Controlled Upward Tapping– a proven method for productivity enhancement and cost reduction

Dr. K.U. Thomas
Rubber Research Institute of India

Rubber industry is one of the major industries in the world and the demand for natural rubber (NR) is expected to go up in the coming years. But natural rubber sector is now passing through a critical phase and. Fall in NR price in the recent past has pushed the growers into a never before crisis. Rubber price during 2011-12 was high and attractive, but it gradually came down and today it is less than half of its best time. Though rubber price declined steeply, cost of living of common man never came down, but, in fact, it is on the increase. Therefore reduction

of wages in any case is not practical. Countries like India are facing shortage of skilled tappers and the situation is likely to aggravate in future. Average age of tapper in India is over 50 years and the younger generation is not interested to take up rubber tapping as a profession, owing to social stigma. Another major issue is the growing share of old and senile plantations in India (Jacob & George, 2008) which is over 50 perc ent now, leading to poor productivity (Thomas, *et al*., 2014). Since 2006 NR productivity curve of India was on plateau for some time, and is declining in the recent past in spite of introduction of better yielding clones like RRII 400 series. As per the latest statistics, total rubber planted area is almost eight lakh hectares of which 67 per cent (534000 ha) area is under tapping. A recent survey by the economics division of RRII revealed that almost 50 per cent of tapping area is with old and senile trees. A close look at the last few years on productivity reveals the impact of this situation, i.e., the average productivity of rubber holdingd in 2014-15 is almost 400 kg lesser than that of 2010-11. The low productivity, low price of rubber and rubber wood etc., makes the rubber growers to think twice before replanting. In the meantime, the lower international NR price and shortage in its domestic availability is conducive for the industry to buy rubber from other countries.

The practical solution at this juncture is to reduce cost of production and to increase productivity by all possible means. Rubber grower is in no way capable of enhancing rubber price, but if they are determined, they can easily reduce cost of production and increase productivity. One of the best option for almost 85-90 per cent of the growers who are still practicing alternate daily or still higher frequency of tapping is to switch over to lower frequencies (d3, d4 or d7) of tapping. The best low frequency method of tapping that can be adopted is once in a week tapping (weekly – d7), for which all inclusive cost of production is nearly 45 per cent of that of alternate daily (d2) tapping. Under the current scenario of NR price uncertainties, increasing cost of production and shortage of skilled tapper, many growers are shifting into Low Frequency Tapping (LFT). Adopting such system of tapping will help in maintaining sustainable high yield for long term. Considerable reduction in incidence of maladies like Tapping Panel Dryness (TPD) and prolonged economic life of trees are the other benifits assured by LFT.

Controlled Upward Tapping (CUT) is a proven harvesting practice ensuring at least fifty per cent increase in yield over long term from high panels of old and senile trees (Dey and Thomas, 2011, Thomas *et al*., 2014). At an assumed rubber production of 1000kg/hectare/year from the old senile trees, tapping wage under alternate daily (d2) frequency (for 150 days) @ Rs 1.50/

tree for 400 trees will be Rs 90,000/-. Hence, the cost of tapping itself will be Rs 90/kg under d2 frequency. Simply by introducing Controlled Upward Tapping (CUT) on the same trees, the productivity can be enhanced to 1500 kg from the 1000kg under d2 (an increase of 50%, over long term). In this situation though the wage is Rs 90,000 itself per year, cost per kg get reduced to Rs 60 (Rs90000/1500kg), a reduction of Rs 30/kg. If the tapping frequency is altered to once in three days (d3), tapping wages get reduced to Rs 60000/ year and at the same productivity of 1500kg, the cost of production will further reduce to Rs 40/kg. By adopting weekly frequency tapping, it can be reduced further. To enjoy such benefit from older trees and to enhance land and labour productivity, the growers need to adopt recommended CUT practices with judicious yield stimulation with ethephon.

Normally downward tapping is done from a height of 125cm from the bud union on the virgin basal panels (A & B panels). Owing to poor tapping quality and various other practical reasons, renewed panel yield tend to be generally low compared to virgin panels. CUT can be practiced on the virgin high panel, i.e. bark above 1.25m to 2.0 m region. If low frequency weekly tapping from year one of crop harvesting, and CUT from renewed panel stage are adopted, sustainable high yielding period can be 40-45 years with an average of 50 years life span for the trees. In effect, instead of the current 2-3 replanting (leading to high cost of production) in 50 years, the new harvesting practice can reduce it to one replanting in life term of a grower, which in turn also will help to reduce cost of production. In general CUT is useful to harvest sustainable high yield for long term from old and senile trees of almost all rubber clones, with an increase of at least 50 per cent.

Modified Gouge knife

Usage of the correct and suitable tool is essential for any system of tapping. Since the tapping panel of CUT is situated above 125cm from the bud union, modified long handled gouge knife (Fig 3) must compulsorily be used for success of CUT. Tapping panel within 125-160cm can be tapped using modified gouge knife with four feet (120cm) long handle, and for CUT tapping above 160cm, knife with 6ft (180cm) handle need to be used. Using this knife, tapper can stand on the ground and tap the high panel. The special shape of the blade ensures a curved tapping cut surface on the inverted cut and is beneficial to prevent spillage, ease in tapping and to reduce injury to cambium. The 'V' shaped long knife is fitted on one end of the metal pipe handle at an angle of 30° (Fig 3 & 4). The blade is 10.8cm

Fig 3. Modified long handled gouge knife

Fig 4. 'V' shaped knife fitted on pipe at 30° angle

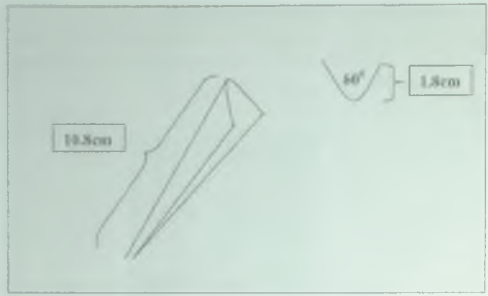

Fig 5. Modified gouge knife blade specifications

long, inner angle of the V shaped blade should be 600 and each arm of the V blade must be 1.8cm (Fig.5). The tip of the V blade should not be acute. While tapping, active knife movements are made by the right hand and left hand guides it. The knife should be held in such a way that left hand is never raised above shoulder height and right hand above chest height (Fig 6). As the tapping goes high on to the panel, knife should be moved up instead of raising the hand. Tapping by a trained person ensures removal of bark shaving at the recommended level. Such a tapping will also ensure latex flow through the tapping cut, never lead to spillage even though the cut is inverted (Fig 7).

Fig 6. Picture showing position of hands

Fig 7. Flow through inverted cut

Though an interested tapper can learn tapping using the modified gouge knife in couple of hours, training for around 2 hours/day for a period of 3-5 days is suggested which more than enough is. The rubber tapping demonstrators in all the Rubber Board regional offices are well equipped to impart training in usage of modified gouge knife to needy

rubber grower/their tappers. Hence, interested growers can contact their nearby regional offices.

Marking of CUT panels

The normal recommended CUT practice in India is periodic panel changing, i.e. tapping the basal renewed panel (S/2) during rainy season with rainguard, and CUT (S/4 cut) on high panel during non-rainy season.

n general, length of cut for Controlled Upward Tapping is one fourth circumference (S/4) irrespective of the girth of the trees, and the slope of cut is 450 since the cut is inverted. If CUT is initiated during first or second year of tapping on BI-1 (C) panel, CUT panel should be marked on virgin bark above BO-2 (B/D) panel. For this the front line of C panel may be extended upwards into virgin high panel upto 2 meter height. At 1.3

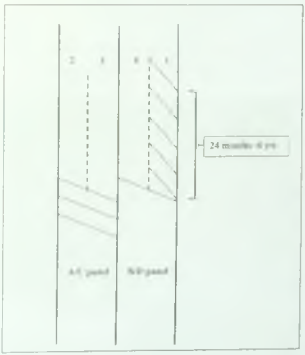

Fig 8. At renewed panel stage (year 1 or 2 on C panel), S/2 d3 or d4 tapping on the basal panel. CUT on high panel with S/4 cut length

Fig 9. Marking using template

and 1.6 meter height determine the girth, divide it into 4 equal panels. Among this, the first high panel (marked as in Fig 8) may be marked using 45° template (Fig 9 & 10) for opening CUT. But, if CUT is proposed to be implemented after two or more years tapping on renewed basal panel

Fig 9. Marked tree

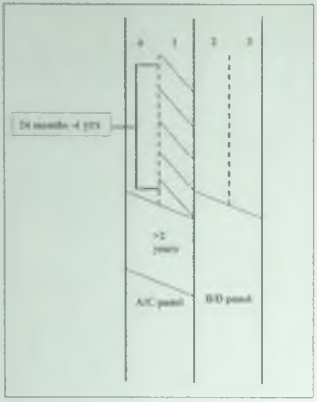

Fig 11. At renewed panel stage (more than 3 year on C panel), S/2 d3 or d4 tapping on the basal panel. CUT on high panel with S/4 cut length

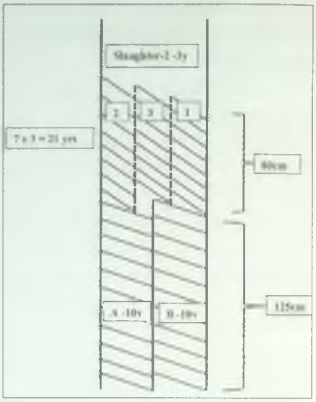

Fig 12. At renewed panel stage (more than 3 year on C panel), S/2 d3 or d4 tapping on the basal panel. CUT on high panel with S/4 cut length

(C panel), the first CUT panel should be taken on virgin bark above C panel itself at bark area marked as 1 in Fig 11. If the tapping frequency on basal virgin panel onwards is weekly (d7), CUT also can be continued under the same frequency, but with S/3 panel length. In this case CUT panel should be marked on virgin bark above BO-2 (B/D) panel at panel 1 in Fig 12. After panel marking in all the above cases, opening of the cut panel is done using ordinary michie/jebong knife (Fig 13) which has to be repeated for the first three tapping. Thereafter modified gouge knife can be effectively used. Since the knife movement in CUT is push tapping from front end of tapping cut towards back end, the spout need to be fixed 15cm (6 inch) below the front of the cut (Fig 14). This allows uninterrupted movement of the gouge knife. The cup hanger can be fixed below the spout allowing free removal of latex filled cups. Maximum allowed bark consumption

Fig 13. Opening

Fig 14. Fixing spout

per month is around 2cm. Bark consumption per tap, monthly bark usage, 6 months consumption, years of tapping on each panel, cumulative usage of bark on the panel and possible years of CUT tapping for the tree is given in Table 1.

There are lot of practical difficulties in practicing CUT during monsoon season. Hence, considering our agro climatic condition, best time to start CUT is immediately after stoppage of north-east monsoon which can continue till the initiation of south-west monsoon (May) including the summer months, approximately six months. During monsoon period (next six months), C or D panel can be tapped on S/2 cut with rainguard. Thus periodic changing of CUT and basal panel for approximately 6 months each is ideal. Under d2 and d3 frequency each S/4 high panel can be tapped for 24 months (4 years) and under d4 each panel can be tapped for 5 years (30 months). However, under weekly frequency (d7), each S/3 high panel can be tapped for 7 years (42 months). After completion of first high panel, second panel is taken on to the right side of the existing CUT panel (while the tapper is facing the tree). Since C/D panel is also tapped for 6 months/year only, harvesting period on it also will be more. Thus depending on the frequency adopted, 16 to 21 years of CUT is

Table 1. Bark consumption per tap, monthly, 6 months, years of tapping on each panel, cumulative usage of bark on the panel and possible years of CUT tapping for the tree

Frequency	Bark consumption			Tapping period per panel and cumulative bark consumption	Possible years of CUT
	Per tap	Per month	6 months		
d2	1.5mm	2.0 cm	12.0 cm	4 yr (24 months) – 48cm	16
d3	1.75mm	1.7 cm	10.0 cm	4 yr (24 months) – 40cm	16
d4	2.0mm	1.4 cm	8.5 cm	5 yr (30 months) – 43cm	20
d7	2.5mm	1.0 cm	6.0 cm	yr (42 months) – 42cm	21

possible. While practicing CUT, the support cut may be cleared (lightly tapped) once or twice in a month if required to guide spilled latex, if any to the spout. Since tapping is only on the high panel during CUT, the task size can be the same as that of half spiral cut on the basal panel. Bark above the CUT panel (above 2m) can be used for slaughter tapping for 2-3 years before felling. Yield from CUT panel is much higher even during summer compared to basal panel. Common tapping frequency can be followed for base panel as well as high panel.

Yield stimulation

Since tapping cut under CUT is shorter than S/2, appropriate yield stimulation practice is essential to prevent crop loss without any harm to the trees. Since the cut is inverted, only lace application (Fig 15) is practical and hence ethephon @ 5% concentration is to be used. The 10% ethephon available in the market may be diluted at 1:1 proportion with coconut/palm oil to make 5% formulation. While making the mixture, the content should be stirred for 10 minutes, and before applying to each tree using the brush.

Fig 15. Ethephon application on lace

Trees under d3 and d4 frequency tapping can be stimulated on the next day of tapping, as per schedule. But for weekly tapped tree, 72 hours before the designated tapping, 5% ethephon need to be applied. The schedule of yield stimulation varies depending on the clone, adopted tapping frequency and the length of cut.

If quarter spiral (S/4) cut on the high panel of clone RRII 105 is tapped at once in three days interval, application of 5% ethephon on the lace at monthly interval is enough. But, for the same clone under S/3 CUT at weekly frequency, fortnightly application of 5% ethephon is needed. However, for medium yielding clones like GT 1, RRIM 600 etc, ethephon application at three weeks interval is necessary under S/4 d3 system. An average of 2ml 5% ethephon/tree/application is required. Quantity required for a given day only need to be mixed taking into account of the number of trees.

Ethephon with 2-chloroethyl phosphonic acid as its active ingredient is an approved yield stimulant for rubber in all rubber growing countries including India. It undergoes rapid degradation in presence of water to phosphoric acid, ethylene and chloride ions and hence is a safe yield stimulant. Govt of Kerala vide circular No. T.P (5) 16566/4 declared it as a bio regulator. World over ethephon is used on various fruits, cereals, tobacco, sugarcane, grapes, pepper, rubber etc. Quantity of ethephon used in rubber is meager compared to its use in other agricultural crops.

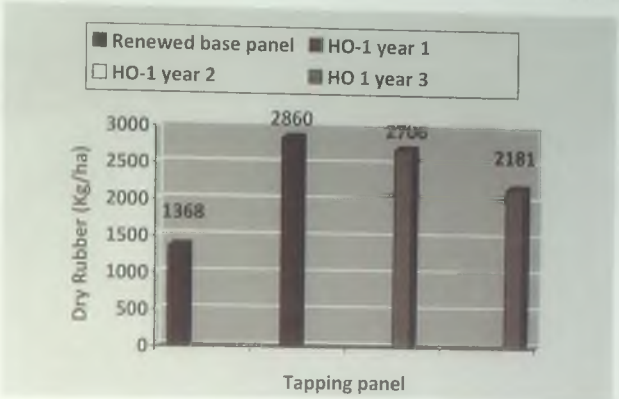

Fig 16. Dry rubber yield (kg/ha) from first three year CUT on same high panel (HO-1) compared to basal panel

Production under CUT

In the first year of introduction of CUT, yield is double or more than that of the yield from basal renewed bark. However, in the subsequent years on the same panel, there can be some reduction. In general, long term yield increase under CUT is more than 50 percent. Such increase is reported from different parts of our country, whether it is Kerala or other non-traditional locations. At Kanjirappally in the traditional region, renewed panel yield was 1368kg/ha/year. During the 1st, 2nd and 3rd year CUT on the same high panel (HO-1), yield was 2860, 2706 and 2181kg/ha/yr. respectively (Fig 16). There are medium estates in South Karnataka who have completed more than 15 years tapping under CUT.

Advantages of CUT

1. A proven harvesting practice to achieve sustainable high yield of atleast 50% for long term.

2. A method to harvest good crop from high panels of TPD affected trees .

3. Since periodic panel change is the recommended practice, task size and frequency can be the same on both basal and CUT panel.

4. Good yield from high panel during summer months compared to basal panel.

5. Due to short tapping cut, tapper can stand at same place and complete tapping

6. Since hands are not raised above shoulder height, there is no fatigue while tapping

7. The special design of the gouge knife ensures flow of latex through the inverted cut itself avoiding spillage of latex.

8. The special design of the knife ensures quality tapping on high panel and better bark renewal on high panel.

9. Modified gouge knife with extended handle can

be used even for slaughter tapping on bark above 2 meter.

10. The adoption of CUT indirectly benefits to extend economic life of tree. Grower is benefitted by low cost of production, and also from the high timber volume.

Points to remember

1. All frequencies except d7, high panel tapping need to be only on S/4 cut. Never attempt half spiral cut for CUT.

2. Do not use michie/jebong knife to tap CUT panel.

3. Modified gouge knife must be used for CUT

4. Do not attempt CUT during monsoon.

5. Apply ethephon as per the recommended schedule only

If Controlled Upward Tapping is implemented properly, sustainable high yield of more than 50 percent for long term is possible. Based on a modest estimate, simply by an all-out implementation of CUT in India, productivity can be enhanced atleast by 200kg leading to substantial increase in NR production of the country.

References

Dey, S.K and Thomas, K.U., (2011). Tapping panel management in rubber (*Hevea brasiliensis*) in north east India. *Natural Rubber Research*, 24 (2), p 228-239).

Jacob, J. and George, T.K., (2008). *Natural Rubber Research* 21 (1&2): 109-118.

Thomas, K. U. and Vijayakumar, K. R., (2006). Controlled Upward tapping. *Rubber Board Bulletin*. 28 (3). 9-13

Thomas, K. U., Dey S. K., Singh, R. P., and Balkrishan (2014). Strategies for Production and Productivity Enhancement in Indian NR Industry : Utility of Controlled Upward Tapping. Placrosym, Calicut.

Thomas, K. U., (2015). Controlled Upward Tapping for better income. *Rubber* 595.

Contact e mail : kuthomas@rubberboard.org.in