TAPPING OF BUDDED TREES*

BY

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Introduction

During the lean years of the depression interest in new planting material and in experimental work which had as its main object the improvement of planting material was necessarily small. Practically no new planting was being undertaken, the young areas planted during the years 1927 to 1931 with buddings had not reached the bearing stage and the chief interest lay in the problems of economic production from mature areas.

Since the introduction of the Rubber Regulation Enactment in June, 1934, there has been a change in outlook and centre of interest. The problems of economic production have become less acute and interest is again centred on the subject of improved planting material. Under the provisions of the Enactment, replanting to the extent of 20 per cent of the acreage established prior to June, 1934, is permitted within the regulation period, and those who desire to take advantage of this provision are vitally interested in the choice of the new material to take the place of the unprofitable trees which are being removed.

We have heard a good deal of discussion during the past year concerning the respective merits of buddings of the best proved clones and seedlings of known origin and their relative value as planting material for present-day use. The discussion has aroused anew all the old objections to the practice of budding, although many of these objections had lost their force as evidence of the value of buddings of the best clones, particularly from the standpoint of yield, was gradually accumulated. But, the striking results which have been obtained in the first tapping tests on seedlings produced by careful breeding between selected clones, have had the effect of attracting renewed attention to certain undesirable qualities of budded trees.

General surveys of the information available concerning buddings and seedlings derived from clones have been given on previous occasions. It is not intended on the present occasion to continue the discussion of the relative merits of these two principal types of

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* The greater part of this paper was embodied in a lecture given by the author at the Annual Conference of the Incorporated Society of Planters on 2nd October, 1936, but it has been revised and brought up to date since.

superior planting material, but to deal more fully with the subject of budded trees and their treatment.

A careful examination of the criticisms of budded trees reveals that many of the objections to buddings are based on a close comparison of buddings with seedlings. It is quite easily understood that a planter will form a clear conception of what he considers to be the ideal rubber tree. Since the conception is based on experience the ideal tree will have the characters of a seedling. There will be a natural tendency to distrust material which does not conform with this preconceived standard of quality and appearance. Judged by this standard, budded trees must inevitably suffer, as they differ in so many important respects from seedling trees. It is necessary to judge the merits of seedlings and buddings by quite different standards, one should not look at a budding with the " seedling eye."

Comparison of the Characters of Buddings and Seedlings in relation to Tapping Practice.

Although the essential differences between the vegetative characters of buddings and seedlings are probably familiar to you it will be as well to describe them in order to show how the differences in form should be taken into consideration in determining the future treatment of the trees.

(*a*) A typical seedling shows a more or less pronounced taper from the level of the lateral roots to a height of about four feet. The decrease in circumference is rapid over the first foot from ground level, becoming more gradual with increase in height until, above a height of about fifty inches, the trunk becomes practically cylindrical up to the level of the first branches. The trunk of a budded tree is almost cylindrical from the level of the union with the stock up to the level of the first lateral branches. Girth measurements taken at heights of 10 inches, 30 inches and 50 inches on buddings of a typical clone gave readings of girth of 30 inches, 28 inches and 27 inches respectively. Comparisons of girth measurements on large numbers of seedlings and buddings show that the difference in girth at heights of 20 inches and 40 inches is only 5 per cent in buddings, whilst in seedlings the mean difference is 15 per cent. The girth of a seedling tree at ground level may be double the girth at a height of 40 inches, whilst the difference in girth at corresponding levels on a budding is seldom more than 10 per cent.

(*b*) In a normal seedling tree, accompanying the gradual decrease in girth there is a corresponding decrease in bark thickness from the base of the tree upwards. This change in the thickness of the bark is accompanied by a change in structure both in the outer layers and the inner layers of the bark. The structure of the outer layer of bark will be dealt with in more detail later; the innermost layers of bark which contain the latex vessels, are of particular interest here. Examination of the productive layer of soft "bark" shows that in a normal seedling tree the number of latex vessels at the base of the tree is approximately 50 per cent greater than the number found at a height of 40 inches.

In a typical budded tree the difference in bark thickness measured immediately above the union and at a height of 40 inches is small, and seldom exceeds 15 per cent. Corresponding with this uniformity in thickness is a uniformity in structure, both of the outer, corky layer and of the inner, soft layer containing the latex vessels.

TABLE I

Distribution of Latex Vessels in the Bark of Buddings and Seedling Trees at different Heights.

Type of Tree	Number and Percentage of Latex Vessels at heights of :—		
	5 inches	20 inches	40 inches
1. Buddings ...	20 *100%*	19 *95%*	18 *90%*
2. Seedlings ... (Unselected) ...	15 *100%*	11 *73%*	9 *60%*
3. Selected Seedlings ... (Mother trees of the buddings in 1) ...	20 *100%*	15 *75%*	— —

To illustrate this important difference in the quality of the bark of buddings and seedling trees the results of a detailed examination of bark sections taken at heights of 5, 20 and 40 inches from ground level on buddings and seedlings are summarised in Table I. The examination was made on 208 buddings of six different clones and 485 seedlings of mixed origin. The buddings were just over five years of age and the seedlings seven years of age. The actual number of latex-vessel rows in the buddings was considerably higher than that in the seedlings at all levels, but for the present this is not the point to which I wish to draw attention. The relative proportion of latex-vessels at different levels is here the chief point of interest; in buddings, if the full count of latex vessels at the base of the trunk is taken as 100, then at 20 inches the number is reduced by only 5 per cent and at 40 inches by only 10 per cent. For seedlings, the corresponding figures are 100 per cent at the base of the tree, which is reduced by 27 per cent at 20 inches and by 40 per cent at 40 inches. It may be suggested that to compare the bark of buddings of good clones with that of a group of ordinary unselected seedlings is hardly a fair comparison. To meet this objection, the ten highest-yielding trees of the group of seedlings examined have been considered separately, and it is again found that the number of latex-vessels at 20 inches is less by 25 per cent than the number at the base of the tree. It is a point of interest that these selected seedlings include the mother trees of the buddings with which these comparisons are made

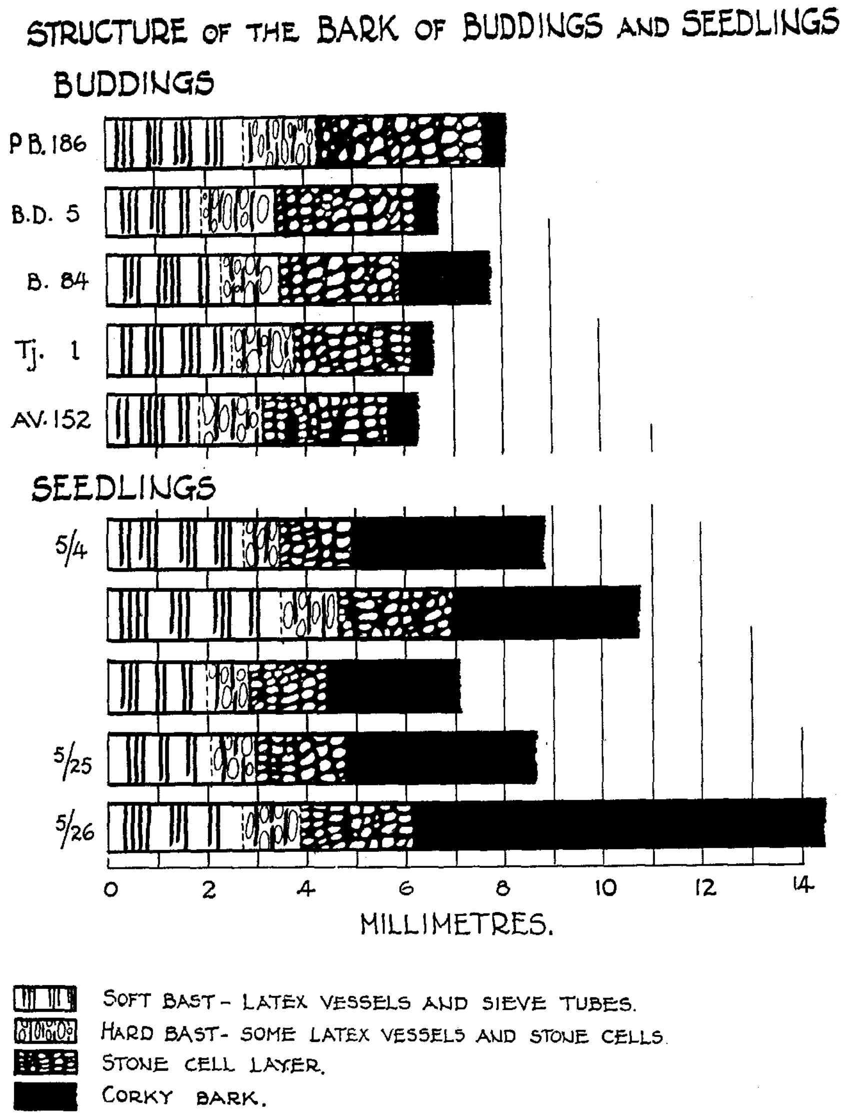
The characters discussed so far, changes in girth and the quality of the bark with increase in height on the trunk, have a very close bearing on yield and tapping practice. In seedling trees it is clear that the highest production will be obtained at the lowest levels, where the maximum length of the tapping cut on bark of the best quality is obtained. Before considering the question of yield in more detail, there is a further characteristic difference between the bark of buddings and seedlings which must be described.

(*c*) It is the common practice to speak of the whole of the tissues outside the wood of a rubber tree as the bark. Although this may not be correct botanically the term is clearly understood in relation to tapping practice, and we will retain it for the purpose of this discussion.

The "bark" is separated from the wood by the actively growing cambium layer from which new wood vessels are formed towards the inside and new bark tissues towards the outside. A longitudinal section taken through the bark shows that it is made up of an inner layer of soft tissue, an intermediate layer consisting of a mixture of soft tissue and harder elements known as stone cells, and an outer layer composed of hard, and for the most part dead, cells consisting mainly of cork. (Strictly speaking only this hard outer layer is the true *bark;* the inner living layers constitute the *bast*). The relative extent of these three principal zones of tissue varies considerably in seedling trees. Different clones may also show considerable differences in bark structure, although within a single clone the buddings show a high degree of uniformity in this respect.

The most important tissues, from our point of view, the latex-vessels, are practically confined to the inner layer of soft bark and the innermost layers of the stone cell zone. Outside this region no latex occurs.

FIGURE 1



In Figure 1 the relative extent of the different tissues in the bark of typical buddings and seedlings is shown diagramatically. The most noticeable difference in the bark structure of seedlings and buddings which the diagrams reveal is the relatively small development of cork on the bark of buddings. In seedling trees the non-latex-bearing corky layer represents from one-third to one-half of the total bark thickness. In most budded trees this cork layer accounts for less than 10 per cent of the total bark thickness. Clone B.84 is quite exceptional among the better-known clones in this respect; the cork layer on buddings of this clone may represent 25 per cent of the total bark thickness. A further interesting feature is the relatively greater development of the stone cell layer, the zone between the cork and the soft bark, in buddings as compared with seedlings. It appears that the deficiency in the corky, protective layer is to some extent counterbalanced by a heavier development of protective tissue below the cork layer. The actual thickness of the latex-bearing zone is approximately the same in the buddings and the selected seedlings examined. The sections used to illustrate these differences in the structure of the bark of buddings and seedlings have been prepared from samples of bark taken at an uniform height of 20 inches on trees about 6½ years of age.

These essential differences in bark structure between buddings and seedlings have been the source of the most numerous criticisms and doubts concerning the value of buddings.

In seedling trees the heavy development of cork is most pronounced at the base of the tree within the normal tapping levels. Usually, the development of a thick cork layer is absent from the upper portions of the trunk and the main branches, so that the bark becomes smooth and similar in appearance and texture to that of a budding. That a heavy cork layer is normally present on bark which it has been the custom to tap appears to have been responsible for a firmly fixed belief that there must be something fundamentally unsound in the practice of tapping bark which is not provided with a heavy cork layer. In any discussion of tapping of budded trees the objection to tapping "branch" bark is generally heard. It is difficult to find actual evidence that branch bark could not be tapped satisfactorily if it were found profitable to do so. Without this evidence the objection to tapping "branch" bark and its application to budded trees is without foundation. The main point it is desired to make is that differences are not necessarily defects; satisfactory answers to criticisms can be obtained only from the results of practical tests.

There is one important respect in which the differences in structure of the bark have an important practical bearing. Although the corky layer of the bark of a seedling tree contributes nothing to the yield of latex, during the actual tapping operation it provides a firm channel along which the tapper's knife can work smoothly. The tapping knife is steadied by the extra resistance of the tough, corky layer and the risks of too-deep tapping and wounding are minimised. Tappers who have been accustomed to work on ordinary seedlings will at first experience some difficulty in tapping buddings. They will either be inclined to wound frequently or, if they have been suitably impressed beforehand concerning the dangers of wounding, tapping is likely to be too shallow. This is a practical difficulty which can be overcome by a little careful attention in the early stages.

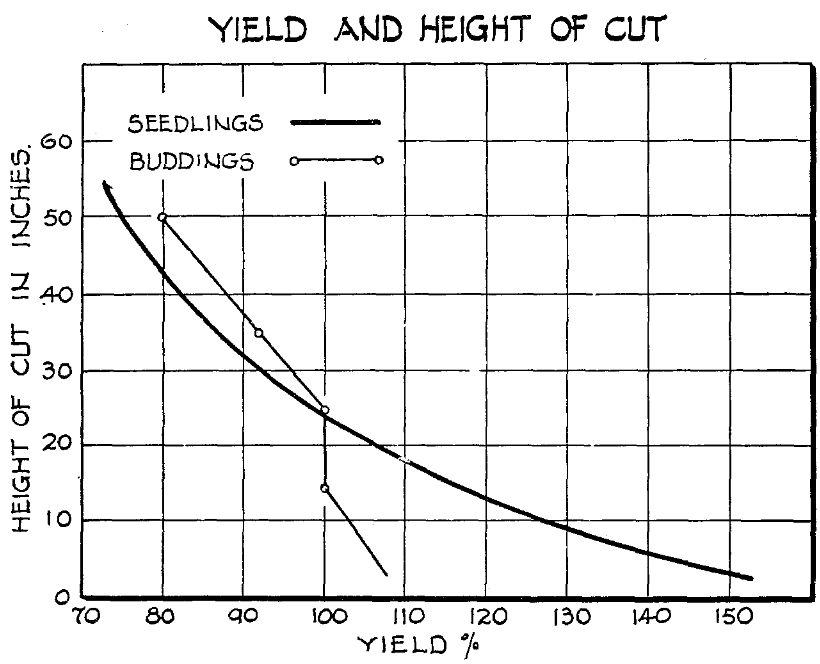
The absence of the thick cork layer on buddings reduces the width of the channel available for the flow of latex at tapping. If the tapping cut is given the same slope as that normally used on seedlings there is a tendency for latex to overflow down the bark. Tapping with a steeper slope at about 30 degrees overcomes this difficulty.

It is now proposed to describe briefly certain experiments which illustrate the bearing of the special characters of budded trees on the choice of a tapping system.

Yields of Buddings and Seedlings at different Tapping Heights

It is well known that the yield of a seedling tree decreases with increase in the tapping height. The relationship between the height of cut and yield is shown in Figure 2.

FIGURE 2



Yield at a mean height of 25 inches is taken as 100, and it is found that at ground level the yield is increased by 50 per cent; at a height of 50 inches the yield is reduced by 25 per cent. In the same Figure a second curve is drawn from records obtained from budded trees of a single clone. It is regretted that the data are so limited, but they are sufficient to illustrate that the change in yield with increase in the height of the tapping cut is much less marked in buddings than in seedlings. The lower portion of the curve has not been completed as the yields of buddings of different clones vary considerably as the tapping cut approaches the union.

More complete records are available for yields of budded trees tapped at heights of 20 inches and 40 inches. For buddings of 11 clones the average yield during the first tapping year on buddings opened at a height of 40 inches is found to be almost exactly 10 per cent less than the yields of trees opened at a height of 20 inches. Reference to the curve in Figure 2 shows that for seedling trees the mean difference in yield between trees tapped at corresponding heights is more than double this figure. Certain clones appear to give practically the same yield at tapping heights of 20 inches and 40 inches.

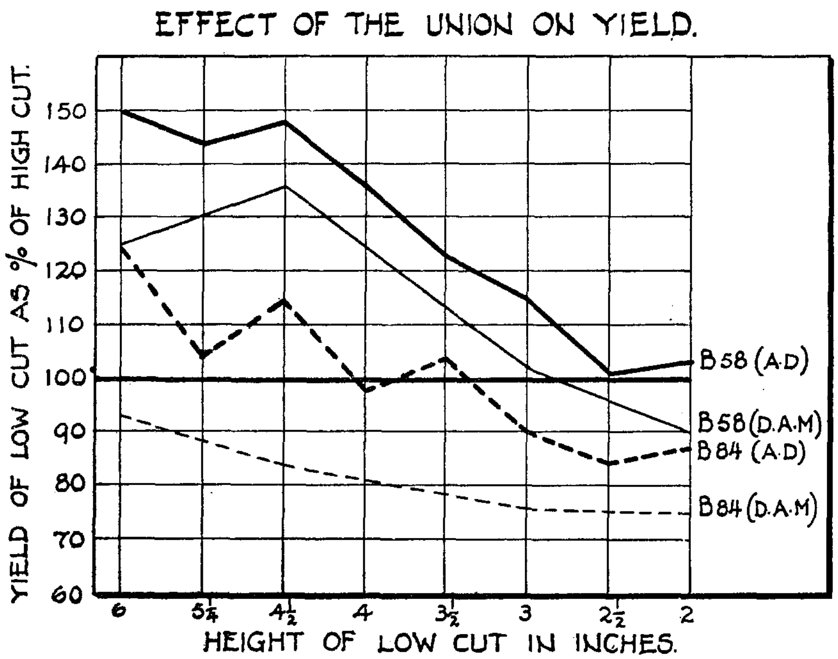
The essential differences in the structure of the tapping zone in buddings and seedlings are thus shown to have an important bearing on yield. It is clear that in the choice of a tapping system which will prove satisfactory for budded trees, full consideration must be given to their special characteristics. It is unlikely that the systems which have been proved by long experience to be satisfactory on seedling trees will be the best systems for buddings.

The Effect of the Union on the Yield of Buddings

The graph illustrating the relationship between yield and tapping height in seedling trees shows a steady increase in yield as the tapping cut approaches the base of the tree. Over the lowest section of bark the increase in yield is most pronounced. In budded trees we find that the reverse is true. In general it is found that, as the tapping cut approaches the union, yields do not increase but may actually decrease. The behaviour of different clones is not uniform. Certain clones may begin to show this "union effect" when the tapping height is still several inches from the union; in others it is not apparent until the tapping cut reaches a much lower level.

To illustrate this point I have taken the results of an experiment carried out on two clones. In each clone the yields of two groups of trees tapped at heights of 6 inches to 2 inches above the union are compared with trees tapped from 40 inches to 36 inches above the union. The figures are given in Table II and illustrated graphically in Figure 3,

FIGURE 3



Two systems of tapping were used, alternate-daily tapping and daily tapping in alternate months.

TABLE II

The Effect of the Union on Yield of Buddings.

Yield of lower cut expressed as a percentage of the yield of the upper cut.

Clone	Tapping System	Heights of Tapping Cuts in inches							
		40	39¼	38½	37¾	37	36¼	35½	34¾
		6	5¼	4½	4	3½	3	2½	2
B. 58	a.d.	150	144	149	138	123	115	100	103
	d.a.m.	121		136			101		90
B. 84	a.d.	125	104	115	98	104	90	83	87
	d.a.m.	93		84			76		75

The results of these experiments demonstrate clearly the *relative* decline in yield which takes place as the tapping cut approaches the union. The word *relative* is important; it should not be assumed that there was a pronounced fall in yield on the lower tapping cut (actually there was a slight increase in yield); the important point is that yields from the upper cuts increased more rapidly than yields from the lower cuts. The difference between clones is also illustrated by the examples selected. In Clone B.58, although the yield of the upper cut increases more rapidly than that of the lower, the latter still remains the higher-yielding cut to within two inches of the union. In Clone B.84 the rate of increase in the yield of the upper cut is relatively more rapid, and its yield exceeds that of the lower cut when the latter is about 4 inches from the union on trees tapped on the alternate-day system.

It will be noticed that with the daily alternate-monthly system of tapping the effect of the union on yield appears to be considerably more marked. This is evident in Clone B.58, and quite pronounced in Clone B.84.

From the results of experiments carried out elsewhere it has been recommended that budded trees should be left untapped from six to eight inches from the union. The results on which this advice is based were obtained with the daily alternate-monthly system of tapping. It is interesting to note that the results obtained with Clone B.84 in the present experiments would support this recommendation. At the same time, as the most usual system of tapping in this country is the alternate-day system, in view of the results we have obtained it appears to be unnecessary to discontinue the tapping of buddings until a considerably lower level is reached when the alternate-day system of tapping is used.

Bark Renewal on Budded Trees

Of all the doubts which have been expressed concerning the value of buddings probably the most numerous have been on the subject of bark renewal. One of the alleged defects of "branch bark" is that it will not renew. It is unfortunate that some of the earliest clones to be tested were used for commercial planting before information was available concerning their secondary characters, particularly bark renewal. Although, as soon as weakness in this respect was observed, the defective clones were removed from the list of those recommended for planting, the warning came too late to prevent the planting of considerable areas with unsatisfactory clones. It seems likely that many of the rumours concerning the defects of budded trees have their origin in these unfortunate areas. Such characters as thinness of the primary bark and a slow rate of bark renewal are clonal characters. Before a clone can be recommended for commercial planting it is now necessary to obtain conclusive evidence that secondary characters of this nature are satisfactory. It is not sufficient that a clone should give a very high yield in the early years of test, other characters are of almost equal importance.

In an area containing buddings of a number of clones which have been tapped continuously since 1928, we have made regular observations on the rate of bark renewal. The records for two clones are given in Table III, and they show that the rate of bark renewal has been entirely satisfactory.

TABLE III

Bark Renewal in Buddings of Clones B.84 and D.65.

Clone	Thickness of Bark in millimetres								
	Virgin Bark at heights of :—		Renewed bark :—age in years						
	4 in.	50 in.	7	6	5	4	3	2	1
B. 84	11.8	11.3	10.4	10.3	10.2	10.1	8.8	8.4	7.4
D. 65	11.7	10.4	9.8	9.4	9.3	8.8	7.1	6.4	5.7

In addition to the measurements of thickness, examinations of the structure of the bark have been made. It has been found that after four years the structure of the inner layer of renewed bark is practically identical with that of the virgin bark. The difference in total bark thickness is accounted for mainly by the smaller development of the stone-cell layer in the renewed bark.

During 1935 renewed bark representing seven years renewal was tapped, and it was possible to make careful comparisons between the yields of trees tapped on renewed bark and virgin bark at the same tapping height. Six clones were included in the comparison. It was found that as the tapping cut approached the renewed bark, yields decreased slightly below the level obtained on trees having virgin bark below the tapping cut. As the tapping cut entered the renewed bark there was an increase in yield, more marked in some clones than others, but in all clones the yield on renewed bark was relatively higher than on virgin bark at the same height.

It is not possible to give in full the detailed results here, but the figures summarised in Table IV show that, despite the fact that many of the trees were tapped on renewed bark during 1935, all clones except D.65 showed an increase in yield.

TABLE IV

Yields of Buddings tapped on Renewed Bark

Tapping system: alternate-day on half-circumference.

Year	Nature of Bark	Tapping Height in January	Yield in pounds per tree per annum					
			A. 44	B. 58	B. 84	D. 61	B. 16	D. 65
1933	Virgin	40 in.	9.3	9.6	15.9	7.1	15.1	20.0
1934	"	30 "	9.5	12.9	18.5	10.9	18.6	26.0
1935	Renewed	20 "	10.0	14.6	19.2	11.8	19.1	23.2

Rate of Increase in the Yield of Buddings

Although it is generally accepted that buddings of the best clones now recommended for planting are capable of very high yields when young, there appears to be a general impression that they will not be able to maintain their yield or show a steady increase in yield with age in the same manner as seedlings. This is still another of the questions which will only be answered with certainty by future results, but from our present evidence there seems to be little reason for anxiety.

In Figures 4 and 5 the yield records of two good clones are shown. Although the trees have been tapped continuously from the time they reached a girth of 16 inches, there is little evidence so far that their good performance at an early age has not been maintained.

It is of interest also that young buddings made in 1928 from the original buddings of Clone B.84 have now been tapped for three years and have given the following yields :—

6th year	7.2	pounds per tree.
7th year	9.4	" " "
8th year	11.2	" " "

So far they are repeating fairly closely the performance of the original buddings.

FIGURE 4

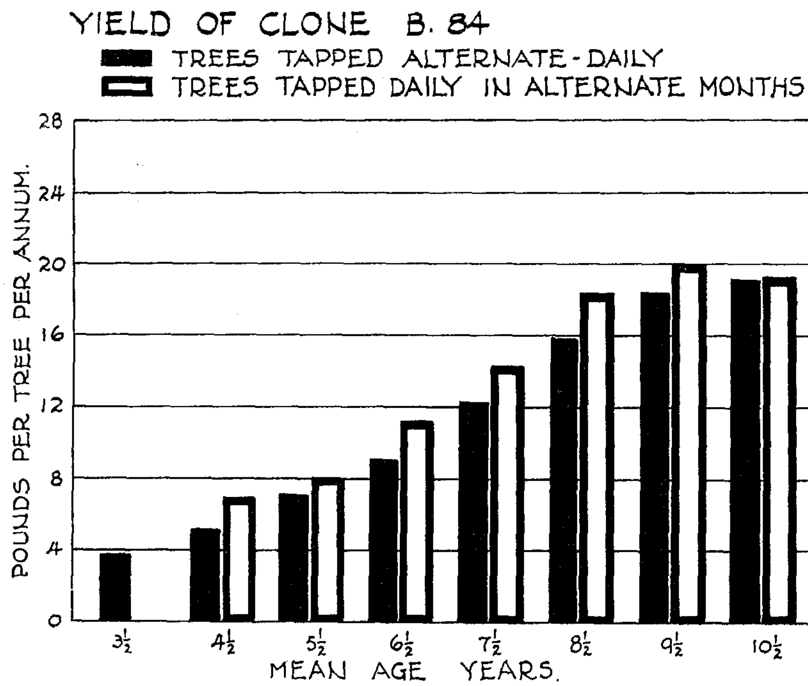
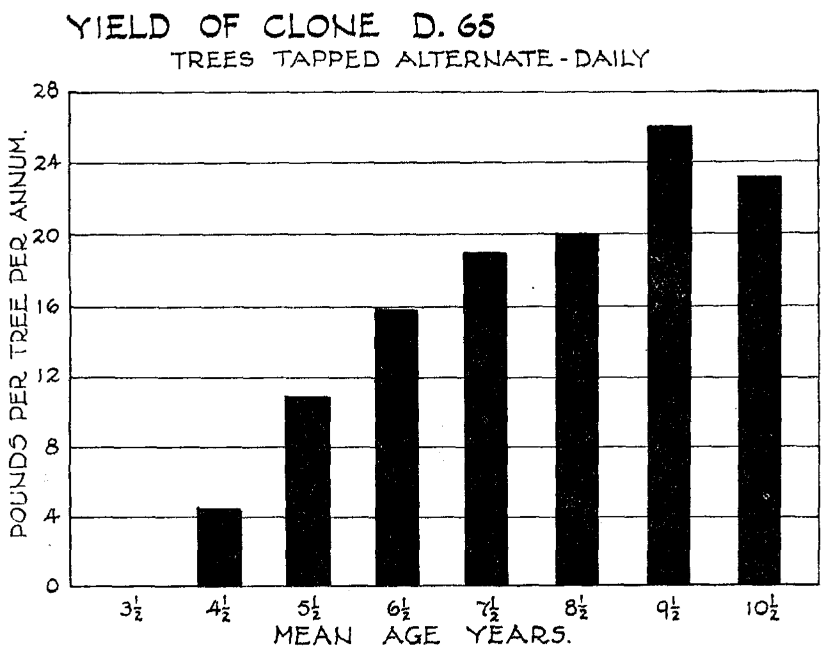


FIGURE 5



Practical Considerations in the Tapping of Buddings

From the experience and information we have gained from tapping experiments on a large number of different clones it is recommended that tapping of buddings should be commenced on the following system:

(i) The minimum girth for commencement of tapping should be not less than 20 inches at a height of 40 inches from the union of bud and stock.

(ii) Trees should be opened on a half-circumference, the lowest point of the tapping cut being 40 inches from the union. (For clones B.D. 5 and P.B. 186 a lower initial tapping height may prove necessary).

(iii) We prefer the single, spiral cut sloping downwards from left to right at an angle of about 30 degrees, but where there is a particular preference for the "V" cut it may be used. The chief advantage of the half-spiral cut is that it is quicker to tap than the "V" and probably gives a slightly higher yield. On the other hand, the "V" cut reduces the danger of loss of latex by overflow from the cut.

(iv) Tapping alternate-daily with bark consumption of $\frac{3}{4}$ to $\frac{7}{8}$ inch per month is recommended for the first two years.

It has been shown that by tapping on the A.B.C. system or tapping every third day, very satisfactory yields per acre can be obtained from young buddings and the yield per tapper can be appreciably increased.

There are one or two minor points of practical importance. It should not be forgotten that the heavy cork layer on the bark of a seedling tree provides a useful anchorage for the spout and cup-hanger: the spout can be forced into the corky bark to a fairly deep level without causing damage; similarly, the usual type of cup-hanger which is held in position by two short claws pressed into the bark is generally satisfactory on seedlings. Greater care is required on buddings, spouts of lighter construction are required and the expanding type of cup-hanger which does not penetrate the bark should be used.

In tapping seedlings a fairly broad-bladed knife or gouge may be used (one-half or five-eighths inch gouges are in general use). For buddings we have found a three-eighths inch gouge to be much more satisfactory.

It is realised that in the older areas where buddings and seedlings have been planted together it will probably prove difficult to give buddings the different treatment their differences in character require. In view of the differences in bark thickness and structure, tapping will be difficult. There will be a tendency either to tap too deeply on the buddings or, if the buddings are correctly tapped, then it is likely that the seedlings will not be tapped deeply enough. If possible it should be arranged that different tappers are allocated to buddings and seedlings or, it might be feasible to arrange that the buddings and seedlings are tapped on alternate days. In large blocks containing only budded trees, particularly if the monoclone system of planting has been followed, the practical difficulties of tapping will be minimised. The general uniformity of the trees should actually make the tapping of buddings very much easier than the tapping of seedlings in which the variation in bark conditions from tree to tree may be very great.

Yields obtained from Budded Areas tapped under Normal Estate Conditions

It is discouraging to us, and not very helpful to you, when confirmatory evidence of the value of buddings is required, that actual records of the yields of large budded areas in commercial tapping are difficult to obtain. The chief reasons for this lack of information are :—

(*a*) The extensive planting of buddings of clones which can now be regarded as "proved," (or, more correctly, approved) dates from about 1928, so that the trees would not have been ready for commercial tapping much before 1934;

(*b*) the introduction of Rubber Regulation has made it unnecessary to tap young areas prior to 1937. It has generally been possible hitherto for an estate to obtain its full exportable quota from mature areas at a lower tapping cost than it would be possible to maintain even from a high-yielding area of young buddings. Under the conditions which have prevailed up to the present, cost per pound has been a more important consideration than yield per acre.

Although the area is small, a fair index of the yield per acre obtainable from buddings of the best clones can be prepared from our records of an experimental area. The records are summarised in Table V.

The block was planted in 1924 and the actual area allocated to each clone is accurately known. This figure is used to compute the yield per acre for each clone. No allowance is made for losses. Since 1931 the method of tapping, collecting and manufacture of the rubber has been made to conform as closely as possible with ordinary estate practice. The crop from each clone is manufactured as smoked sheet and lower grades are made up as crepe in the usual way. The total weight of dry rubber obtained from each clone is recorded monthly.

TABLE V

Records of Yield per acre from an Experimental Area planted with Buddings.

Clone	Acreage	Yield per acre in pounds No. of Trees per Acre 1931 6 to 7 years	1932 7 to 8 years	1933 8 to 9 years	1934 9 to 10 years	1935 10 to 11 years
Clone A. 44	1.34	590 73	613 64	530 58	503 53	491 53
Clone B. 58	.84	743 79	864 78	845 78	983 77	1,049 77
Clone B. 84	.50	735 66	959 68	1,068 70	1,273 70	1,258 68
Clone D. 61	.46	467 52	549 52	479 57	634 56	695 56
Clone D. 65	.06	1,232 72	1,423 72	1,409 72	1,668 72	1,530 72
Clone B. 16	1.08	792 64	906 63	998 64	1,128 63	1,188 62
All Clones (Mean) (See foot note)	4.28	760 68	886 66	888 67	1,032 65	1,035 65

Under the rules for the assessment of untapped rubber the following maximum allowances are given for budded rubber (Controller of Rubber. Circular, 10th October, 1934).

Age in years ...	*6 to 7*	*7 to 8*	*8 to 9*	*9 to 10*	*10 to 11*	*11 to 12 and older*
Stand per acre ...	*110*	*105*	*100*	*90*	*85*	*85*
Yield per acre in pounds per annum ...	*600*	*750*	*900*	*1,000*	*1,100*	*1,200*

The figures presented in Table V give an accurate record of the actual yields per acre obtained from the different clones. The stand of trees per acre is low, considerably lower than it would be in a present-day planting, and it is reasonable to expect that even better results would have been obtained with a higher initial density of planting. Attention is directed to the footnote to Table V.

Further records of yield are available from comparatively large blocks of buddings of a number of clones in monoclone plantings. The blocks are from 60 to 70 acres in size and each block contains 18 tapping tasks. Tapping is alternate-daily with a single cut from left to right commencing at a height of 40 inches from the union. During the first tapping year the following yields have been obtained :—

	Age of Buddings at Commencement of Tapping	Yield in pounds per acre
Clone P.B. 25 ...	5 years	578
Clone S.R. 9 ...	6 „	324
Clone A.V.R.O.S. 49 ...	5½ „	517
Clone A.V.R.O.S. 50 ...	5½ „	464
Clone A.V.R.O.S. 152 ...	5½ „	393

At the conclusion of the first tapping year the blocks of 18 tasks have been divided into three sub-groups each containing six tasks. The first group is tapped alternate-daily, the second on the A.B.C. system with periods of six months tapping and three months rest; the third group is tapped every third day.

The results obtained with Clone P.B. 25 follow; for the other clones the work is not yet sufficiently advanced for discussion.

Clone P.B. 25.—Buddings six years of age at the commencement of the experiment :

Tapping System	A.D.	A.B.C.	Third-daily
**2nd year*			
Yield in lb. per acre	757	539	543
Yield as % of A.D.	*100*	*71*	*72*
Mean yield per tapper in lb. dry rubber	13.2	14.0	14.0
3rd Year.			
Yield in lb. per acre	935	704	725
Yield as % of A.D.	*100*	*75*	*77.5*
Mean yield per tapper in lb. dry rubber	16.1	18.0	18.6

* *During the first year all tasks were tapped on the alternate-daily system. When the comparison of the three systems of tapping was commenced the tapping height on all trees was 30 inches from the union.*

The yields from the tasks tapped alternate-daily are excellent, and they are well in excess of the maximum allowance for budded rubber of this age permitted by the rules for the assessment of young areas.

The yields obtained under the A.B.C. and third-day systems of tapping are also very satisfactory. Production in pounds per acre is practically the same on both systems. The proportional loss in yield is less than the proportional reduction in number of tapping days. It is clear, therefore, that the trees are deriving some benefit from the extra rest allowed by the lighter tapping systems. A point of particular interest at the present time is the very satisfactory yield per tapper obtained on the lighter systems of tapping. A yield of 18 pounds per cooly on a task of 300 trees which are not yet eight years of age, reckoned from the date of budding, is exceptionally good.

TABLE VI

Summary of Yield Records of young Budded Trees from Tests carried out on Estates.

Clone	Yield in pounds per Tree			
	1st Tapping Year		2nd Tapping Year	
	No. of Trees	Yield	No. of Trees	Yield
Tj. 1 ...	*(3)* 38	7.9	*(1)* 10	11.8
A.V.R.O.S. 49 ...	*(3)* 5440	4.6	*(1)* 20	5.8
A.V.R.O.S. 50 ...	*(3)* 5513	4.8		
A.V.R.O.S. 152 ...	*(2)* 5418	3.6		
B.D. 5 ...	*(3)* 28	4.4	*(1)* 20	7.6
B.D. 10 ...	*(2)* 27	5.9	*(1)* 20	6.1
P.B. 25 ...	*(1)* 5400	5.7	*(1)* 5400	7.2
P.B. 23 ...	*(1)* 13	4.7		
P.B. 186 ...	*(1)* 21	4.7		
S.R. 9 ...	*(1)* 5400	5.0		
A. 44 ...	*(3)* 56	8.6	*(2)* 39	9.6
B. 84 ...	*(3)* 60	6.8	*(2)* 40	9.9
B. 16 ...	*(2)* 40	9.2	*(2)* 40	11 6
D. 61 ...	*(2)* 40	6.1	*(2)* 40	8.9
B. 58 ...	*(2)* 40	6.7		

* *Numbers in brackets indicate number of sources from which records have been obtained.*

From a number of estates on which buddings have now reached the tapping stage we are receiving regular records of yields. On the whole, the yields are coming up to expectations. We should be glad to receive many more records of this type from estates where buddings of the best-known clones are now being tapped. In Table VI a summary of the records from tests which have been continued for a full year or more is given.

Summary

1. In the course of this lecture the chief aim has been to illustrate the manner in which budded trees differ from seedling trees in many important respects. It is important that these differences should be fully appreciated as it has been shown that they have a most important bearing on tapping procedure.

2. Recommendations for the early tapping of budded trees are made and attention is drawn to details of practical importance in field practice.

3. Records of yields of buddings of a number of approved clones when tapped under normal estate conditions are presented. The results so far obtained support the records of early tests on the original series of buddings of the various clones.

4. An appeal is made for the further collaboration of estates in obtaining records of yields of budded areas, so that more may be learnt of the influence of environmental conditions on the performance of different clones.