

STIMULATION OF THE YIELD OF RUBBER TREES AS A ROUTINE ESTATE PRACTICE

Field experiments on the use of synthetic growth substances to stimulate yields have been in progress since 1951 at the Rubber Research Institute of Malaya. This article, reprinted from Planters' Bulletin No. 45 by courtesy of the Rubber Research Institute recommends usages of these substances in routine estate practice. Properties of available stimulants, methods of application and yield response are discussed. Finally a schedule is suggested for tapping and stimulation of buddings and seedlings grown under normal management. Research on stimulants is also being undertaken by the Department of Agriculture, Stock and Fisheries, but this is necessarily a long-term project and it will be some time before firm recommendations can be made as a result of local experience.

Properties of Available Stimulants

There are at present four proprietary yield stimulants available in Malaya :

Trade name	Active ingredients
1. Flomore	2,4,5-T
2. Star Brand	2,4,5-T
3. Stimulex	2,4-D
4. Ready Rub	2,4,5-T

Flomore and Star Brand stimulants are formulations of similar composition, containing 1 per cent. 2,4,5-T, and prepared according to R.R.I. recommendations. They have a greasy appearance and are for application to scraped bark below the tapping cut. They are unsuitable for monthly or bi-monthly application above the cut, if users attach any importance to the quality of the renewing bark for future tapping.

Stimulex is a fluid formulation containing 2,4-D in a mixture of vegetable oils. Its stimulating effect is of the same order as that of the 2,4,5-T formulations but it is less injurious to the bark tissue. Stimulex may be applied to tapped bark above the cut at monthly or bi-monthly intervals, but overlapping of the areas of bark treated with stimulant must be avoided.

Like the 2,4,5-T stimulants, Stimulex has to be applied to scraped bark if applied below a downward cut. This stimulant needs stirring before use.

Ready Rub contains 2,4,5-T. It is intended to be applied to unscraped bark below the tapping cut and should not be applied to renewing bark above the cut.

Results at present available suggest that Ready Rub is less effective than any of the other stimulants on renewed bark ; satisfactory results have been recorded from application to virgin bark during ladder tapping. Ready Rub should be stirred before use.

Method of Application of Yield Stimulant

On Lightly Scraped Bark below the Tapping Cut

The depth of scraping of virgin bark can be determined by removing first the dead cork, then a thin greenish layer and finally a smooth yellowish layer. This is the correct depth of scraping and is confirmed by the presence of coarse reddish tissue, and in many cases by the appearance of minute drops of latex. On no account should latex ooze out after scraping.

Scraping of renewed bark should not go deeper than the typical reddish layer ; it can be done with a stiff steel wire brush which is flexible and does not cause serious wounding. Any hard steel scraper is suitable for use on virgin or thick renewed bark.

The small latex drops (and, if there has been any accidental wounding, the outflowing latex) should be given time to dry before the stimulant is applied ; intermingling of the latex with the stimulant should be avoided as this leads to a

thick application resulting in swelling, burring and cracking of the treated bark, which may dry up and rot away to the cambium. We therefore recommend scraping in the morning and application of the stimulant in the afternoon or, if rain or other circumstances interfere, the next morning.

If an excessive amount of dried latex covers the bark after scraping this should be removed before the stimulant is applied; but it is better to leave the few beads of latex from properly scraped trees untouched, as removal may cause renewed exudation of latex.

The greasy 2,4,5-T yield stimulants can be conveniently applied with a flat $1\frac{1}{2}$ -inch paint brush, provided instructions previously noted have been adhered to, difficulty in application is generally caused by mixing of latex and stimulant. On no account should the compound be heated. Stimulex is, by its fluid nature, easier to apply than the greasy preparations, but like these should not mix with latex. Care should be taken that it does not run down to unscraped bark beneath the strip where it has been applied.

The treated strip of bark must be tapped away within three months after application. The stimulant should therefore be applied to a strip not more than $2\frac{1}{2}$ inches deep on alternate-daily or 2 inches on third-daily tapping of a half-circumference cut. Application should be made thinly and evenly; this can be ensured by allowing one man to rub the painted bark strips with a rag so that any excess stimulant is removed.

One man can scrape either 125 average-sized rubber trees tapped on a low half-circumference cut, or 75 trees tapped on ladder cuts, per day. For painting, a fair task might be 350 trees with low cuts or 250 trees with ladder tapping. Similar tasks can be given to the man who removes the excess stimulant from the painted strips. These figures are meant as a guide only and much depends on the girth of the trees, the height of the cuts and the type of ladder used; these factors also determine the number of trees which can be treated with a gallon of stimulant. 500 average-sized trees can be treated with one gallon if applications are made below one half-circumference cut per tree.

The total cost of treatment per tree tapped on one half-circumference cut, including labour and material, is between 4 and 8 cents, depending on the size of the trees, the position of the cuts and the type of stimulant used.

On Renewing Bark above the Tapping Cut

We recommend that of the available yield stimulants only Stimulex should be used for this method of application, in which the stimulant is applied at monthly or bi-monthly intervals to the thin film of bark left after the preceding month or two months of tapping. An artist's half-inch paint brush is most suitable for this purpose. Application should be made on a non-tapping day and the scrap should not be removed before application, as this would result in mixing of latex and stimulant.

On Unscraped Bark below the Tapping Cut

Of the available yield stimulants, only Ready Rub gives an increase in yield level if applied to unscraped bark below the tapping cut. When tapping alternate daily, not more than $2\frac{1}{2}$ inches of bark below the half-circumference cut should be treated. Care must be taken that the stimulant, which on a hot day can be a rather thin fluid, does not run down the bark.

Age at which Rubber Trees may be Stimulated

Normally a rubber tree is brought into tapping between 5 and 7 years after planting or budding. Before the trees are opened for tapping they have a yearly girth increment of some 3 to 4 inches per year. When the trees are opened for tapping, the rate of girth increment is slowed down markedly; several of the modern high yielding clones in particular show very poor girthing on tapping.

It has been shown in an experiment carried out on Prang Besar Further Proof seedlings that application of a yield stimulant to young trees checks growth even more severely. Owing to late dripping, the small extra yield obtained by stimulating such young trees is collected mainly as cup-lumps if no second collection is made. A similar disappointing response to stimulation has been recorded in other experiments on young budded trees, and it appears that young trees should not be stimulated.

Very satisfactory results have been obtained when 18-year-old buddings and seedlings have been treated with a yield stimulant. At this age rubber trees have normally reached or already passed their peak performance, and there is no further build-up in yield level. The rate of growth in terms of girth has levelled off to a small yearly increment. Such trees can be treated with a stimulant, and despite high increases in yield the growth rate is not appreciably retarded. This has been confirmed in several experiments, one of which has been in progress since February 1952. The use of a stimulant may thus be considered at approximately the eighteenth year of life, when the virgin bark of the low panels of the trees has been tapped away. This does not mean that we recommend this treatment as ordinary estate routine, but if for some reason a temporary increased output is required from the mature areas, such trees may be stimulated without risk to their future performance.

Quality of Renewed Bark after Half-Yearly Stimulation below the Cut

One of our experiments has now reached the stage where we can express an opinion on the quality of bark which has been stimulated in the past. We are at present tapping second renewal bark of clonal seedlings which were stimulated when tapped on first renewal bark. Half-yearly application of a yield stimulant to a 3-inch strip of scraped bark below the cut has been continued throughout. The tapping system is S/2.d/2.100 per cent. The second renewal bark of stimulated trees is 1-1½ mm thicker than the bark of the unstimulated control trees. The yield appeared to be quite normal and a good response was obtained to subsequent application of a stimulant which, however, resulted in severe damage to the bark of third renewal—a phenomenon generally observed when thin second renewal bark is stimulated.

These observations have given us more confidence in the use of stimulants, as we now have reliable evidence that a normal yield is obtainable from bark which has renewed after stimulation below the cut at the first renewal stage. The standard of tapping should of course be high, since stimulants aggravate tapping wounds.

Quality of Renewed Bark after Monthly or Bi-monthly Stimulation above the Cut

We have already stated that only Stimulex (a 2,4-D formulation) should be considered for this method, which is at least as effective as the ordinary method of half-yearly application below the cut when thin renewed bark is being tapped. (However, in virgin bark at high level, or on thick first-renewal bark, the half-yearly application below the cut gives a better yield response.) The thickness of the bark treated above the cut is markedly increased by formation of non-latex-bearing tissue in the cork region. If overlapping of the stimulated strips is avoided, the bark may renew quite smoothly without the burring and cracking which occurs when a 2,4,5-T formulation is applied above the cut.

In bark which is smoothly renewed in this way, the latex vessel system is normal and the records of tapping show that the yield capacity is similar to that of untreated control trees. Shallow tapping of this thick renewed bark should not be permitted, as the extra thickness does not contain latex vessels.

Response to Successive Applications of Stimulant

There is a decreasing response to successive applications of a stimulant, which may be largely explained by the position of the tapping cut. If, on clonal seedlings, the tapping cut is low down the stem, the response to stimulation is small regardless of whether the application is the first or has been preceded by earlier applications on the same panel; in the latter case, however, the response is more disappointing and may even be negative (see *Figures 1 and 2*).

A factor contributing to this is that the bark at the lower part of the stem of a seedling tree is usually of second renewal when the tree has reached the age when stimulant should be applied. The first panel of seedling trees is opened at 20 inches from the ground, the second (up to recently) at 30 inches, and the later panels are of even greater height. This results in bark of different renewal on the same panel; the bark of first renewal gives a good response and that of second renewal lower down the stem a poorer response to stimulation.

On high level tapping when the cut moves towards the junction between virgin bark and bark of second, or poor first renewal, the

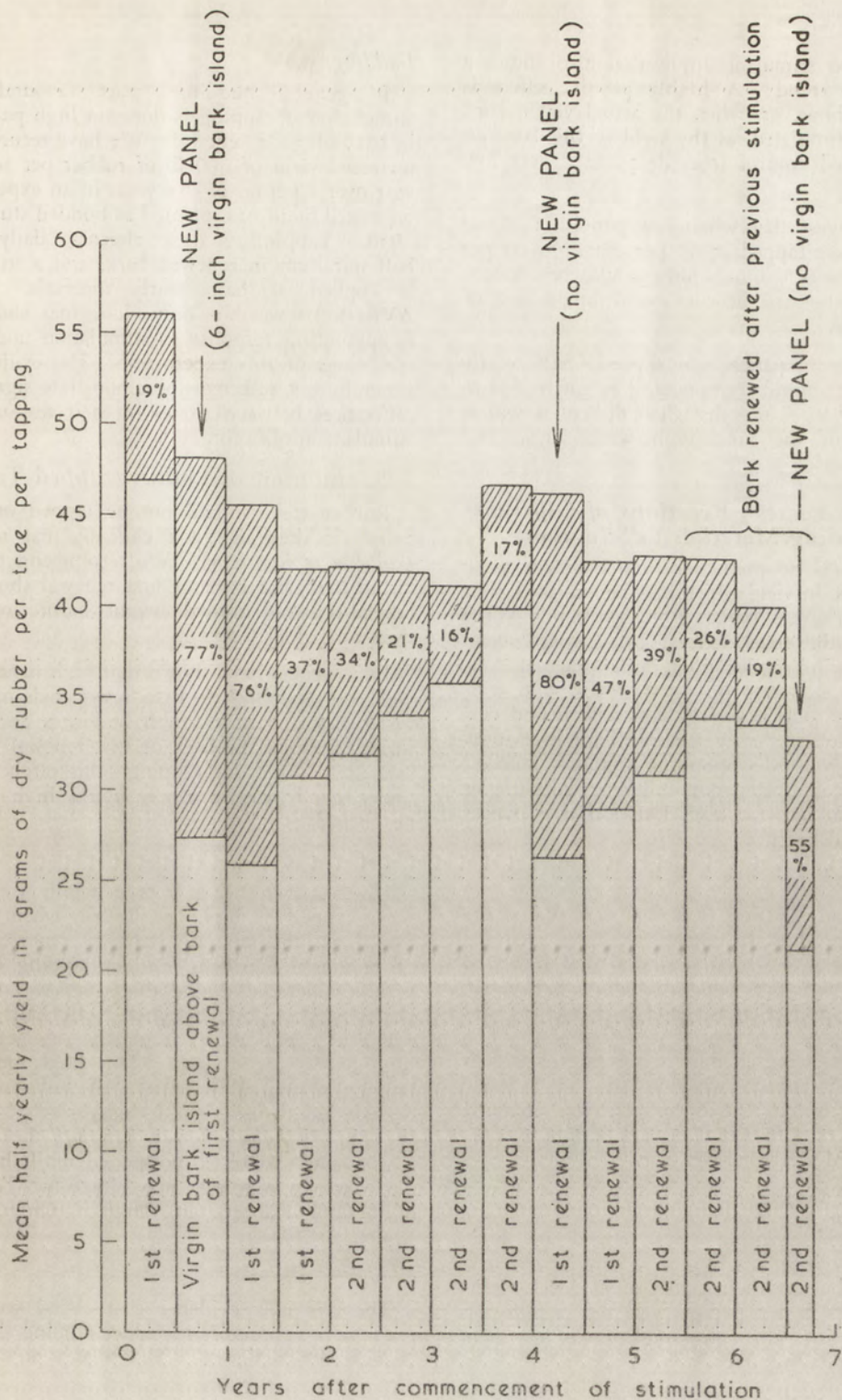


Figure 1. Effect of 2,4,5-T yield stimulant on yield of clonal seedlings, planted December, 1931, and tapped S/2. d/2. 100 per cent. Shaded portion shows extra yield obtained by stimulation. Dates of stimulant application were: first, February, 1952; second, November, 1952; thereafter, May and November each year.

response to stimulant application also shows a downward trend. A highly positive effect is obtained, however, when the actual virgin bark island is stimulated, as the yield of this bark on unstimulated control trees drops to a very low level.

We suggest that when low panels of clonal seedlings are tapped at 67 per cent. or 100 per cent. intensity, stimulation should be discontinued as soon as the cuts are within 1 foot of ground level.

When high panels are tapped, half yearly stimulation should continue and be intensified to once every three months when the cut is within 6 inches of the junction between virgin and renewed bark.

Yield Increases : Reactions of Different Planting Materials to Stimulant

In general no predictions can be made as to the increase in yield which may be expected after application of a stimulant; much depends on the health of the trees and on local environment. Trees growing under poor environmental conditions do not respond satisfactorily, and it is often from such material that an increased output is desired. Poorly renewed bark of healthy trees also gives a disappointing response. The best results are obtained from well renewed bark, or from virgin bark at high level on trees which are in good heart.

Clonal Seedlings

On clonal seedling trees 20 years old at the time of the first treatment, we have recorded over a period of seven years a total increased yield of 36.5 per cent. following half-yearly stimulant application to good bark of first and later of second renewal (see *Figure 1*). The control trees were yielding at the rate of 876 lb per acre per annum, which means that a yearly increase of some 320 lb per acre was obtained at a total cost in stimulant application of less than \$12(M) per acre per year.

Unselected Seedlings

Unselected seedling trees tapped on high panels in virgin bark give a similar relative response, but as their actual yield level rarely exceeds 500 lb per acre per year the quantity of rubber obtained through stimulation is less than for clonal seedling trees.

Buddings

In general buddings react favourably to stimulation if tapping is done on high panels or in bark of good renewal. We have recorded an increased yield of 300 lb of rubber per acre per year over a period of five years in an experiment on mixed buddings, planted as budded stumps in 1930. Tapping is done alternate daily on a half-spiral cut in renewed bark, and a stimulant is applied at half yearly intervals. Clone AVROS 50 was the only clone that showed a disappointing response to stimulation under the conditions of this experiment. The evidence is generally not sufficient to demonstrate significant differences between clones in their responses to stimulant application.

Stimulation of Ladder-trapped Trees

Rubber trees should not be tapped on high panels if there is good bark of first renewal available at low level. We recommend that all virgin bark and bark of first renewal should be tapped out at normal height before opening trees for ladder tapping.

Experiments have shown that high panels may yield considerably less than low panels of good first renewal bark on both buddings and seedlings. Only if the bark of first renewal is considered too thin for tapping—this rarely occurs under good management—should high panels be opened.

Unselected Seedling Trees

Unselected seedling trees generally yield less when tapped on high panels than when tapped low down the tapering stems in renewed bark of reasonable quality. Ladder tapping of this planting material should therefore, as a routine estate practice, be combined with half yearly stimulant application from the moment the high panels are opened. This holds only for tapping at normal intensity. If sufficient bark reserves are available for a long period of double cut 200 per cent. intensity tapping, the use of a stimulant should be postponed until the final 2-3 years of tapping (see 'Intensive Tapping of Mature Rubber' in *Planters' Bulletin* 38, September 1958).

Clonal Seedlings

There is now evidence that clonal seedlings react more favourably to ladder tapping than do unselected seedlings. The yield on ladder

tapping is higher than that obtained when tapping second renewal bark low down the stem; this effect, however, is less striking than in certain clones mentioned below. We recommend application of a stimulant at half yearly intervals when tapping clonal seedlings on high panels.

Clones

A different approach to stimulation of yield should be followed when tapping budded trees on a high panel. Certain clones normally show a large increase in yield when high panels are opened, such as clones PB 186, Pil B84, Pil A44, PB 86 and Tjir 1.

The more recently developed clones have not yet been intensively tested for clonal reactions, since in most of our experiments these trees are still being tapped in bark of first renewal. In one experiment clone RRIM 501 is giving a very high yield on ladder tapping whereas all other clones give an unimproved or reduced yield during the second year of ladder tapping, compared with that obtained from first renewal bark during earlier years.

It appears that clones of high yield capacity when tapped in virgin bark at normal level, will again produce high yields when tapped on high cuts, especially after completion of tapping of first renewal bark at normal height. It is recommended that when high panels are opened on budded trees, no stimulant should be applied for a period of at least three months, so that it can be ascertained whether the particular clone will give a high yield on ladder tapping. If no favourable response is recorded, a stimulant should be applied at intervals of six months. This method has given satisfactory results on practically all clones. Clone PB 25, which in our experiments did not respond well to ladder tapping, has given outstanding yields when ladder tapping has been combined with stimulant application. If yields are high after opening for ladder tapping, we recommend postponement of stimulant application until a well defined downward trend sets in as the cut approaches the renewed bark. The period of high yields is largely determined by the height of opening (see *Planters' Bulletin* 43, July, 1959, 'Ladder Tapping of Budded Trees').

The Effect of Tapping System on the Response to Stimulation

Tapping Intensity

Tapping systems of low intensity such as S/2.d/3.67 per cent. and S/2.d/2.100 per cent. permit a better response to stimulation than do high intensity systems such as 2S/2.d/2.200 per cent., 3C/2.d/2.300 per cent. and 2C/1.d/2.400 per cent. The latter 'slaughter-tapping' system actually shows a negative response: after a peak yield lasting one month, the yield level drops to a level far below that of unstimulated trees tapped on the same system (see *Journal of the Rubber Research Institute of Malaya*, 1955, Vol. 14, Communication 296, page 387).

It is shown in *Planters' Bulletin* 38 (September 1958) in the article 'Intensive Tapping of Mature Rubber' that when tapping is on a double cut system at 200 per cent. intensity (2C/2.d/2.200 per cent.), stimulants are effective for only a limited period of 1½-2 years.

Comparing S/2.d/2.100 per cent. with S/2.d/3.67 per cent. tapping, it appears that the third daily system gives a better response, but the yield does not equal that of trees tapped alternate daily and also treated with a stimulant. A large saving in tapping costs will nevertheless be achieved by combining third daily tapping of a half-spiral cut with stimulant application.

Periodic Tapping

There is still no conclusive information about the response to stimulation under alternate daily periodic systems. Such systems have been reported to give satisfactory results if the stimulant is applied two to three months after the resting period, so that full advantage is taken of flush yield due to resting.

Daily periodic systems are not considered suitable for combination with stimulant application below the cut. Application of Stimulex above the cut to the bark tapped away during the preceding tapping period may prove satisfactory, but a low d.r.c. is expected at the end of the tapping period and the renewing bark will probably have a wavy appearance.

Full Spiral Tapping

We have not yet tested the effects of stimulants under the full spiral tapping system. This tapping system has largely lost its popularity in

Malaya because it interferes badly with girthing in young trees and because it is not conducive to a high standard of tapping.

Reports from estates indicate that a combination of a stimulant with this tapping system may result in bursts in the renewing bark above the cut and 'bleeding'—possibly due to an excessive dose of stimulant. We recommend that not more than 1-1½ inches of bark below the full spiral cut should be treated.

Full spiral tapping causes late dripping, and a stimulant is expected to increase this effect.

Further Observations on Response to Stimulation

Effect of Environment

Trees growing under poor environmental conditions do not respond well. It is often on such material that stimulants are applied in an effort to increase the crop from low-yielding fields.

Brown Bast

Brown bast incidence is not increased by the use of yield stimulants. If for some reason a tree goes dry after stimulant application, the treated strip of bark should be shaved away.

Rate of Flow

Yield stimulants gave a slight increase in the rate of latex flow, but the duration of flow is greatly increased during the peak yield period. If full advantage of the stimulant is to be obtained a second collection should be made especially during the first month after application, otherwise there may be a high proportion of cup-lump.

Precoagulation

High tapping gives latex of high magnesium content which increases precoagulation. This effect is often attributed to the use of a yield stimulant, as ladder-tapped trees are frequently so treated. However, yield stimulants tend to reduce rather than to increase precoagulation.

Dry Rubber Content

The d.r.c. of the latex declines during the periods when yields are stimulated, but increases again when the yield returns to normal, some three months after application of the stimulant below the cut.

Properties of the Latex

The properties of latex concentrate and dry rubber may be affected to some extent by the use of yield stimulants. The volatile fatty acid (VFA) production in a stimulated latex is about twice that in a normal latex and consequently the use of small additional quantities of anti-coagulants followed by quick processing should be adopted for latex from stimulated trees. VFA formation sometimes gives rise to additional fermentation bubbles in RSS; the addition to the diluting water of 2-4 oz. of formalin per coagulating tank is usually enough to correct the increased bubble formation. Stimulation sometimes causes increased enzymic discolouration for a short time after application of the stimulant, and care should be taken when using this latex for preparing pale crepe.

These effects on latex composition are small for tapping near the base of the tree and for low tapping intensities. They are greater for high tapping which gives rise to effects similar to those caused by stimulation. Moreover, VFA content, fermentation bubbles and enzymic discolouration all increase with greater intensity of tapping. More vigorous steps are then required to avoid ill effects which are due partly to the stimulation treatment and partly to the height of the cuts and to the intensity of tapping. These adverse effects are mitigated by the practice of bulking latices before processing, giving a mixture in which latex of normal composition predominates.

Suggested Schedules for Tapping and Stimulation of Yield

These schedules are represented in diagrammatic and tabular form in *Figures 3 and 4*. Roman numbers are assigned to successive phases of tapping both in the schedules below and in the figures.

Buddings—Tapping System S/2.d/2.100 per cent.

1. Open the trees when 70 per cent. of the stand has reached tappable size at 50 inches above the union. The second panel to be opened at the same height at the opposite side of the trees. No stimulation should be done. This will give 10 years of tapping of virgin bark at normal height (A1 and B2).

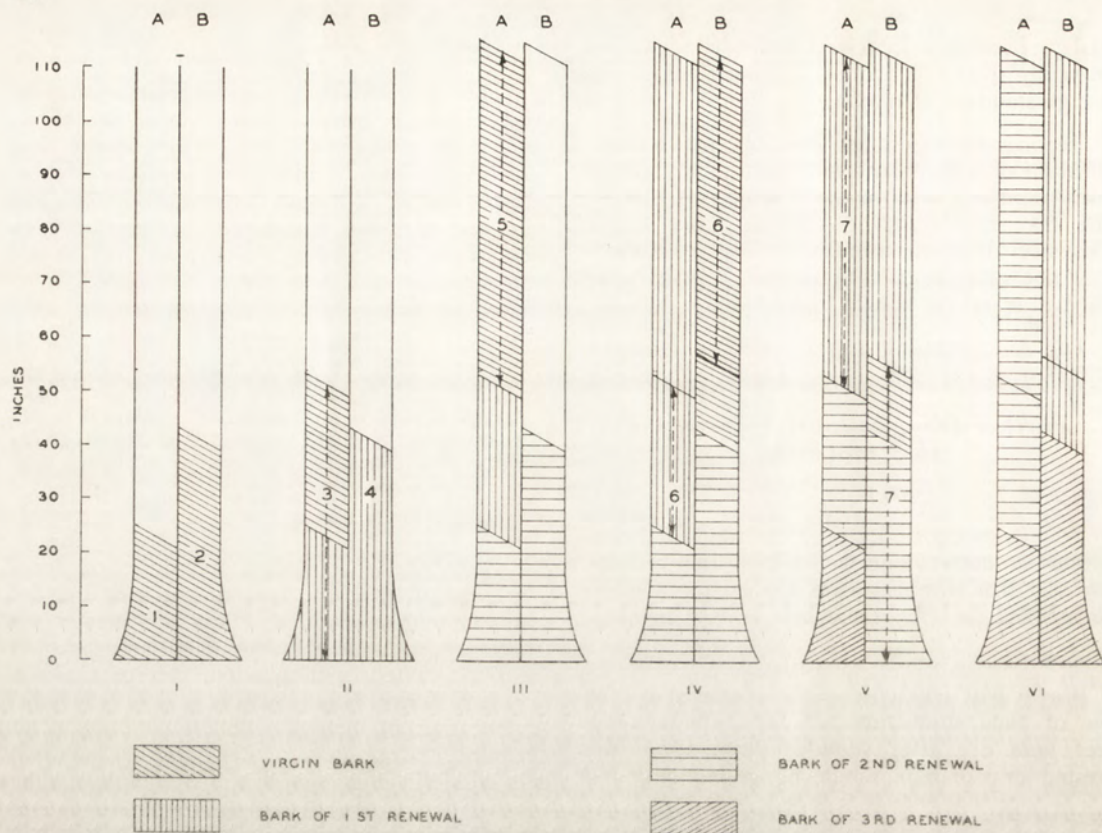


Diagram	Succession of panels		Bark. r. = renewal	Tapping system	Period of tapping, years	Stimulant application
I	1st.	A1	Virgin	S/2.d/2. 100%	5	None
	2nd.	B2	"	"	5	None
II	3rd.	A3	1st r.	S/2.d/2. 100%	4½	Optional
	4th.	B4	" "	"	4½	Routine, ½-yearly
III	5th.	A5	Virgin	C/2.d/2. 100%	4½	Optional. Routine quarterly from 60 in. down to 50 in. (v.b. island)
IV	6th.	A6	2nd r.	2C/2.d/3. 13¾%	5	None
	2 cuts	B6	Virgin	"	5	Optional. Routine quarterly from 60 in. down to 50 in (v.b. island)
V	7th.	A7	1st r.	2C/2.d/2. 200%	4	To both cuts during final 2 years of planting
	2 cuts	B7	2nd r.	"	4	
VI	Gives final bark position of trees					

Figure III. Suggested tapping schedule for buddings. Panels numbered in order of tapping.

III. The third panel (A3) is opened in first renewal bark of the first panel. No virgin bark island should be created. Bark consumption when tapping renewed bark will be slightly greater. No stimulation should be done unless there is an urgent need for a temporarily increased crop. The fourth panel (B4) should be opened in the renewed bark of the second panel with routine half yearly application of a stimulant. The trees are then over 20 years old and will respond favourably without ill effects. A total of 9 years tapping of first renewal bark may be expected.

III. A high fifth panel (A5), tapped alternate daily, should then be opened above the oldest bark of second renewal at 110 inches from the union. If no favourable response to ladder tapping is observed after three months, a yield stimulant should be applied at half yearly intervals, to be increased to quarterly applications when the cut comes within 10 inches of the junction between virgin and renewed bark. This will give $4\frac{1}{2}$ years of ladder tapping, up to the time when the cut has reached the bark of second renewal.

IV. Tapping is continued into the renewed bark of the low panel (A6), but without stimulation, and at the same time a second high panel (B6) can be opened at the opposite side of the tree. Both cuts are tapped third daily, 2C/2.d/3.133 per cent. A stimulant should be applied to the high cut when the yield shows a downward trend as the cut approaches the renewed bark below. Stimulation should be half yearly at first and later quarterly, and should cease when the high cut crosses into the renewed bark. A period of 5 years of third daily double-cut tapping may be expected on these panels.

V. At this stage the trees have been tapped for $28\frac{1}{2}$ years and will be some 35 years of age. Such fields will probably be considered for replanting. There is still bark of first renewal on the two high panels available and one low panel with bark of second renewal. One high (A7)

and one low panel (B7) could be tapped out together in four years of alternate daily double cut tapping (2C/2.d/2.200 per cent.) with half yearly stimulant application during the final two years of tapping, leaving another high panel of first renewal.

Seedlings—Tapping System S/2.d/3.67 per cent.

I. Open the trees when 70 per cent. of the stand has reached tappable size at 20 inches from ground level (A1). Open the second panel at 40 inches from the ground at the opposite side of the tree (B2).

II. The third panel (A3) is opened at 30 inches above the top mark of the first panel, hence at 50 inches from ground level. The fourth panel (B4) is opened in the renewed bark of the second panel at 40 inches from the ground. These four panels together will give a period of 18 years of third daily tapping, during which a stimulant should be used on the fourth panel, and may be used temporarily if the yield drops when the tapping cut approaches the junction of virgin and renewed bark on the third panel. Our experiments have shown a disappointing response to stimulant when the cut approaches ground level on seedling trees; it is advisable to discontinue stimulation when the cut reaches a height of one foot above the ground.

III. When the low panels have been tapped out, a high fifth panel (A5) is opened at 110 inches from the ground, if branching allows, for third daily tapping of a half-circumference cut. This should be combined with half yearly application of a stimulant, to be increased to quarterly application when the cut comes within 10 inches of the renewed bark of the third panel. This will give 6 years of tapping on this panel.

IV. After the cut reaches the renewed bark at 50 inches from the ground, tapping is continued into the low panel (A6) without stimulation, and at the same time a new high panel (B6) is opened. Both panels are tapped third daily (2C/2.d/3.133 per cent.). No stimulation should be

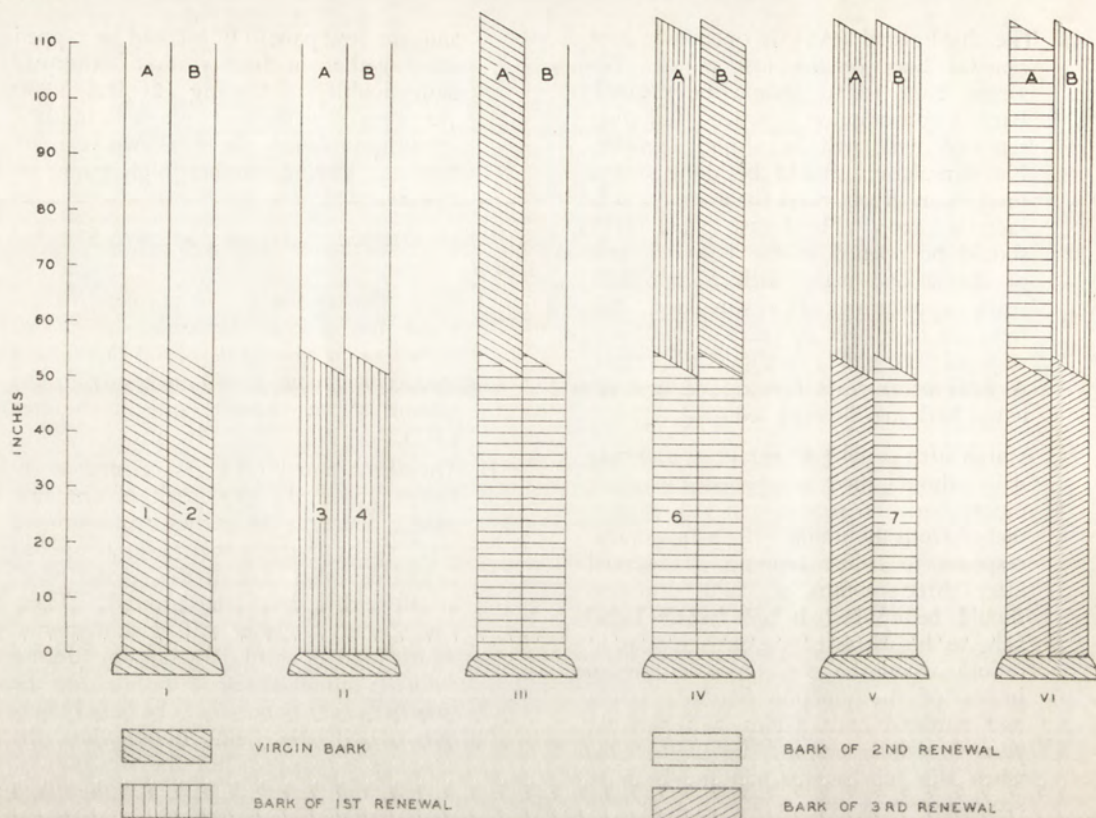


Diagram	Succession of panels		Bark. r.=renewal	Tapping system	Period of tapping, years	Stimulant application	
I	1st,	A1	Virgin	S/2.d/3 67%	2½	None	
	2nd,	B2	Virgin	"	5	None	
II	3rd,	A3	30 in. virgin 20 in. 1st r.	"	6	Temporary when crossing virgin bark island	
	4th,	B4	1st r.	"	4½	Routine ½-yearly down to one foot from ground level	
III	5th,	A5	Virgin	C/2.d/3 67%	6	Routine ½-yearly. Quarterly from 60 in. down to 50 in. (v.b. island)	
IV	6th,	{	A6	30 in. 1st r. 20 in. 2nd r.	2C/2.d/3. 133%	5	None
	B7		Virgin	"	5	Optional	
V	7th,	{	A7	1st r.	2C/2.d/2. 200%	4½	Quarterly to low cut from 50 in. down to 40 in. (v.b. island) ; routine ½-yearly to both cuts during final 2 years of tapping
	B7		Virgin and 2nd r.	"	4½		
VI	Gives the final bark position of trees						

Figure IV. Suggested tapping schedule for seedling trees. Panels numbered in order of tapping. Dotted lines indicate full length of tapping panels.

done until the yield from the high panel starts to drop as the cut moves towards the renewed bark underneath. A period of 5 years of double cut tapping may be expected on these panels. The high cut will then be between 15 and 20 inches above the renewed bark.

- V. At this stage the trees have been tapped for 29 years and the area will probably be considered for replanting. As in the case of the budded trees, there is still bark of first renewal on the high panels and also a 15-20-inch strip of virgin bark above an uninterrupted panel of second renewal at normal height. One high (A7) and one low panel (B7) can be tapped out together. The tapping intensity may be increased to alternate daily (2C/2.d/2.200 per cent.), with half yearly application of stimulant during the

final two years of tapping and quarterly application to the low cut as the strip of virgin bark is tapped away towards the bark of second renewal.

These suggested schedules are given as a guide but cannot always be put into effect. If the quality of bark of first renewal is poor, high tapping will have to be done first, followed by tapping of renewed bark. Also if wind damage or root disease curtail the life of a stand of rubber trees, intensive tapping with stimulation will have to be done at an early stage. Economic considerations may also enforce changes of tapping policy. Simultaneous change-over of tapping panels on all trees will greatly facilitate planning of tapping policy and sudden deviations from a fixed schedule. Uniformity in the field is a strict requirement for the proper execution of a programme in which stimulation and a double cut tapping system are combined.