EXPERIMENTS WITH ECONOMIC TAPPING SYSTEMS (1)

BY

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Introduction

During times of high prices of rubber the object of all tapping systems is to obtain the maximum yield of rubber consistent with the health and longevity of the trees, the cost of tapping being within quite wide limits a matter of only secondary importance. During periods of low prices the reverse is the case; the cost of tapping becomes a large item in estate economy and methods which show promise of reducing this cost, even at the loss of a small proportion of the crop, become popular.

What was probably the first attempt in Malaya in recent times to save tapping costs at a sacrifice of part of the crop was the introduction of A.B.C. tapping by Harrison in 1927 (1). He suggested that if one-third of the estate were rested and the remaining two-thirds tapped alternate-daily the yield would in the course of a few years recover to the normal and the cost of tapping would at the same time be reduced by one-third. His contention has very largely been borne out in practice, but it must be pointed out that there is little or no evidence to show that one-third of the estate is the most suitable proportion to be rested; it might be larger or smaller and is likely to vary with the age and condition of the trees. Nor is there any satisfactory evidence to show what are the most suitable periods of tapping and rest. The most popular arrangement is one year tapping and six months rest, though there is an important body of planting opinion which favours two years tapping and one year of rest. It is hoped that the experiments described in this paper may in time throw some light on the latter question but much experimental evidence is required before any indication can be obtained of the answer to the former question as to the most suitable proportions of tapping to rest.

The next step in the direction of saving in tapping cost was an attempt to use the tappers' time more economically. A tapper's time can be divided into two parts, the time spent in the actual tapping and the time spent in walking from tree to tree. It was argued that if two cuts were put on the tree instead of one the time spent in walking could be halved and the number of trees that

a tapper could deal with could be correspondingly increased without any increase in the total amount of time spent in tapping.

Maas (2) found from observations in Sumatra that on ten-year-old rubber the time spent in walking from tree to tree and the time spent in the actual process of tapping, cleaning the cup etc. were in the proportion of one to four. On fully matured rubber it has been found on Seventh Mile Estate that the proportion is nearer to one to eight. It is probable that the difference in nationality of the tapper is responsible for the greater part of the difference in time of tapping, though clearly a low stand per acre, broken, hilly land and small poorly-grown trees would all tend to increase the proportion of the time spent in walking and enlarge the scope for economy that might be obtained from tapping two cuts instead of one.

The introduction of double-cut tapping systems has progressed along two quite different lines. The first consists of a short intensive period of tapping followed by a period of rest; this is exemplified by the Sunderland system in which the trees are tapped on two cuts every third day. While it lasts this tapping system is one-third as heavy again as ordinary alternate-daily tapping. This is followed by a period of rest equal to the period of tapping or to one-half of the period of tapping according to the nature of the trees and the total intensity of the tapping system considered desirable. Both types of Sunderland system have been tried on a number of estates in Malaya.

The second type of two-cut tapping recently introduced into Malaya is the "double-four" system. This differs from the Sunderland system in that it is much less intensive and can so far as is known at present be continued indefinitely without the introduction of a period of rest. This is not to say that a system of, for example, double-four A.B.C. would not be an improvement, but experimental evidence on this point is necessary. It must also be noted that if double-four tapping with a period of rest is to be adopted the same problems will arise of the most suitable proportion of tapping and rest and the most suitable duration of the resting period which were referred to above in relation to A.B.C. tapping on a single cut.

In the experiment on Seventh Mile Estate an attempt has been made to compare on a large scale and with proper attention to the modern technique of field experiments the merits of some of the tapping systems suited to mature plantations of unselected planting material. Some of the questions discussed above are however outside the scope of this experiment and much more experimental work remains to be done. The introduction of restriction of production with the compulsory resting of a part of every estate offers

opportunities of carrying out experiments on tapping on a large scale of which advantage ought to be taken.

In conclusion it may be stated that the Rubber Research Institute is always ready to co-operate in the designing of field experiments of this nature and to advise as to a suitable method of carrying them out.

Part I

In this paper an account is given of an experiment set up early in 1933 on Seventh Mile Estate, Selangor, designed to test over a period of five years different economic tapping systems against the normal alternate-daily tapping that is customary in Malaya.

Every effort is made within the limits imposed by the necessities of the experiment to conform as nearly as possible to the procedure adopted on the estate on which the experiment is being carried out. Thus each plot consists of a whole tapping task; tapping commences on the experimental area at the same time as on the rest of the estate and the same holidays are taken.

In addition to the records of yield of rubber and scrap, the yield per tapper is also recorded so that the comparative costs of the various tapping systems can be determined.

Tapping Systems under Test

Eight tapping systems are being compared.

They are:—

1. A.B.C. Alternate-daily. Single "V" cut on half the circumference.

Each plot consists of 375 trees sub-divided into three sections A, B, and C, of 125 trees each. During the first three months sections A and B were tapped alternate-daily and section C was rested. During the second three months sections B and C were tapped and section A was rested. During the third period of three months sections A and C were tapped and section B was rested. The areas to be rested will succeed each other in rotation in the above order until the experiment is concluded.

2. This system is the same as number 1 except that the periods of tapping and rest will be for ten and five months instead of six and three months.

3. This is the same as number 1 except that the periods of tapping and rest have been fixed at fourteen and seven months.

4. The "Sunderland" system. Two-cuts third-daily A.B.

The trees are tapped on two half-circumference "V" cuts on opposite sides of the tree on every third day. Each plot consists of 300 trees sub-divided into two sections A and B of 150 trees each. During the first three months section A was tapped and section B was rested. During the second three months section B was tapped and section A was rested.

The sections in tapping and resting will alternate every three months until the conclusion of the experiment.

5. The same tapping system as number 4 but the periods of rest and tapping are five months instead of three months.

6. Also the same as number 4 but the period of tapping and resting are seven months instead of three months.

7. The "Double-four" system. *Two-cuts fourth-daily without* rest.

The trees are tapped every fourth day on two half-circumference "V" cuts on opposite sides of the tree. Unless compelled by an excessive bark consumption it is not intended to allow any period of rest. Each plot consists of 600 trees sub-divided into four sections A, B, C and D of 150 trees. One section is tapped each day in rotation.

8. Control. Alternate-daily. Each plot consists of 250 trees tapped on alternate days on a single half-circumference "V" cut. No long period of rest is given.

The tapping systems used in this experiment are summarised in Table I.

TABLE I

Summary of Tapping Systems under Test

Plot No.	Tapping Systems	No. of Trees in plot	No. of Trees in task
1	A.B.C. 6 months tapping 3 months rest	375	250
2	„ 10 „ „ 5 „ „	375	250
3	„ 14 „ „ 7 „ „	375	250
4	Two cuts third-daily 3 months rest & tapping	300	150
5	„ „ 5 „ „	300	150
6	„ „ 7 „ „	300	150
7	Two cuts fourth-daily	600	150
8	Alternate-daily	250	250
	Total	2.875	

Task Size

On this estate it has been found by experience that with Tamil tappers a task of 250 trees is the most suitable size. This size has been adopted in the single-cut tasks, namely in plots 1, 2, 3, and 8.

Since it is intended as nearly as possible to complete the tapping of the double-cut tasks at the same time as the single-cut tasks, a task size of 150 trees has been chosen for plots 4, 5, 6 and 7.

The Lay-out of the Experiment

A plan of the experiment showing the position of the blocks and plots is shown in Figure 1.

The experimental area contains 17,250 trees divided into six blocks (I to VI in Figure 1) of 2875 trees. Each block is divided into eight plots (1 to 8 in Figure 1). One of the tapping systems described is allotted to each plot. The order in which the plots occur in the blocks was taken at random.

The Experimental Material

The area on which the experiment is set up consists of approximately 245 acres planted in 1911 at a planting distance of 18 feet by 14 feet. At the commencement of the experiment the stand was a little less than 70 trees to the acre. The soil is quartzite and the land undulating and broken up by deep ravines the bottoms of which are not planted. The experimental area comprises fields 1, 2 and part of 4; The previous tapping history of each field is shown in Table II.

Previous Yields

The yields in lb. per acre per annum for each field for the three years prior to the commencement of the experiment are given in Table III. The yields in the year 1932 to 1933 are estimated from eleven months' tapping in fields 1 and 2 and nine months' tapping in field 4.

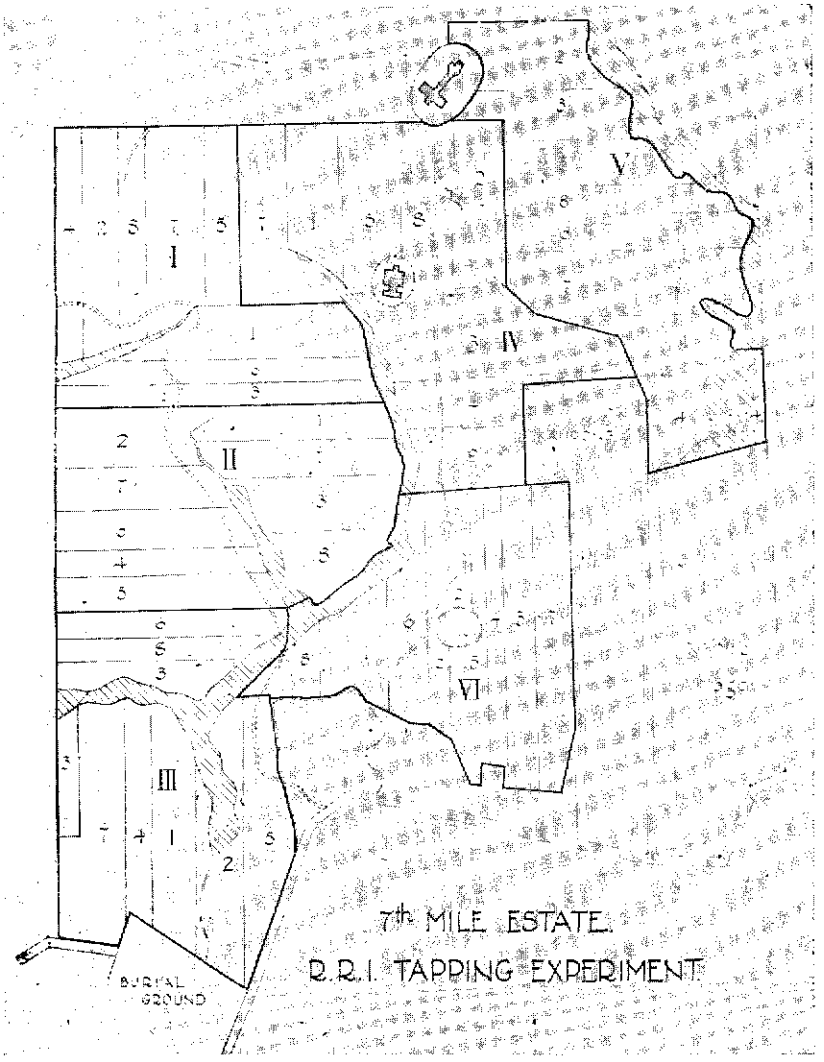

I
II
III
IV
V
VI
BURIAL GROUND
7th MILE ESTATE.
R.R.I. TAPPING EXPERIMENT.

TABLE II

Previous tapping History of the Experimental Area

Field 1 73½ ac. Planted Dec. 1911			Field 2 164 ac. Planted Nov. 1911			Field 4 (Part) 7½ ac. Planted Nov. 1911		
Panel	Height of cut in	Date of opening Panel: Tapping System	Panel	Height of cut in.	Date of opening Panel: Tapping System	Panel	Height of cut in	Date of opening Panel: Tapping System
1	18	15.10.15 Daily on 1/3	1	18	15.10.15 Daily on 1/3	1	18	1.1.16 Daily on 1/3
2	21	15.10.16 Daily on 1/3	2	21	15.11.16 Daily on 1/3	2	21	1 2.17 Daily on 1/3
3	24	15.12.17 Daily on 1/3	3	27	15.1.18 Daily on 1/3	3	27	1.4.18 Daily on 1/3
1	36	1.7.19 Daily on 1/3	1	36	1.8.19 Daily on 1/3	1	36	1.10 19 Daily on 1/3
1	18	1.7 20 A. D. on 1/3	1	18	1. 8 20 A. D on 1/3	1	18	1.10.20 A D. 1, 3
2	38	1 2.22 A.D. on 1/3	2	38	1.12.21 A. D on 1/3	2	36	1 10.22 A. D. on 1/3
		Rested 1.10.27—1.5 28			Rested 1 9.27—1.10.28	A	42	1 5.27 A. D. on ½ Rested 1.8.27—31.7 28
A	42	1.5 28 A D. on ½	A	42	1.10 28 A. D. on ½		40	1 8.28 A. D on ½ Rested 1.4.33—31.5 33

NOTE:—Panel A consists of panel 3 and half of panel 1.

On 31st May 1933 the cuts in fields 1 and 4 had reached ground level and in field 2 the cut was about 4 inches from ground level

TABLE III

Previous Yields of the Experimental Area

Pounds per acre per annum

	1930—1931	1931—1932	1932—1933	Mean
Field 1	810	879	907	865
2	767	818	844	810
4	855	896	848	866
			Mean yield of whole area	848

METHOD OF RECORDING YIELDS

The latex from each task is brought into the factory and weighed to the nearest half ounce. The contents of the buckets of each tapper are mixed and a sample of about 25 grams is removed with a dipper. This is weighed to the nearest tenth of a gram and coagulated in a glass Petri dish by the addition of 10 c.c. of 5 per cent acetic acid. The coagulum is rolled out into a thin sheet, washed, and dried in the smoke house for twenty four hours and then weighed. The percentage dry rubber content is calculated, and from this and the total weight of latex the total weight of dry rubber from each task in tapping is estimated.

The scrap from each task is weighed separately when brought in. It has been found that the wet scrap from the single-cut tasks contains about 20 per cent of water and from the double-cut tasks about 30 per cent of water. The dry weight of the scrap is estimated on the basis of these figures.

The amount of lump is small and is not taken into consideration.

TAPPERS

The tappers employed in this experiment are Tamil men. Four tappers are assigned to each block. To eliminate as far as possible variations in skill between the different tappers, those known to be very much above or below the average in skill were not employed in the experiment and the tasks allotted to the tappers chosen were changed after every twenty four tapping days in the manner described below.

Plots tapped in each successive Period of 24 tapping Days by each Tapper

Tapper	1st period	2nd period	3rd period	4th period	5th period
No. 1	1, 2	7	4, 5, 6	3, 8	1, 2
No. 2	3, 8	1, 2	7	4, 5, 6	3, 8
No. 3	4, 5, 6	3, 8	1, 2	7	4, 5, 6
No. 4	7	4, 5, 6	3, 8	1, 2	7

Since each tapper in each group of four will tap in rotation one plot of all tapping systems it is considered unnecessary to change them from one block to another.

HEIGHT OF CUT AND BARK CONSUMPTION

In fixing the opening height of the tapping cut there were two possibilities. It would have been possible either to have varied the height of the tapping cut so that the period allowed for bark renewal would have been the same in each tapping system or to have fixed the height of the cut at the same level in each plot and to have varied the period allowed for renewal. The former system was chosen and the period allowed for renewal has been fixed at ten years.

The experiment has been timed to last for five years by which time a complete panel on half the circumference should be tapped out. In practice it has been found impossible to open the cuts at the required height. To have done so would have necessitated the tapping of renewed bark of less than six years of age. To avoid this all the cuts were raised by six inches so that by the end of five years the cuts on the single-cut system and the lower cuts on the double-cut systems should all reach a point six inches above ground level.

On the single-cut systems a bark consumption of $\frac{3}{4}$ inch per month tapped has been allowed.

On the three Sunderland-system plots a bark consumption of 4 inches per annum on each panel has been estimated. This allows for a shaving of 0.067 inch per tapping to be removed as against 0.05 inch on the single cut. The increased allowance of bark has been permitted to compensate for the greater drying out that is experienced with third-daily tapping compared with the alternate-daily.

In the double-four system $4\frac{1}{2}$ inches per panel or 9 inches per year has been allowed. A further increase in bark consumption to compensate for the long interval between tapping would not be practicable since it would have necessitated either shortening the period of renewal or raising the upper cut to an excessive height.

In addition to the allowances for bark consumed in tapping, an extra $\frac{1}{2}$ inch was added for opening the cuts on virgin bark and $\frac{1}{4}$ inch on renewed bark, an extra $\frac{1}{4}$ inch for re-opening a cut after a period of rest and $2\frac{1}{2}$ inches for the cup.

Details of the initial heights of the tapping cuts are given in Table IV.

TABLE IV

Programme of Bark Consumption and initial Heights of Tapping Cuts

Tapping System		Bark Consumption per year inches	Bark Consumption per five years inches	Allowance for :- Opening inches	Allowance for :- Reopening old panel inches	Allowance for :- Cup inches	Initial height of Tapping Cut inches
1. A.B.C. 3 months		6	30	$\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{2}$	$34\frac{1}{4}$
2. A.B.C. 5 months		6	30	$\frac{1}{4}$	1	$2\frac{1}{2}$	$33\frac{3}{4}$
3. A.B.C. 7 months		6	30	$\frac{1}{4}$	1	$2\frac{1}{2}$	$33\frac{1}{2}$
4. 2 cuts third-daily 3 months	upper	4	20	$\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$45\frac{3}{4}$
		8	40				
	lower	4	20	$\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$25\frac{1}{2}$
5. 2 cuts third-daily 5 months	upper	4	20	$\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{1}{2}$	$44\frac{3}{4}$
		8	40				
	lower	4	20	$\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{2}$	$24\frac{1}{2}$
6. 2 cuts third-daily 7 months	upper	4	20	$\frac{1}{2}$	1	$2\frac{1}{2}$	44
		8	40				
	lower	4	20	$\frac{1}{4}$	1	$2\frac{1}{2}$	$23\frac{3}{4}$
7. Double-four	upper	$4\frac{1}{2}$	$22\frac{1}{2}$	$\frac{1}{2}$	–	$2\frac{1}{2}$	48
		9	45				
	lower	$4\frac{1}{2}$	$22\frac{1}{2}$	$\frac{1}{4}$	–	$2\frac{1}{2}$	$25\frac{1}{4}$
8. Alternate-daily		9	45	$\frac{1}{2}$	–	$2\frac{1}{2}$	48

Note :—To avoid tapping renewed bark of less than six years of age all the cuts were opened at six inches above the heights shown in the right hand column of the above table.

Part II

Results of tapping for the first year

June 1933 — May 1934

The total yields of dry rubber not including scrap, for the first year of the experiment are shown in Table V.

TABLE V

Yields June 1933—May 1934

Total Yield per Plot (lb. dry Rubber) excluding Scrap

Block	Plots and Tapping Systems							
	1	2	3	4	5	6	7	8
	A. B. C. 6-3	A. B. C. 10-5	A. B. C. 14-7	Sunderland 3-3	Sunderland 5-5	Sunderland 7-7	Double-four	Alternate-daily
I	2,524.5	2,669.6	2,240.2	1,690.3	2,037.1	1,821.0	6,095.1	2,245.4
II	2,443.0	2,066.8	2,187.2	1,509.4	1,556.8	1,546.6	5,557.8	2,041.1
III	2,373.1	2,340.5	2,389.0	1,184.4	1,850.1	1,267.4	4,698.5	2,016.7
IV	2,684.5	3,149.6	2,737.9	1,671.5	1,837.1	1,602.9	6,290.0	2,718.8
V	2,857.4	2,522.7	2,664.2	2,016.0	1,587.9	1,633.9	6,400.0	1,978.1
VI	2,262.9	2,003.6	1,808.9	1,432.2	1,511.7	1,472.7	5,028.6	2,399.8
	15,145.4	14,752.8	14,027.4	9,503.8	10,380.7	9,344.5	34,070.0	13,399.9

Grand Total = 120,624.5 lb.

In Table VI the figures from Table V have been recalculated to yield per acre (*70* trees) and the figures for scrap and total weight of dry rubber have been included.

In Table VII the mean yield per acre of first-grade rubber is shewn for each month of the experiment in pounds of dry rubber and as a percentage of the control. In addition, the total yield up to the end of each month is given as a percentage of the control. This last figure is also shown as a graph in Figure 2.

TABLE VI

Yield in lb. per Acre for first Year of tapping of first-grade Rubber, scrap Rubber and total dry Rubber

	Block	Plots and Tapping Systems.							
		1 A. B. C. 6-3	2 A. B. C. 10-5	3 A. B. C. 14-7	4 Sunderland 3-3	5 Sunderland 5-5	6 Sunderland 7-7	7 Double-four	8 Alternate-Daily
First-Grade Rubber	I	471.2	498.3	418.2	394.4	475.3	424.9	711.1	628.7
	II	456.0	385.8	408.3	352.2	363.3	360.9	648.4	571.5
	III	443.0	436.9	446.0	276.4	431.7	295.7	548.2	564.7
	IV	501.1	587.9	511.1	390.0	428.7	374.0	733.8	761.3
	V	533.4	470.9	497.3	470.4	370.5	381.2	746.7	553.9
	VI	422.4	374.0	337.7	334.2	352.7	343.6	586.7	671.9
	Mean	471.2	459.0	436.4	369.6	403.7	363.4	662.5	625.3
	Per cent.	75.4	73.4	69.8	59.1	64.6	58.1	105.9	100.0
Scrap.	Mean	56.2	55.9	52.9	59.9	64.2	64.5	137.6	82.6
	Per cent. of First-grade	11.9	12.2	12.1	16.2	15.9	17.1	20.8	13.2
Total Dry Rubber	Mean	527.4	514.9	489.3	429.5	467.9	427.9	800.1	707.9
	Per cent.	74.5	72.7	69.1	60.7	66.1	60.4	113.0	100.0

General mean = 473.9 lb. first-grade rubber per acre.

TABLE VII

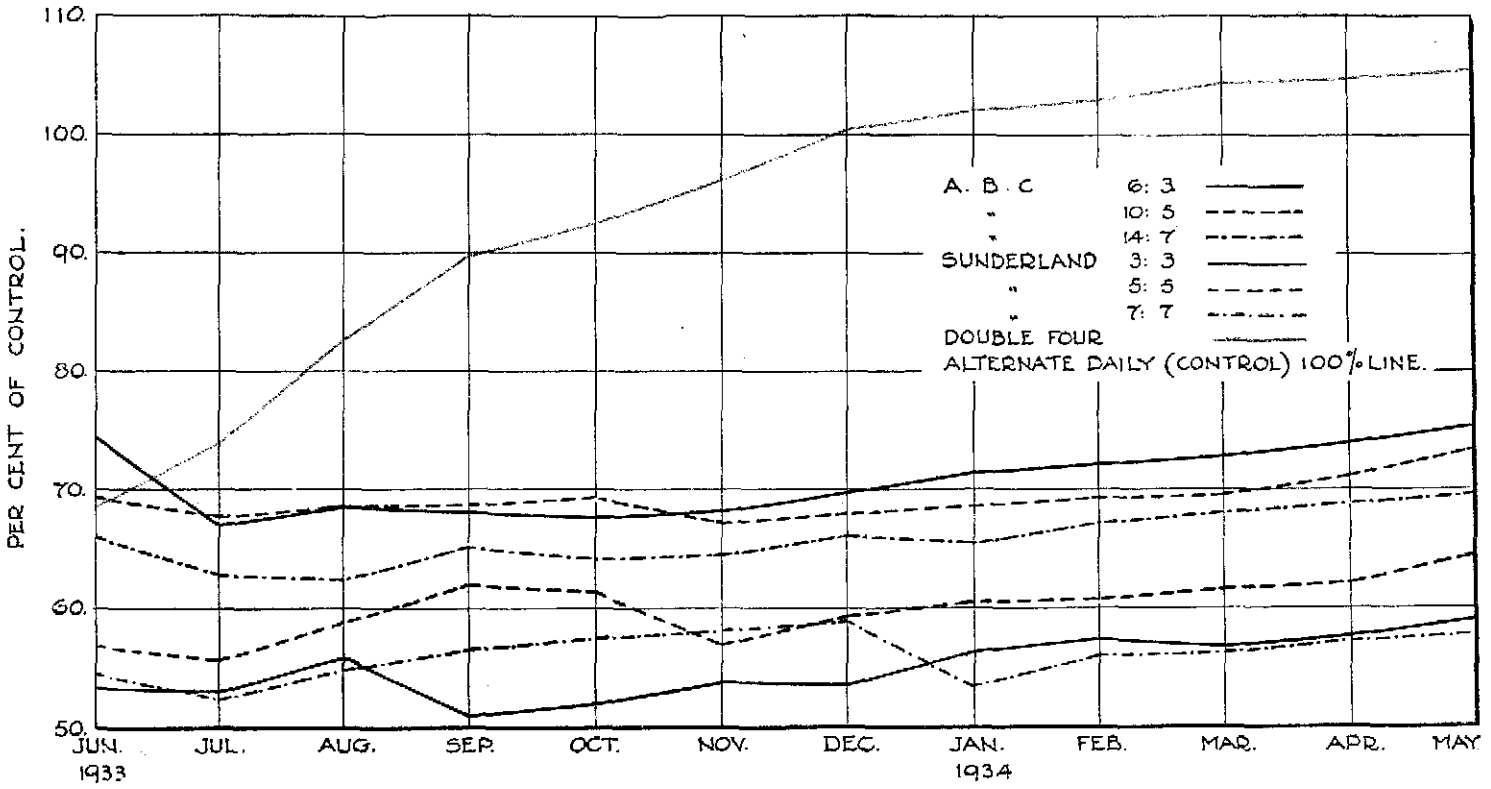
Mean Yield in Pounds per Acre per Month of first-grade Rubber

Plots and Tapping Systems

Month		1 A.B.C. 6-3			2 A.B.C. 10-5			3 A.B.C. 14-7			4 Sunderland 3-3			5 Sunderland 5-5			6 Sunderland 7-7			7 Double-four			8 Alternate-Daily		
		Yield			Yield			Yield			Yield			Yield			Yield			Yield			Yield		
		lb.	per cent	Total per cent	lb.	per cent	Total per cent	lb.	per cent	Total per cent	lb.	per cent	Total per cent	lb.	per cent	Total per cent	lb.	per cent	Total per cent	lb.	per cent	Total per cent	lb.	per cent	Total per cent
June	1933	30.5	74.7	74.7	28.4	69.6	69.6	26.9	66.0	66.0	21.6	53.0	53.0	23.2	56.8	56.8	22.2	54.3	54.3	28.0	68.5	68.5	40.8	100	100
July	...	31.9	61.3	67.2	34.8	66.9	67.9	31.4	60.4	62.9	27.1	52.1	52.5	28.0	53.9	55.1	26.2	50.4	52.1	40.7	78.3	74.0	52.0	100	100
August	...	41.8	71.4	68.8	41.1	70.2	68.8	36.0	61.5	62.3	35.3	60.3	55.5	37.8	64.6	58.8	34.4	58.8	54.7	56.3	96.3	82.6	58.5	100	100
September	...	35.5	66.6	68.3	36.9	69.2	68.9	39.0	73.2	65.2	19.3	36.2	50.5	37.1	69.6	61.6	32.6	61.2	56.4	59.1	110.9	90.0	53.3	100	100
October	...	39.2	65.9	67.7	42.1	70.8	69.3	36.0	60.5	64.1	33.0	55.5	51.7	35.3	59.3	61.1	36.3	61.0	57.4	61.0	102.5	92.8	59.5	100	100
November	...	40.7	71.5	68.4	33.4	58.6	67.4	38.1	66.8	64.5	35.2	61.7	53.4	21.4	37.5	56.9	34.7	60.9	58.0	64.5	113.2	96.4	57.0	100	100
December	...	41.8	78.4	69.8	38.8	72.8	68.1	40.1	75.2	66.1	27.3	51.2	53.1	38.9	73.0	59.2	34.3	64.4	58.9	67.6	126.9	100.7	53.3	100	100
January	1934	40.5	81.8	71.2	36.8	74.3	68.9	30.8	62.2	65.6	39.2	79.2	56.1	34.3	69.3	60.4	14.1	28.5	53.4	56.1	113.3	102.2	49.5	100	100
February	...	42.3	78.9	72.1	39.1	72.9	69.3	42.4	79.1	67.1	36.0	67.2	57.4	33.6	62.7	60.6	32.2	60.1	56.0	60.6	113.1	103.4	53.6	100	100
March	...	36.5	79.7	72.7	33.3	72.7	69.6	36.7	80.1	68.3	24.2	52.8	57.0	32.7	71.5	61.6	27.5	60.0	56.3	53.9	117.7	104.6	45.8	100	100
April	...	43.8	87.4	74.0	43.2	86.2	71.0	38.0	75.9	68.9	34.0	67.8	57.9	34.6	69.1	62.2	34.6	69.1	57.4	54.7	109.1	105.0	50.1	100	100
May	...	46.7	90.0	75.4	51.0	98.3	73.4	41.0	79.0	69.8	37.4	72.1	59.1	46.8	90.2	64.6	34.3	66.1	58.1	60.0	115.6	105.9	51.9	100	100

NOTE:—The thick horizontal lines indicate the point at which a rested section is brought into tapping and a tapped section taken into rest.

Fig. 2. TOTAL YIELD AS PERCENTAGE OF CONTROL.



That the differences in yield are caused chiefly by differences in tapping system is shown by the Analysis of Variance in Table VIII.

TABLE VIII

Analysis of Variance. First-grade Rubber

	Degrees of Freedom	Sums of Squares	Mean Squares
Tapping Systems ...	7	528865.2	75552.2
Blocks	5	84077.6	16815.5
Error	35	79332.4	2266.6

The mean square due to tapping systems is very much greater than that due to error and the experiment is therefore fully significant.

The standard error of the mean of six plots is equal to 19.4 lb. or 4.1 per cent of the general mean of 473.9 lb. per acre. Taking

TABLE IX

Yield per Tapper and Comparative Cost of Tapping

Tapping System	Yield per Tapper per tapping			Comparative cost per lb.		Comparative Yield per acre	
	First grade rubber lb.	crap rubber lb.	Total dry rubber lb.	First grade rubber per cent	Total dry rubber per cent	First grade rubber per cent	Total dry rubber per cent
1	14.7	1.7	16.4	87.8	88.8	75.4	74.5
2	14.2	1.7	15.9	90.8	91.6	73.4	72.7
3	13.6	1.6	15.2	94.9	95.9	69.8	69.1
4	14.0	2.3	16.3	92.1	90.4	59.1	60.7
5	15.0	2.4	17.4	86.0	84.5	64.6	66.1
6	13.5	2.4	15.9	95.6	92.8	58.1	60.4
7	16.5	3.4	19.9	78.2	74.7	105.9	113.0
8	12.9	1.7	14.6	100.0	100.0	100.0	100.0

twice the standard error of the difference between two means as a test of significance, differences in the yields of the tapping systems under test of less than 11.6 per cent or 55 lb. must be regarded as being possibly due to chance and not to the tapping system employed.

Yield per Tapper and Cost of Tapping

The yield per tapper per tapping and the cost of tapping are shown in Table IX.

Since it would be misleading if no notice were taken, in calculating the cost per lb. of tapping, of the difference in value between first-grade rubber and scrap, the total weight of dry rubber is assumed to be the weight of first-grade rubber plus three-quarters of the weight of the scrap, and the comparative cost of harvesting the total dry rubber is calculated from this figure.

TABLE X

Mean Dry Rubber Content

Month		Tapping Systems							
		1	2	3	4	5	6	7	8
June	1933	43.5	43.7	43.2	43.9	42.6	43.7	44.1	44.0
July	...	41.8	42.3	42.3	43.6	42.6	43.2	45.5	43.7
August	...	41.8	40.5	40.8	41.4	41.9	42.3	43.1	41.7
September	...	42.7	40.2	39.7	47.4	40.3	41.1	42.1	41.4
October	...	40.4	39.4	38.9	43.9	39.9	39.6	42.1	41.0
November	...	40.3	42.1	39.7	42.3	48.7	40.4	41.2	41.4
December	...	42.8	40.8	39.9	46.0	43.2	37.7	40.4	40.8
January	1934	41.5	40.8	41.8	42.3	41.9	46.0	41.3	40.8
February	...	40.9	40.8	40.7	41.9	41.8	45.4	41.8	42.1
March	...	40.3	40.0	39.7	42.1	40.1	41.0	39.7	41.0
April	...	39.5	41.5	38.0	39.6	45.2	39.7	38.5	38.9
May	...	38.4	38.8	37.3	39.1	39.5	38.9	39.3	39.5

The horizontal lines show the points at which tapped and rested sections were changed over

For convenience of reference the figures from Table VI for the comparative yields of first-grade rubber and total dry rubber are included in Table IX.

The mean dry rubber content in each month is shown in Table X.

Discussion

A.B.C. Tapping; Plots 1, 2 and 3

The largest difference in yield, amounting to 34.8 lb. of first-grade rubber, is between plots 1 and 3. This difference is only slightly larger than the standard error and cannot be regarded as statistically significant. It may be concluded from this that if there is any difference in yield as a result of varying the period of tapping and rest it has not shown itself with certainty by the end of the first year. The loss in crop compared with the control amounts to 19 per cent for the whole year, but that the benefit of the rest is having a satisfactory effect is shown by the fact that the mean loss in yield in the twelfth month amounts to only 11 per cent (Table VII).

Sunderland System; Plots 4, 5 and 6

Although there are the same number of half-circumference cuts per annum in the A.B.C. plots and in the Sunderland plots, the yield of the latter is consistently lower than that of the former and there is no corresponding saving in tapping costs; at the end of the first year the Sunderland system has shown itself to be definitely inferior to A.B.C. tapping on this type of rubber.

Double-four System; Plot 7

At the end of the first year double-four plots have shown an increase in yield of 5.9 per cent and a saving in tapping costs of 21.8 per cent, or 13 per cent and 25.3 per cent if scrap is included in the total yield. On the other hand it must be pointed out that the double-four has had an advantage over the control in that the mean height of the two cuts was lower than the height of the single cut of the control plots. By the time the experiment is concluded this advantage will have been eliminated but from the data provided in Table IV it can be calculated that the mean heights of the two cuts of the double-four plots and the single-cuts of the control plots were 40 and 49 inches respectively during the first year. From Grantham's (3) data as published by Ashplant it can be determined that the yields at 40 and 49 inches would be in the proportion of 109 to 100. The actual yield of the double-four

plots has been found to be equal to 105.9 per cent, or 113 per cent if scrap is included, of the yield of the control, a very close agreement with the theoretical figure.

Summary

A description of the tapping experiment on mature rubber on Seventh Mile Estate designed to compare eight different tapping systems and the results of the first year of tapping are presented.

This experiment is to last for at least five years and in summarising below the inferences to be drawn from the first year's results the possibility that they will have to be modified later must not be disregarded.

(i) The A.B.C. tapping systems show a loss of 28 per cent of crop and a saving of 8 per cent in tapping costs

(ii) The Sunderland system shows a loss of 38 per cent and a saving in tapping costs of 11 per cent

(iii) The double-four system shows no loss in crop but a saving in tapping costs of 25 per cent

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