3 6d/7	3	Apr,Sept,Nov (No stimulation in the initial two years)
PB 217	S/4(RG) d/4 6d/7	5	Apr,Jun,Aug,Oct,Dec

* fortnightly stimulation in the initial two years i.e.24 rounds / year

Clone	Tapping system	No.	Schedule
Medium yielding			
GT 1	S/2(RG) d/3 6d/7	4	Apr, Aug, Oct, Dec
GT 1	S/2(RG) d/4 6d/7	7	Mar, Apr, Jun, Aug, Oct, Dec, Jan
RRIM 600	S/2(RG) d/3 6d/7	4	Apr, Aug, Oct, Dec

N.B: 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
4. Stimulation may be done between 48-72 hours before tapping under d/6 frequency

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LOW FREQUENCY TAPPING (d4& d7) WITHOUT REDUCTION OF DRY RUBBER YIELD

Annual yield under different frequencies of tapping and stimulation wth rain guarding in clone RRII 105

Tapping System	Tapping days	Stimulations/ year	Yield Kg/ha/yr	Annual bark consumption (cm)	Mean per tap yield:Kg
S/2(RG) d/3 6d/7 (2 tappings/ week)	102	0	1706	16-18	16.7
S/2(RG) d/3 6d/7 (2 tappings/ week)	102	3	2200	16-18	21.5
S/2(RG) d/4 6d/7 (3 tappings/ fortnight)	71	6	2172	14-16	30.6
½S/2(RG) d/6 6d/7 (1 tapping/ week)	50	12	2350	12-14	47.0

Estimated per tap yield under d2 frequency is 14.6 kg

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ADVANTAGES OF RAIN GUARDING

Success of low frequency tapping with rain guarding

Resulted in

LOW INCIDENCE OF TPD

Yield performance (kg/block) under various tapping systems at Mullumala estate-RRII 105

System	97-98	98-99	99-00	00-01	Mean
1/2S d/6 6d/7* (50 taps/year)	2199	2779	2313	2109	2350 (8)
1/3S d/3 6d/7* (97 taps/year)	2066	1683	2478	1843	2017 (13)
1/2S d/2 6d/7 (139 taps/year)	2387	1951	2127	2149	2154 (26)
1/3S d/2 6d/7 (145 taps/year)	2376	1633	1700	2407	2029 (19)
1/2S d/3 6d/7 (97 taps/year)	1366	1052	2044	1493	1489 (22)

Figures in parenthesis indicate TPD %, *ET 5% 12/y (m)

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Low incidence of TPD in Kerala Estate practicing Low Frequency Tapping (LFT) of S/2 d4 since 9 years . Data of 2009-2010

Year of planting	No. of Trees	Clone/Dry rubber yield (kg/ha)	Dry rubber yield (kg/tree)	No of TPD Trees	Percent of TPD
1986 RP	2100	GT 1 : 1179; PB 235 : 1339	4.785 3.75	194	9.20
1989 RP	4800	RRIM 600 : 1617 GT 1 : 1981 PB 311 : 1753	4.65 4.90 4.54	234	4.87
1993 RP	2100	RRII 105 : 1827 PB 311 : 1122	4.93 4.25	111	5.28
1996 RP	3000	RRII 105 : 2229	5.36	135	4.50
1999 RP	1800	RRII 105 : 2212	5.98	57	3.16
1999 RP	1200	PB260 : 1256	5.47	30	2.50
2001 RP	2700	RRII 105 : 1695 PB 260 : 2032	5.69 5.49	22	0.81

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Effect of Low Frequency Tapping (LFT)on dry rubber yield and incidence of TPD in Hariharaputra estate

Field	No. of trees	Tapping system	Dry rubber yield (kg /tree)	No. of TPD Trees	Percent of TPD
1965 PB 86	------	3S/8U d3 + S/2 d/3	7.09	-------	---------
1983 PB 86	3381	S/4U d3*	5.57	68	2.01
1989 RRII 105; PB235	3068	S/4U d3*	7.63	102	3.32
1993 RRII 105	7282	S/2 d4 6d/7(10m/12)	4.96	549	7.53
1997 RRII 105	4519	S/2 d6 6d/7(10m/12)	4.23	503	11.1
2000 RRII 105	3056	S/2 d6 6d/7(10m/12)	5.33	120	3.92

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Low incidence of TPD in Ambanad estate (TR&T Company) practicing Low Fequency Tapping (LFT) of S/2 d4 snce 9 years Data of 2009-2010 in Middle Division

Field	Clone	Dry rubber (Kg/ha)	Dry Rubber (Kg/Tree)	Total trees Tapped	TPD Trees	TPD%
NC 85	GT 1, RRII 105	970	2.91	2432	296	10.85
NC85B	GT 1, RRII 105	1127	2.94	2662	340	11.33
NC86	GT 1, RRII 105	845	2.37.	3640	384	9.54
NC87A	GT 1, RRII 105	757	2.10	2189	208	9.06
NC88	GT 1, RRII 105	1185	3.12	3012	312	9.50
R93A	RRII 105	1340	3.38	1230	282	18.00
R94A	RRII 105	`1025	2.56	1610	85	5.01
R95	GT1, PB 260	1860	4.19	9208	1067	10.38
R96	PB 217	911	2.22	9232	182	1.93
R97	RRII 105	1617	3.94	2812	90	3.10
R2000A	RRII 105	1112	2.71	1520	50	2.14

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Low incidence of TPD in Ambanad estate (TR&T Company) practicing Low Frequency Tapping (LFT) of S/2 d4 since 9 years. Data of 2009-2010 in Lower Division

	Field	Clone	Dry Rubber Yield (Kg/ha)	Yield % of Tree (Kg/Tree)	TPD %	Number of Trees
1	NC85C	GT1; RRII105	1287	3.11	1.64	6683
2	R86	RRII105	2391	5.52	1.24	4837
3	NC87B	RRII105	1005	2.51	2.07	2406
4	R88	GT1; RRII105	2073	4.95	2.37	6303
5	R89	GT; PB260	1778	4.62	2.67	7465
6	R91	RRII105	1136	3.74	19.81	2988
7	R93B	GT1	718	1.65	2.2	3626
8	R94B	RRII105	1511	3.51	2.44	4953
9	R98A	RRII105	1453	4.61	4.99	12640
10	R99A	RRII105	1236	4.6	Nil	1202
11	R2000B	RRII105	1620	4.41	Nil	2588

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HIGH YIELDING CLONES CAN BE CULTIVATED WITH OUT FEAR OF TPD

- **In the southern regon of India many small holders are reverting to clone RRIM 600**

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- **COST OF RAIN GUARDING**
- **WITH PREVENTION OF HIGH CROP LOSS RAIN GUARDING IS VERY COST EFFECTIVE**
- **MOREOVER COST OF LABOR CAN ALSO BE SAVED DUE TO SUCCESS PF LOW FREQUENCY TAPPING**

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Cost of rain guarding (400 trees) as in 2010. Now 30% more.

- **Polythene skirt**
- **15 Kg of 300 gauge LDPE @ Rs 120/kg = Rs 1800 (41.0 US$)**
- **30 Kg pf adhesive @ Rs 28/kg = Rs 840 (19.0 US$)**
- **1 kg of LDPE ribbon 400 gauge (2cm) = Rs 120 (2.72US$)**
- **Stapler pins,, cotton waste/clothe etc = Rs 100 (2.3 US$**
- **Stitching charge for 15 kg polythene = Rs 225 (5.11 US$)**
- **Labor charge @Rs5/tree = Rs 2000 (45.5 US$)**
- **Total = RS 5085 (116 US$) = 29 cents/tree**
-
- **Cost of second rain guard, if necessary = RS 4413 (100US$) =25 xenis/tree**

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- **II Cost of Kissan/ Guardian rain guard**
- **Small = Rs 3.25 (7.39 cents)**
- **Medium = Rs 3.50 (7096 cents)**
- **Large = Rs 3.75 (8.52 cents)**
- **Labor charge = Rs 5/tree (11.36 cent)**
- **Cost/400trees = Rs 4685 (106.5 US$) =27 crnts.tree**
- **Cost of leak proofing if needed = Rs 4413 (100 US$) 25cents/tree**
- **Cost is Rs 400 (9.1 US$) less than that for poylthene skirt**
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- III Cost of Tapping shade Top
- Small = Rs 10.20 (23.18 cents) Rs 2.20 (0.97 cents)
- Medium = Rs 10.50 (23.86 cents) Rs 2.50 (5.68 cents)
- Large = Rs 12 00 (27.27 cents) Rs 3.00 (6.81 cents_
- Exra large = Rs 13.00 (29.55 cents) Rs 3.00 (6.81 cents)
- Labor charge = Rs 7/tree (15.9 cents)
- Cost/400 trees = Rs 9613 (218.5US$) = 55cents/tree
- Cost of leak proofing if needed = Rs 4413 (100 US$) = 25 cents/tree
- Labor charge fo CUT = Rs 10 tree (22.72US$)
- Remarks: Tapping shade can be reused for 2 to 3 years
-
- Cost 6 extra of Panel washings/year = Rs 648/400 trees (14.72 US$)

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PROBLEMS

- **PANEL GUARDS BECOME LEAKY .**
- **AFTER 5 MONTHS 50% RAIN GUARDSBECOME LEAKY**

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PROBLEMS

BARK ROT

PANEL WASHING WITH FUNGICIDE :1 to 3 TIMES/MONTH IN RAINY SEASON

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NO STUDY ON BARK ROT INCIDENCE UNDER d4 AND d6 TAPPING

IT HAS TO BE LOW

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WE MUST EVOLVE BIODEGRADBLE RAIN GUARDS

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CONCLUSIONS

1. RAIN GUARDING IS ESSENTIAL FOR LATEX HARVEST OF HIGH YIELDNG CLONES WITH LOW INCIDENCE OF TPD UNDER d3,d4 ANDd6 TAPPING.
2. CORRECT DOSE OF STIMULATION
3. NO NEED OF RECOVRY/ COMPENSATOTY TAPPING

CONCLUSIONS

4. REDUCED CROP LOSS UNDER LITS (S/3 & S/4)
5. IN MODERATE RAIN FALL REGIONS TAPPING SHADE CAN BE USED FOR CONTROLLED UPWARD TAPPING OF HIGH PANEL WITH INCREASED TASK.

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THANK YOU FOR KIND ATTENTION