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NEW SUPER HIGH TAPPING TECHNIQUE

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One of the major difficulties encountered with upward tapping at super high level (*i.e.* higher than 120 in.) is to get the latex to flow efficiently into the cup. On leaning trees and trees of irregular formation the time taken to guide the latex down the panel to the cup is sometimes greater than the time taken for climbing the ladder and tapping the tree. The problem is aggravated when the panels are damp or wet.

It was observed that at least one-third of a tapper's total tapping time was taken up in ensuring that the latex from the high cut flowed into the cup. In spite of this, latex from badly leaning and bending trees still dripped on to the ground.

A most suitable method to overcome this problem is the use of a thread as the transporting medium for latex. Latex guide strings were first used in South Vietnam or Cambodia. Independently in Malaysia the technique of guide strings has been developed by D. Selby, Manager of Kemuning Estate (Kumpulan Guthrie Sendirian Berhad).

METHOD

The guide string method involves the use of a thread to allow the latex to flow more efficiently into the cup. Auxiliary tools are also needed to fit the thread on to the tree.

Guide string

Any cheap material can be used as a latex guide string. The use of plastic, vulcanised rubber or other raw rubber non-compatible media is less desirable, unless the rubber can be stripped off easily and completely from the thread. From a rubber manufacturing point of view, the best material to use is undoubtedly raw rubber. Raw rubber threads tend to snap in sunlight when the tree canopy is sparse. It appears, however, that there are clonal variations in this respect : rubber threads from the clone PB 86 proved to be more suitable than from Tjir 1. They are more flexible, do not snap easily and last longer. These rubber threads can be obtained from the harvested strings by splitting the thick threads into thin strings.

These rubber threads can be obtained by first using nylon threads which are harvested when a suitable quantity of rubber has coagulated around the threads. The thick rubber threads are then split into thin strings and the nylon thread is discarded.

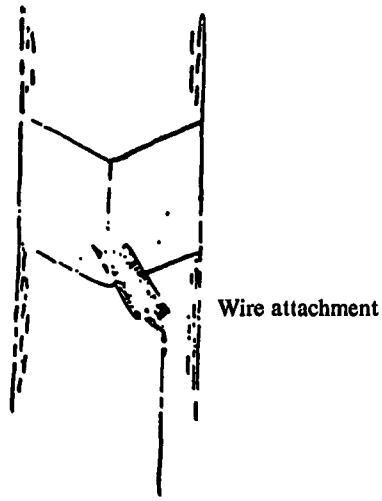

Fig. 1
Spout and thread in position

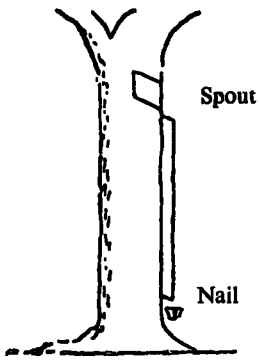

Fig. 2
Upright tree

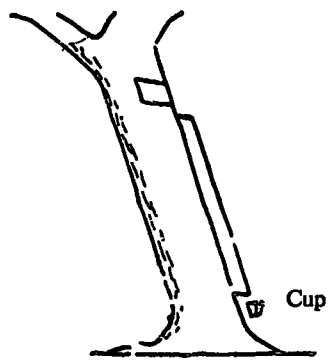

Fig. 3
Backward leaner

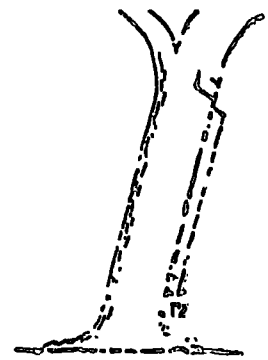

Fig. 4
Forward leaner

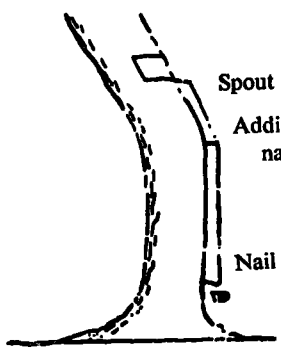

Fig. 5
Badly bending tree

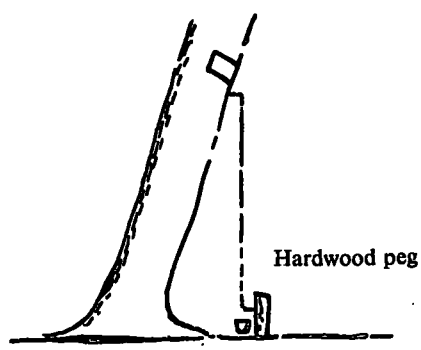

Fig. 6
Badly leaning tree

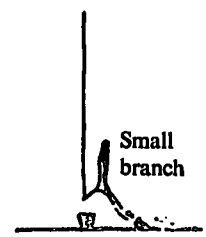

Fig. 7
On friable soil

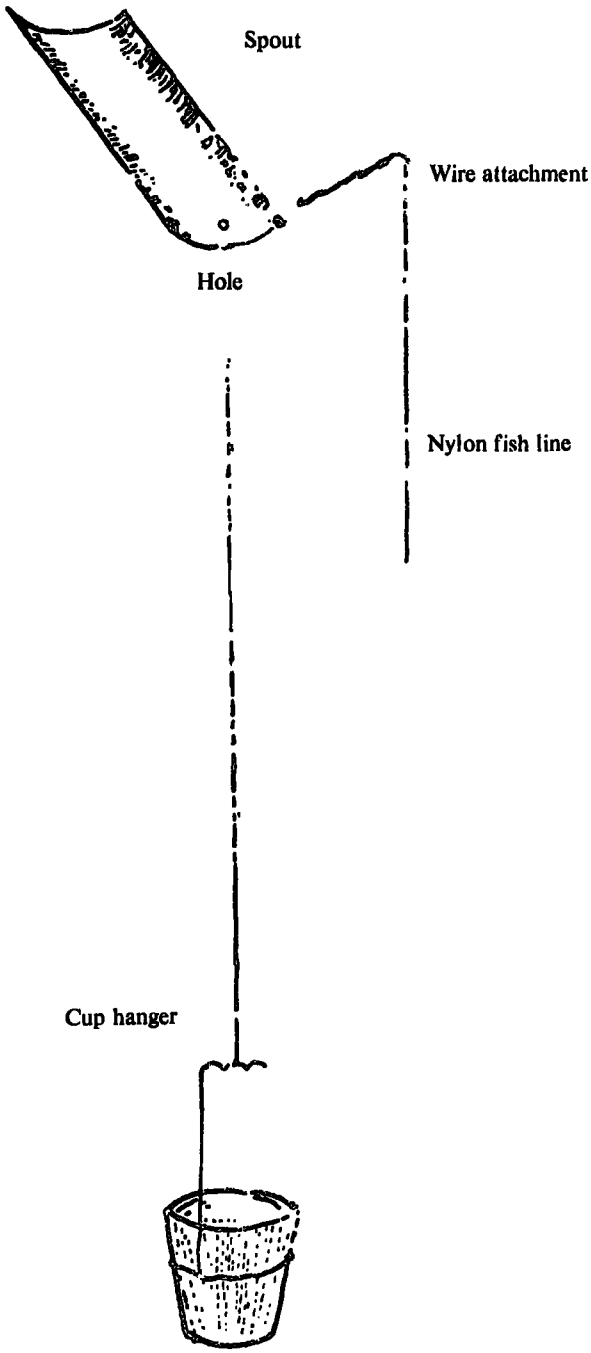

Fig. 8

Guide string with cup hung on the string

Spouts

To fix the guide string properly on to the tree a special spout with a wire attachment on one side is required. The spout should be made from heavy gauge metal so that it can be driven firmly into the tree. A small hole is drilled in the forward end to attach a 5 in. long wire hook. This wire attachment facilitates the tying up of the guide string to the spout. This device enables the field operator or tapper to drive the spout into the tree and to clean the spout when necessary without damaging the wire hook or the rubber string. It also facilitates the replacing of the guide string.

Nails

Two and a half-inch long nails are used for attaching the lower end of the string on the tree. The nail helps to establish the true vertical when stringing for the first time, by acting as a plummet. When the true vertical has been ascertained the nail is driven firmly into the bark at 4 in. height above the cup with the head inclined downwards.

Fitting

When fitting the guide string on to the tree the spout with thread is placed under the spout channel and driven firmly into the bark 5—6 in. below the tapping cut (Fig. 1). The free end of the thread is taken down the tree and tied to a nail 4 in. above the cup. It is essential that the guide string is fitted as near to the true vertical as possible on the tree to ensure smooth and fast flow of latex along the string and to prevent loss of crop by spillage.

On upright trees the fitting of string to the true vertical can be done easily (Fig. 2), but on backward and forward "leaners" this is not always possible; therefore another method should be followed. In these circumstances the stringing could be done as illustrated in Figs. 3 and 4. Additional nails should be placed where necessary to prevent the string from making contact with the bark ; the nails so placed should incline downwards (Fig. 5). When the string is not fitted to the true vertical, guiding latex to flow along the dry string is necessary at the initial tapping. With string fitted to the true vertical such assistance is not required ; the tapper merely taps the tree and passes on to the next tree without wasting any further time. The string should not be allowed to become floppy — a few turns of the slack string around the nail at cup level is all that is required. On badly leaning trees the lower end of the guide string should not be fixed on the tree but tied up to a peg, with a nail, that has been driven into the ground as illustrated in Fig. 6 ; on more friable soils a small branch can be used instead (Fig. 7).

Latest development

The latest development of the technique is that the cup is no longer fixed on the tree or placed on the ground, but hung on the string itself. A strong string and a special cup hanger are required to allow the cup to be hung on the string. It appears that a nylon fishing line meets the requirement for this new technique. Once encased with coagulated latex the string is extremely strong and provides sufficient elasticity to prevent breakage by contact with ladder. However, the rubber needs to be stripped off from the string before despatching.

The lower end of the string is tied to a cup hanger and the cup hanger is so designed that it can be hung easily on the string with the cup placed exactly under the string (Fig. 8). This device facilitates stringing to the true vertical, and placing the cup to the height required. No additional spouts, nails and conventional wire spirals are required.

The cost of the complete tools for this new technique, (spout with wire attachment, nylon fishing line and cup hanger) is currently $ 10* to $ 15 per hundred set or 10 to 15 cts. per set. With the earlier described technique the rubber strings require harvesting and replacing at two to three months intervals, but with the latest developed technique the guide strings should last much longer and should not need to be harvested at such short intervals.

* $ 1 Malaysian is Rs. 2/- (approx.)

EXPERIMENTAL

To assess the value of the guide string method, Chemara has laid out the following experiment on Kemuning Estate.

Experimental RF 182/2 — Trial on latex guide string

The main object of the trial is to study the influence of latex guide strings on the time taken to complete tapping and collecting latex as compared to tapping without guide strings. The second objective is to investigate the effect of guide strings on the yield and the performance of the harvested crop.

Details of the experiment are given below :-

Site : Field 36A, Kemuning Estate

Material : Clone PB 86, 1936 replanting

Stand/acre : 127

Tapping system : 2·½ C.d/3 U ; high and low tapping carried out on different days according to the high-low-rest sequence.

Layout : The experimental area consisted of six high cut tasks of 250 trees per task. The six tasks were tapped by two high cut tappers, using ½ V.d/3 U tapping, and one low cut tapper on ½ S.d/3, having 500 trees (= two high cut tasks) as a task. The six tasks were sub-divided into three pairs, each containing two treatments: "with and without strings" during the experiment period of 72 tappings. The experiment period (P II) was preceded and followed up by uniformity trial periods of 24 tappings (P I and P III) in which periods both tasks of a pair were equipped with guide strings. After period III, a second experiment period (P IV) of 48 tappings commenced and again followed by a uniformity trial period (P V) of 48 tappings but now with no strings on either tasks of the pairs. In the first experiment period (P II) the stringed tasks were Nos. 11, 12 and 15, while during the second experiment period (P IV) Nos. 12, 13 and 16. In period II the trees were strung according to the old technique of fitting the string on to the trees, while in period IV the "hanging" method was followed. Swapping of the high cut tappers occurred at an interval of six tappings in order to eliminate/reduce the tapper's influence, if any.

RESULTS

1. *Time observations*

Results of the time observations on tapping and collecting latex are summarized in Table 1.

TABLE 1

TIME TAKEN TO COMPLETE HIGH CUT TAPPING

Comparisons between	1st expt. period	2nd expt. period	Uniformity trial		Pre-treatment
	P II	P IV	P III String	P V No string	P I String
	Hr Min	Hr Min	Hr Min	Hr Min	Hr Min
A. *Tapping*					
Without string	5 42	5 28	4 24	5 23	4 08
With string	4 25	4 17	4 20	5 27	4 07
Time saved	+1 17	+1 11	+0 04	−0 04	+0 01
B. *Latex collection*					
Without string	0 44	0 44	0 43	0 42	0 41
With string	0 45	0 45	0 43	0 42	0 42
Time difference	−0 01	−0 01	0 00	0 00	−0 01

Note (1) P I : 8/9/69 —3/10/69 pre-treatment period

P II : 5/10/69 —27/12/69 1st experiment period

P III : 28/12/69—23/1/70 uniformity trial period

P IV : 24/1/70 —20/3/70 2nd experiment period

P V : 27/3/70 —21/5/70 uniformity trial period

(2) Stand/acre : 127

Height of super high cut : 130″—140″

Height of low cut : 30″—40″

Task size high cut : 250

Task size low cut : 500

Tapping system : 2·½ C.d/3 U with high and low cuts tapped by different tappers.

The main observations are :-

(i) Using latex guide strings on high tapping resulted in a considerable reduction on the time taken to complete tapping; the average time saved was not less than 1 hr. It was also observed that there was more variation in time in the method without string; a slight decrease in tapping time was noted in successive periods.

(ii) No saving on time was found in collection of latex as expected.

Occasional time observations on tapping of individual trees revealed that, by using guide strings, considerable time was saved on efforts to guide the latex from the cut into the cup, as shown in Table 2 (*a*).

TABLE 2(A)

TIME TAKEN UP FOR TAPPING

AVERAGE TIME TAKEN UP IN SECONDS

Type of operation	With guide strings	Without guide strings
(*a*) Carrying a ladder and walking from tree to tree	4	5
(*b*) Putting the ladder to a tree, cleaning the cup and climbing the ladder	17	15
(*c*) Lacing and tapping	32	29
(*d*) Guiding latex and coming down from the ladder	6	32
Total time	59	81

More accurate observations were carried out daily at four different times during 12 successive days. The data analysed were only on operation (*d*) re-guiding latex and coming down from the ladder.

The result is given below :-

TABLE 2(B)

TIME TAKEN IN SECONDS/TREE FOR GUIDING LATEX AND CLIMBING DOWN THE LADDER

Comparisons between	Time of day (a.m.)				
	7 – 8	8 – 9	9 – 10	10 – 11	Mean
No string	32·2	32·6	30·8	32·4	32·0
String	8·6	8·2	8·6	7·9	8·3
Mean	20·4	20·5	19·8	20·1	20·2

Comments: It is apparent that the string method required significantly less time than without string — a difference of not less than 20 seconds. There appears no difference in time between time of day during which the operation was performed, indicating that the time difference found between the two methods was persistent throughout the whole tapping time.

2. *Yield*

High cut : Data on yield per acre are tabulated in the following tables.

TABLE 3(A)

TOTAL DRY RUBBER YIELD FROM HIGH CUT

(in lb/dry rubber/acre/period*)

Comparisons between	Experiment period		Uniformity trial period		Pre-treatment
	1st	2nd	Both string	Both no string	Both string
	P II	P IV	P III	P V	P I
With strings	164·3	133·4	160·4	104·8	162·6
Without strings	160·0	131·7	162·6	99·4	164·4
Difference	+ 4·3	+ 1·7	- 2·2	+ 5·4	- 1·8

* Note: Period of 24 tappings for three tasks or eight tappings/task *i.e.* 1 month.

TABLE 3(B)

LATEX YIELD FROM HIGH CUT

(in lb/dry rubber/acre/period*)

Comparisons between	Experiment period		Uniformity trial period		Pre-treatment
	1st	2nd	Both string	Both no string	Both string
	P II	P IV	P III	P V	P I
With strings	154·6	125·8	149·7	94·8	150·5
Without strings	150·1	123·2	152·3	91·1	151·2
Difference	+ 4·5	+ 2·6	- 2·6	+ 3·7	- 0·7

Total dry rubber (*Table* 3*a*) *and latex yield* (*Table* 3*b*): Total dry rubber includes latex, precoagula, tree lace and " string rubber ", if any.

The data in Tables 3(*a*) and 3(*b*) suggest that the use of guide strings results in a slightly increased yield in terms of total dry rubber and latex. However, the design of the experiment does not enable the confirmation of this suggestion and the safest conclusion is that the yield is not significantly affected by guide strings.

Cup lump in lb/acre/month (*Table* 3*c*): As can be seen in Table 3(c), the use of guide strings reduced the yield of cup lump. It should be noted that the resting period between tapping and collection had been fixed at 30 min. for both treatments. Nevertheless, the tasks with guide strings produced 15%—19% less cup lumps than the tasks without guide strings. This indicates that the flow of latex was easier and faster along the string than along the front channel.

TABLE 3(C)

CUP LUMP YIELD FROM HIGH CUT

(in lb/dry rubber/acre/period*)

Comparisons between	Experiment period		Uniformity trial period		Pre-treatment
	1st	2nd	Both string	Both no string	Both string
	P II	P IV	P III	P V	P I
With strings	5·4	4·9	6·1	7·1	6·0
Without strings	6·7	5·8	7·1	6·9	5·4
Difference	− 1·3 − 19%	− 0·9 − 16%	− 1·0	+ 0·2	+ 0·6

Lace/string (*Table* 3*d*) : Lace from the tapping cut and front channel and, if any, also strings were regularly harvested and recorded. Data on the yield of lace and strings are summarized in Table 3(d).

The tasks equipped with guide strings clearly showed a higher yield than without guide strings. The difference was at least 1·4 lb/acre/month or 93% more lace and "string rubber" for the stringed tasks.

TABLE 3(D)

LACE/STRING YIELD FROM HIGH CUT

(in lb/dry rubber/acre/period*)

Comparisons between	Experiment period		Uniformity trial period		Pre-treatment
	1st	2nd	Both string	Both no string	Both string
	P II	P IV	P III	P V	P I
With strings	2·9	2·7	3·5	1·3	5·4
Without strings	1·5	1·4	3·2	0·9	7·0
Difference	+ 1·4 93%	+ 1·3 93%	+ 0·3	+ 0·4	− 1·6

Precoagulum (*Table* 3*e*) : Data on precoagulum yield are given in Table 3(e).

The use of guide strings resulted in a reduction of precoagulated yield (*viz.* at least 1·30 lb/acre/month or 75%). This indicates that the latex from guide strings is probably less contaminated with bacteria and minerals causing precoagulation.

As latex from high cut is prone to precoagulation, the use of guide strings could reduce this problem to a great extent.

TABLE 3(E)

PRECOAGULUM YIELD FROM HIGH CUT

(in lb/dry rubber/acre/period*)

Comparisons between	Experiment period		Uniformity trial period		Pre-treatment
	1st	2nd	Both string	Both no string	Both string
	P II	P IV	P III	P V	P I
With strings	0·4	0·0	0·0	0·3	0·7
Without strings	1·7	0·2	0·0	0·6	0·7
Difference	− 1·3	− 0·2	0·0	− 0·3	0·0

Earth rubber: Data on earth rubber are given in Table 4.

TABLE 4

FIELD EARTH RUBBER FROM HIGH/LOW CUT

(in lb/fresh weight/acre/period*)

Comparisons between	Experiment period		Uniformity trial period		Pre-treatment
	1st	2nd	Both string	Both no string	Both string
	P II	P IV	P III	P V	P I
With strings	18·5	12·4	17·2	55·0	34·1
Without strings	30·0	15·1	19·1	50·2	32·9
Difference	− 11·5 − 38·3%	− 2·7 − 17·9%	− 1·9	+ 4·8	+ 1·2

The tasks equipped with guide strings showed in P II and P IV an average of 11·5 and 2·4 lb per acre per month respectively, or 38·3% and 13·5% less earth rubber. The data thus support the opinion that guide strings reduce loss of crop by spillage.

It is realised that earth rubber is only a rough measure for spillage of rubber; nevertheless the striking difference found indicates that loss of crop could be reduced by using guide strings. It should be noted that during the pre-treatment and experimental period, rubber guide strings were used, fitted on to the trees, according to the old technique. With the latest developed technique, whereby the cup is hung exactly under the guide string/spout an even higher reduction of spillage (earth rubber) can be expected.

Bark consumption: Data on bark consumption are summarized in Table 5.

TABLE 5

AVERAGE BARK CONSUMPTION/TAPPING/TREE

(in 0·01 in.)

Comparisons between	Experiment period	
	1st	2nd
	P II	P IV
With strings	23·08	24·48
Without strings	24·81	24·51
Difference	- 1·73	- 0·03

The difference in bark consumption between the string and no string method was significant in period II, but no longer significant in period IV.

The data show that the bark consumption of super high tapping was high *viz.* 1·8″—2·6″per month, *i.e.* more than double the normal rate allowed for low tapping. This high consumption may be partly due to swapping of the tappers, which occurred regularly in this experiment. In practice, where no swapping of tappers occurs, it may be feasible to control the bark consumption to a maximum of 1¾″—2″ per month on d/3 tapping.

Low cut and DRC (Table 6): The data, summarized in Table 6, show that the yield of the super high cut (½V.d/3 U) on virgin bark was not less than 79·9 lb/acre/month or 97% superior to the low cut (½S.d/3) on renewed bark. The total yield data reveal that very high yield of rubber can be obtained with tapping of the virgin bark at such 'super' high level.

The DRC of the high cut latex was also slightly higher. No difference in DRC was observed between tapping with strings and without strings.

TABLE 6

HIGH AND LOW CUT TAPPING — TOTAL DRY RUBBER YIELD AND DRC

(in lb/dry rubber/acre/period*)

Comparison	Experiment period				Uniformity trial period				Pre-treatment	
	P II (1st)		P IV (2nd)		P III		P V		P I	
	Yield	DRC	Yield	DRC	Yield	DRC	Yield	DRC	Yield	DRC
High cut										
String	164·3	36·9	133·4	37·2	160·6	36·6			163·5	35·8
No string	160·0	36·8	131·7	36·7			101·6	35·6		
Difference	4·3 2·7%	0·1	1·7 1·3%	0·5						
Low cut										
String on high cut	80·4	36·2	42·2	36·2	69·1	35·0			81·4	35·4
No string on high cut	84·1	35·8	42·4	35·9			50·2	31·9		
Difference	− 3·7 − 4·4%	0·4	− 0·2 − 0·5%	0·3						
Total yield high and low cut										
String	244·7	36·6	175·6	36·7	229·7	36·2			244·9	35·6
No string	244·1	36·3	174·1	36·3			151·8	33·8		
Difference	0·6 0·2%	0·3	1·5 0·9%	0·4						
Difference high and low cut	lb %	Points	lb %	Points	lb %	Points	lb %	Points	lb %	Points
String	83·9 104	0·7	91·2 216	1·0	91·5 132	0·8			82·1 101	0·4
No string	75·9 90	1·0	89·3 211	0·8			51·4 102	3·7		
Mean	79·9 97 105%	0·85	90·2 214 101%	0·9	91·5 132	0·8	51·4 102	3·7	82·1 101	0·4

3. *Extension of the economic life of rubber trees*

Assuming the maximum practical height for tapping at super high level of stem or branches is 200 in. and a bark consumption of maximum 2 in. per month on d/3 tapping, the economic life of a rubber tree could theoretically be extended by seven to eight years, but in practice probably only by four to five years, as we still have to learn much on possibly achievable bark consumption on such high upward tapping.

ADVANTAGES

The following benefits may be expected from the use of the guide strings when tapping on high level :-

1. Saving on tapping time as no time is wasted for guiding latex;
2. Badly leaning and bending trees can be tapped without loss of crop;
3. Low branching no longer limits the possibility of high tapping;
4. Lower % of cup lump due to earlier completion of tapping and probably faster flow of latex to cup;
5. Lower % of precoagulum probably due to less contamination with bacteria and/or minerals causing precoagulum;
6. Higher % of 1st quality rubber due to lower % cup lump, lower % precoagulum and reduction in spillage;
7. Increased yield per acre probably due to-
   (*a*) Much earlier completion of tapping;
   (*b*) Reduction in spillage;
   (*c*) The fact that all trees can be tapped;
8. With guide strings, tapping discipline, including controlled bark consumption can probably be enforced at super high level;
9. Tapping can be continued at super high level (*i.e.* higher than the conventional maximum of 120 in.). On virgin bark this means that the economic life of a rubber tree can, in healthy areas, be extended for a number of years.

It should be noted that increased yield per tree, if any, is only small, but increase in yield per acre can be considerable, as no selective tapping is done; now it is useful to tap all trees, especially as there is no further pressure of time.

APPRAISAL AND RECOMMENDATIONS

Though latex guide strings can be favourably used for normal high tapping the main benefit of this method is obtained when tapping virgin bark above 120 in. This is called Super High Level Tapping to distinguish it from the normal high tapping. The practical height to which normal tapping discipline can be enforced has hitherto been confined to a maximum of about 120 in. above the union. The virgin bark above 120 in. is usually left untapped or exploited by slaughter tapping; such exploitation is usually made without discipline, with the result that tapping can only be carried out for a relatively short period.

With the guide string method, however, it has been proved that tapping discipline can be enforced to super high levels, once the tapper is accustomed to the new technique. The time saved on tapping enables the tapper to maintain tapping disciplines and to tap an economic task size varying from 240 high cuts on hilly land and up to 275 high cuts on flat to gently undulating terrains, with an average stand of 80—90 trees per acre. Low branching, leaning and malformed trees do not limit the possibility of high tapping any more, because with guide strings, they can be exploited without excess spillage of latex.

With the maintenance of tapping discipline at super high level a considerable extension of the economic life of rubber trees is possible. Trees that are well grown and with a good and healthy canopy are more likely to maintain high yields. To appreciate the guide string method, one should consider guide string and super high tapping as a whole, because guide strings alone do not increase yield and super high tapping without guide strings may either not be feasible or may deteriorate easily into slaughter tapping. For proper tapping at super high level, guide strings are thus essential. As such, super high tapping in combination with guide strings can be very profitable. It was observed that yields from areas tapped and strung at super high level rapidly re-established at about a level which was equal to the yield previously achieved when normal ladder tapping was first introduced. The increased yields obtained are mainly due to tapping in virgin bark at super high level and partly due to the tapper now being able to tap all trees in his task — including leaning and low branching trees which usually are left untapped — rather than to the use of string itself. Moreover, the crop harvested produces a higher percentage first quality rubber than tapping without guide strings, because the use of guide strings results in lower percentage of late drippings and precoagulum.

When applying the string method, it is recommended to separate super high cut tapping completely from the low cut tapping by preferably employing male tappers for the high cuts, as they are more suited to the job by skill and physique. The normal low cuts can be reserved for female tappers and older male tappers.

Separate tasking not only allows more efficient utilization and deployment of labour, but also simplifies supervision of both normal and guide string tapping. Moreover, it provides greater flexibility for management in choice of tapping frequency for each cut. It also allows a better opportunity for accurate assessment of the economics of the separate high and low cut tapping. It is further recommended that the latest simplified technique, whereby the cups are hung on strings, be applied to *all* trees whether they be leaning trees or not.

As extension of the economic life of rubber trees depends largely on controlling bark consumption, it is essential that the rate be no more than 2 in. per month on d/3 tapping, and the V cut not exceeding the half circumference of the tree. For this purpose the super high cut tappers should be provided with special upward tapping knives and the two vertical side channels of the ½ V cut should regularly be extended upwards to ensure that no more than a half circumference is tapped.

The introduction of the latex guide string method and adoption of disciplined super high level tapping will no doubt have a great impact on the planning policy of a company; the replanting and fertilizer programme for rubber plantings should also be modified, since the economic life of the rubber tree can be extended considerably.

ACKNOWLEDGEMENT

The authors thank the Managing Director of Kumpulan Guthrie Sendirian Berhad for permission to publish this paper and the Director of Research and Technical Services of Chemara Research Station for his critical comments on the draft paper.

Special thanks are also due to the Field Assistants and the staff of the Statistical Section for their assistance.

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QUESTIONS AND ANSWERS

Question: Super high tapping — (*a*) How often is the string renewed? (*b*) Is there a build-up of latex on the string? (Mr. E. O. B. Lover).

Answer: (*a*) The string has to be renewed about every four months. (*b*) There is a slow build-up of latex on the string and this necessitates the renewal after four months.

Question: Does latex coagulate on the string, and if so what happens to that coagulum ? (Mr. Ranjan Wijeratne).

Answer: Latex does coagulate on the string but this occurs to a negligible extent: however it can slowly build up the thickness of the thin nylon string used and replacement of the string may be necessary in about four months.

Question: Would you please screen the colour slides on super tapping? (Mr. D. E. C. Wijesinghe). The complete set of slides demonstrating the technique of super high tapping was screened again.

Question: It was noted that super high tapping was being done on comparatively young trees, before utilizing bark up to 120 in. Is there any reason for this higher level bark being used at an early stage ? (Mr. G. A. Wells).

Answer: Young trees were used on an experimental basis in order to further evaluate the effects of this system of tapping. It is perhaps possible that low-yielding seedlings may react better to higher level tapping: this would however be at the expense of growth of the younger plants and needs prolonged investigation.

Question: (*a*) How many years of high level tapping are possible before yields drop to levels previously obtained from low level tapping ? (*b*) How many years before uprooting would you recommend commencement of super high level tapping? (Mr. Maurice Forster).

Answer: (*a*) This is carried out on trees which are uneconomic on low level tapping and can be carried out for a period of four years before yields drop markedly. (*b*) This could be recommended for a period of four years before uprooting in Malaysia but will have to be evaluated under Ceylon conditions for a critical period to be established in Ceylon as rainfall and other conditions are different.

Question: You said that you could extend the economic life of the tree by super high tapping. Can you give us some idea of the number of extra years of exploitation please ? (Dr. O. S. Peries).

Answer: The economic life of the tree is expected to be increased by a period of approximately four years by this method which reaches up to bark previously unused.

Question: (*a*) Has any research been undertaken to develop a mechanical tapper or allied instrument other than the conventional knife ?

(*b*) Is it possible to use a mechanical tapper without injury to the panel ? (Mr. A. Q. N. Jayamaha).

Answer: (*a*) Frankly no. Many suggestions have been made but I do not think that any country has done research on this problem.

(*b*) Yes, I am sure that a mechanical tapper can be developed, that will perform the job without injury to the bark ? The ingenuity of the human mind is limitless — I am a firm believer in this, that is why I am doing the job I am. (Dr. O. S. Peries).