REPLANTING AND REJUVENATION OF OLD RUBBER*

R. A. TAYLOR, B.Sc.,
PHYSIOLOGICAL BOTANIST,
RUBBER RESEARCH SCHEME (CEYLON)

UNTIL very recently a crop of 500 lb. of rubber per acre was looked on as very satisfactory even in the best rubber districts of Ceylon where probably the highest average yields obtained in the East are still registered. The fact that even the first fruits of experiments in the raising of high-yielding strains have shown that this yield can with practical certainty be doubled if not trebled clearly proves that the rubber plantation industry was started in a hurry with no thought to the quality of the material employed. Seeds were bought by the thousand because they were Para rubber seeds and the result is that we have large areas of mediocre trees. There is little to wonder at when we see signs of uneasiness among owners and hear questions raised about the possibility of replacing their poor trees with more productive varieties.

With the present depression in the industry efforts have had to be made to reduce the costs of production to a minimum and in many cases estates are still working at a considerable loss. Whether the present prices for rubber are likely to improve to any very great extent I am unable to say but it is unlikely that they will ever reach the phenomenal heights that they have attained on occasions in the past. The only way in which costs of production can, in most cases, be reduced still further is by obtaining an enhanced yield. This is practically impossible, economically, on older estates which are yielding 300 to 400 lb. per acre and it is not difficult to forecast that such properties will be unable to keep their heads above water when the area under budded and selected rubber is increased so that it amounts to a significant proportion of the world's total.

It would appear that the higher-yielding estates, by dint of extra manuring and special effort to increase their yields to a maximum, will be able to carry on at a profit for some considerable time but that neglect of agricultural works in time of depression may put them in much the same category as the poorer estates. The latter in my opinion will be forced to replant or abandon, if not now, at least within measurable time.

* Read by T. E. H. O'Brien, M.Sc., A.I.C., Chemist, Rubber Research Scheme (Ceylon).

Such properties would, I think, be well advised to experiment with replanting. There is no need to undertake extensive schemes at the outset, as in all probability still better planting material than at present available will be on the market shortly, but it seems wise to make a start now before reserve funds are still further depleted by trying to bolster up out-of-date properties.

In view of the present excess of supply over demand the question as to what is to be done with this extra rubber is only natural. I am not competent to deal with this but it would appear that many new outlets would be exploited if producers could supply rubber profitably at a low figure. Roadmaking is a case in point. I feel sure that the difficulties attending the laying of rubber roadways would soon be surmounted if rubber could be obtained for a number of years at a price at which it could compete with other materials. This argument merely supports the statement that many estates will have to increase their production or close down. Dividends will be the perquisite of properties which can reduce their costs of production so that they can sell at a profit at prices approaching the present selling price of the commodity.

THE TERMS "REJUVENATION" AND "REPLANTING"

Attempts to improve the productivity of old rubber areas may be made in two ways. Either the land may be completely cleared and replanted, or a percentage of the best trees may be left and the vacancies created by the removal of the poor trees supplied with young high-yielding stock. The former is generally termed replanting and the latter rejuvenation.

REJUVENATION

Rejuvenation it is thought will be applicable only in special cases. The retention of even a small percentage of the best trees introduces an element of competition for light and ground space and the young supplies consequently suffer. As however the system is attractive in respect of the fact that the land is never completely out of production, a few comments may not be amiss.

Young rubber raised from proved budded stock has yielded as much as 10 lb. a tree in its first year of tapping and there is no reason to suspect that this yield will not be augmented as years go on and the trees increase in size. For this reason it will be uneconomical to leave permanently any tree yielding less than this amount. This is the lowest limit which should be considered and it will be preferable to leave no tree which does not reach "mother tree standard" that is, which does not yield at least five times the average yield of the trees in the field.

Considerations of shading must also be taken into account and not more than 10% of the previous stand should be allowed to remain. It is thought that if this maximum is exceeded disappointment will result. A greater stand will interfere with planting operations, with subsequent cultivation in the early years, and with the growth of the young plants.

It may be possible or desirable in some cases temporarily to leave the best 25% of the old trees to help to cover the costs of replanting. Such a stand can be expected to give 50 to 60% of the previous yield at a cheaper rate of tapping, but it is estimated that two years will be the maximum length of time that this will prove satisfactory. The danger of damage to the young plants during the subsequent felling increases greatly after this. In such a scheme I consider it advisable to plant up the full stand of young rubber as far as possible at the beginning so as to avoid the necessity of extensive supplying when the old trees are removed.

REPLANTING

The concluding part of the last section really belongs to this as none of the original trees are eventually left. Wherever possible a clean sweep at once or at a very early date is considered preferable. The young areas are given every chance to put on uniform growth. An uninterrupted contour system can be laid down and generally the work is simplified. The retention of known mother trees is naturally desirable no matter whether a clean sweep is being made or not. These are usually so few in number that they will interfere with none of the operations.

OVERTAPPING PRIOR TO REMOVAL

The desirability of realising as much as possible of the capital invested in the old trees need not be stressed. Some form of heavy tapping should be employed but reliable data on suitable methods are scanty. One thing which recent experiment has shown, however, is that, if it is desired to keep up such tapping for a year, or two, the system must not be too drastic. Tapping to the wood is undesirable except probably during the three months immediately preceding removal.

The following scheme has been tentatively suggested in an article in the April number of *The Tropical Agriculturist*, 1930:

Open the normal cut on each side of the tree and tap both on alternate days to the normal depth and with normal standard of tapping. Such tapping should avoid the bottom 9 inches or foot of the panel so that this may be available for use the year before removal. Tapping of this description can probably be kept up several years if bark is available.

The year before removal both cuts should be put down to the base of the tree so that the lower end in each case is about 9 inches above ground level. Tapping here is continued in the same way except that during the final three months tapping may be carried out to the wood and subsidiary cuts put in wherever bark exists which can be profitably exploited.

It is thought that the yield from the earlier year or years of heavy tapping may raise the normal production by 50% and the final year by 100 to 150%. These figures are merely estimates in the *real* sense of the word.

Where rejuvenation is favoured the trees to be retained will naturally be tapped in the normal way, one half cut on alternate days, and in the early stages the same will hold good where a larger percentage is being left as a temporary means of revenue. Overtapping of these latter will later follow the same lines as suggested for the generality.

Tables have been prepared showing estimates of expectation of crop during the period of replanting, including heavy tapping, and the earlier years of production of the young budgrafts. These can be inspected.

TAPPERS' TASKS DURING OVERTAPPING

The size of tappers' tasks will have to be reduced during overtapping and, to what extent, will have to be decided by trial and by a study of the economics of the situation. There are two factors here which are antagonistic: (a) if small tasks are given, say 110 trees, costs of tapping will probably be much as before; (b) with larger tasks, say 150 trees or more, the costs of tapping can be made lower but the yield will be less owing to the later tapping of a large number of the trees. In the present state of the market it is possible that smaller yields at a lower cost will be more profitable.

REMOVAL OF TREES

There is no reason why, during the period of heavy tapping, any completely useless trees should not be removed. If required for firewood the timber can be kept fresh by cutting the roots on one side, pushing the tree over and leaving one of the large roots unsevered. The severed roots can be removed gradually. The extra space may benefit the remaining trees and at least the extra light will help in the establishment of a heavier ground cover. When the final clearing is undertaken the trees will have to be removed fairly completely, root and all. It is unnecessary to finecomb the ground for rootlets unless *Fomes* is known to be present but at least all large roots must be taken up. The cost of this work will vary with circumstances but it is thought that an average of Re. 1-50 a tree should be about the maximum spent.

It has been said that to do the job thoroughly would cost about Rs. 4-50 a tree, but is it likely that the extra Rs. 3-00 spent as a safeguard against the possibility of root disease in the future will be economic ? This amounts to Rs. 300-00 per acre and *Fomes* or other outbreak will have to assume unheard-of proportions to necessitate the spending of this amount per acre on eradication during the ensuing decade.

Regarding the method of removal there are no doubt many present who are better informed than I am but it is probable that elephants or monkey grubbers will prove economic. The final removal of roots will in either case have to be done by coolies.

DISPOSAL OF TIMBER

It may be possible in certain circumstances to sell a proportion of the timber as firewood and, in fact, the possibility in specially favoured cases of selling the trees to a firewood contractor before they are felled should not be overlooked.

It has been suggested that the timber could be converted into charcoal and stored in that form as fuel for suction gas engines.

Apart from the above there is little to suggest but burning. When recourse is had to burning, however, it should be localised so as not to deplete the soil still further of organic matter. Burning over previously cut trenches or holes is recommended.

The possibility of converting wood into synthetic farmyard manure has been suggested but as no information is available as to the feasibility of this method of disposal no suggestions can be made. Furthermore the cost is likely to be high.

RENOVATION OF OLD SOILS

The question has many times been asked whether these old washed-out soils can support a further crop. In their present state I do not think so, at least satisfactorily, but there is no reason why, with care, they should not be brought back to a satisfactory condition of fertility. It is common knowledge that our Ceylon soils and probably all tropical plantation soils lack nitrogen and, even more so, organic matter. In the past many estates, as well as neglecting selection of the material to be planted, made no effort to employ careful planting methods. Stumps were put in with alavangoes and no precautions were taken to retain the original fertility of the soil. The resulting trees are smaller than they might have been and yields are lower in consequence.

Nitrogen, phosphates and potash, the active constituents of manure mixtures, can be supplied to the soil fairly cheaply nowadays but it is expensive to purchase all the organic matter

required from the manure merchant. When the old rubber is removed every possible source of potential humus must be exploited. Trees felled just after they have put on their new head of foliage will supply two lots of leaf, one on the ground and the other which can be removed from the felled trees while it is still green and in a form in which it can readily be incorporated in the soil. Large quantities of plant material should not however be dug in alone unless it is known to be fairly rich in nitrogen content. A nitrogenous manure such as calcium cyanamide or mixtures containing cyanamide should be added at the same time. The soil organisms which are responsible for the breaking down of this material make use of quantities of nitrogen-containing compounds and if this amount is not added with the green matter it must be supplied by the soil. The quantity of nitrogen thus abstracted is locked up in the bodies of these organisms during their life and is not available for plant food, and this may even suggest in some cases that the addition of green matter is detrimental. Only on their death is the store released. It is however not desirable that the numbers of these beneficial bacteria should be allowed to decrease; an increase should be aimed at, since without their presence soils become poor. They are found in their greatest numbers in soils which are said to be in good tilth.

In jungle the soil, fauna, and flora are extensive and humus is plentiful. One finds earthworms and other creatures which are almost completely absent from estate soils. Humus consists very largely of broken down plant roots and other plant debris which has been carried underground by the agency of such animals as earthworms. Unfortunately a very large proportion of these beneficial organisms are destroyed when a clearing is fired and their increase should be studied later by bringing about the right conditions for their existence. Soils which are plentifully supplied with the right organisms require little cultivation, they open up the soil in a more efficient manner than the average forking Aeration is permitted and, as plant roots breathe as well as the above ground portions, growth of plants is encouraged. For their continued existence and multiplication a sufficiency of plant residues is essential and this is most economically provided by growing, pruning, and burying large masses of green manure on the land.

The terms green manure and cover crop are frequently considered synonymous. I prefer to apply cover crops to the creeping plants whose main function is to keep the soil in position, although in most cases they also have considerable green manurial value. These will be dealt with in the next section. By green manures are meant the tall growing plants which by their nature can stand several prunings per year and survive to

produce a large bulk of material for burying. Among these are the Tephrosias, Crotalarias, some Desmodiums, Sesbanias, Indigoferas, etc., and it is to my mind desirable on replanted land to have the areas between contours full of these so that they resemble miniature forests. Only in this way will it be possible to obtain the necessary weight of organic matter to bring back the soil to a reasonable fertility.

While it is desirable to have the top foot of soil all over the plantation in a good state of tilth with sufficient humus I would advise, in the case of replanting, the localisation of burying of such material. The rubber is the main crop and burying in pits near the young plants is preferable to distributing the available material all over where most of it will be out of reach of the limited root system. When the trees get older burying will take place further away and gradually all the intervening ground may be brought to a satisfactory state.

There is one way apart from soil considerations in which this burying of green material may benefit crops. As is well known the factors which govern the growth of plants are as follows: sufficient light, sufficient heat, sufficient moisture, and a soil sufficiently rich in nitrogen, phosphates, etc. Another factor is of great importance and that is the amount of carbon dioxide in the air. All the carbon contained in the plants has been taken from the air by the leaves in the form of this gas. It is elaborated by the leaves to form starch, sugars, etc., which in turn are the raw materials with which the plant builds up new tissue, renews bark, replaces latex withdrawn, etc. Rubber itself contains little nitrogen, phosphates or potash; these manurial constituents act largely as tonics to the tree facilitating the building up of carbon containing compounds. Among the factors mentioned above, light, heat and moisture are usually present in excess in the tropics and the nutrient salts of the soil of well-kept estates are sufficient. The limit to further growth is in all probability drawn by the amount of carbon dioxide in the air. Recent experiments in England have shown that an increase in carbon dioxide in the air results in increased growth in the plants studied. There seems little reason why a different result should be experienced with rubber. The decay of organic material in the soil is productive of much carbon dioxide. Actually in the soil this gas may have an effect similar to yeast in breadmaking, puffing it out to a certain extent and making it friable. Much of it however escapes to the air and is available for further use. The more material buried therefore the more gas liberated and the reason for the luxuriant growth in jungles could probably be found in the same factor.

The burying of green manures has been dealt with at some length as I am firmly convinced that only by extensive use of this method will many of our older estates be able to grow another crop. A cover of vigna is not sufficient; material in large quantities will have to be buried.

RE-OPENING OF THE LAND: PREVENTION OF EROSION, ETC.

An opportunity such as this should be taken to do away with the old fields of varying size. The whole area should be divided up into uniformly sized blocks of as far as possible uniform shape. This is for convenience in future running. Manuring programmes, cultivation, etc., can be much more easily arranged and the land is divided up into blocks which would lend themselves to experiment should the occasion arise.

On re-opening old land it will obviously be of little use to take a lot of trouble over re-making the soil unless suitable measures are adopted to prevent further loss. Much has been written on the prevention of erosion and I propose to refer only briefly to the various methods. There are two factors which probably contribute more than anything else to soil deterioration, wind and water, the latter usually being considered the more important. The old square or rectangular system of planting with drains sloping at 1 in 40 did nothing to keep the soil in its place. Stone terraces held back the larger particles of sand and gravel but let through much of the finer particles and all the soluble part of the soil. The drains permitted of scouring and conducted a very large proportion of the water off the land. In the light of present knowledge the system has nothing to recommend it. Conservation of water in the soil is an important matter and for this reason as well as from an anti-erosion point of view surface run-off must be reduced or stopped completely.

There are now various well-known ways of preventing loss of soil but I look on contour planting in some form as a first essential where rubber is concerned. I favour the trench system of contour planting advocated by Mr. Denham Till. Here contour trenches 3 ft. by 3 ft. are cut at intervals of 20 to 24 ft. Lining is similar to any other form of contouring and it is preferable to mark off the agreed intervals between the successive contours down the hill at its steepest part. Adjacent contours will then always diverge, never converge. It is considered easier to insert short lengths where the divergence is too great than to break and start at a lower level when they come too close, one is also assured of a number of continuous contours.

During the cutting all the better soil, top soil with cover crops, is thrown uphill. This is used later for refilling purposes. The subsoil excavated is thrown out on the lower side of the trench to form a bund. Plants put in at 12 ft. intervals along such contours will give a stand of 120 to 150 trees per acre. In filling, portions of the trench only need be filled at the outset. Six ft. of trench should be filled for each plant, that is 3 ft. on either side of it. To prevent the refilled portion being washed down gradually into the intervening spaces the soil will have to be sloped so that actually a length of 8 or 9 feet will be filled at the bottom of the trench and gradually tailed off to 6 ft. at the top.

The unfilled portions afford excellent pits for the cheap burying of green manures and act as effective water traps. The green matter buried is exactly in the right place for use by the plant and so is the store of moisture.

The above system has all the erosion-preventing properties of the perhaps better known contour platform system and besides there is no check to growth caused by the roots filling the prepared hole and so becoming "pot bound."

Contour platform planting is probably next best. It is efficient as a prevention of erosion and it is less costly, at least in the first year. It does not however do away with the necessity of digging holes for the plants or pits for burying purposes.

It is thought that one or other of these methods is essential if success in replanting is to be obtained. The former method has to my mind many points to recommend it. The initial higher cost is balanced later by the extra cutting required in the other; the opening work except for burying of manure loppings is completed in one year.

In the event of lack of funds preventing the employment of either method much may be done to prevent soil movement by alteration and extension of the old drainage system. Drains sloping at 1 in 40 or so are best neglected but others with a more gentle slope may be re-cut and supplied with blocks, spills and water traps as has been described in a paper presented at a previous conference. Even here planting should be done on the contour. Generous holes will be required.

In all cases a thick growth of cover crops is essential but probably most essential where no terracing is done.

The wind factor in soil deterioration or this combined with sun must be counteracted. Winds, besides retarding growth of young plants, dry out the surface layer of soil and reduce bacterial activity. Great heat acts in the same way only probably in a more pronounced manner. Both can be controlled by shade, and ground covers of Gliricidias, Albizzias or some such small tree as *Leucaena glauca* will be essential in replanting schemes. Special wind belts may be necessary in certain cases and it may pay to leave temporarily belts of the old rubber augmented by Gliricidias in rows at intervals across the field. Regarding ground covers there is a big selection but where Vigna (*Dolichos hosei*) is already growing this will probably prove best and most easily established. Others are Calopogonium, Pueraria, and Cowpea which do not stand heavy shading and which must be regarded as temporary covers and *Centrosema pubescens* or *Indigofera endecaphylla* which if established in a clearing may persist reasonably well under older rubber.

PLANTING MATERIAL

All plants should be budded and only proved material should be used. A selection of clones may be made from the following, which are probably the most fully tested clones at present available: Tjirandji 1, 8, 16; AVROS. 49, 50, 71, 80, 152, 256; Bodjong Datar 2, 5, 10; Prang Besar 23, 25; SR 9; Cultuurtuin 88; Djasingha 1.

A budwood nursery containing the selected clones will have to be laid down at least 18 months before the first supply of budwood is required, and in such a nursery six budded stumps will be required for each acre to be budded. Establishment of budwood nurseries is discussed in a booklet entitled "The Budding of Rubber" issued by the Rubber Research Scheme. Arrangements will also have to be made about 2 years ahead for seedlings for budding purposes. 300 seedlings should be allowed for each acre to be dealt with to allow of selection of the most vigorous.

LAYOUT OF THE LAND

About two years ago the advice given on planting material was to plant a mixture of budded plants and selected seedlings. More recently estates have been advised to plant budded plants only but to mix the clones. This shows increase in faith in budding but I prefer to go on further and recommend, when proved material only is being used, that different clones be kept strictly separate. It is quite possible and indeed probable that to get the best out of certain clones special mild, or it may be heavy, tapping systems will have to be employed. Where clones

are separate each can be treated on its merits; any admixture renders this impossible. The mixing of clones has been recommended with a view to future thinning out of the poorer trees, but thinning out in the case of budded rubber consists of the complete removal of poor clones. Is it not preferable, if such action is necessary, to have a piece of ground which can be replanted rather than an area which will suffer permanently from a deficient stand of trees per acre ? By the time it has been discovered that a certain clone does not come up to expectation it will be impossible to replace it with better material in a mixed stand. Further if really proved material only is used little if any thinning out will be necessary.

A plan of layout is suggested below which allows of clones being kept separate. If the land is divided up into 10 (or 20) acre fields a certain number of these can be allotted to each clone. In the diagram the fields are shown square but in actual practice the boundary fields will usually be irregular in outline. In such a scheme there would eventually be 10 fields or blocks of each clone all adjacent.

Budding is best done in the nursery where supervision is easy and therefore it will be most convenient to have the budwood nursery and seedling nursery in close proximity to each other.

The planting out of budded plants and the subsequent attention necessary are described in the previously mentioned booklet on "Budding."

AREAS PLANTED UP WITH UNSELECTED MATERIAL DURING 1925 AND 1926

I have been frequently asked whether young rubber 4 or 5 years old grown from unselected seed could be budded satisfactorily or whether it should be cut out and replaced. I am definitely in favour of making an attempt to bud such plants. The number of successes will be fewer but the growth of the plants when successfully budded is so vigorous that to my mind the extra trouble is worth while. Plants budded at this age will reach tappable size one year at least before budded stumps put out at the same time.

In such areas there will no doubt be plants which prove very difficult to bud; these will either have to be left or replaced with budded stumps.

In connection with the budding of such comparatively old plants there are one or two points which might be mentioned. 'Green' budwood has proved preferable to the more mature brown wood. Also the 'snag' left when the stocks are cut back requires more attention. This will have to be carefully cut back to the union of stock and scion as soon as the young budded shoot is 4 to 5 ft. high, in order to reduce as much as possible the "elephant foot." The cuts heal over satisfactorily if protected by a waterproof coating of asphalt or tar.

CONCLUSION

Most points except actual costs have been touched on. A rough estimate, believed to be on the generous side has been drawn up and I propose to read this out item by item. Any information, which anyone present can give, will be welcomed as exact figures are not yet available. Discussion is invited and any questions raised will be answered as far as possible.

TAPPING ARRANGEMENTS DURING HEAVY TAPPING

It is assumed that an area is being replanted on a ten-year basis, one-tenth of the area being cleared each year. The unit of yield represents the yield which would be obtained from that area under normal tapping conditions.

Plots	1	2	3	4	5	6	7	8	9	10
1930	x	n	n	n	n	n	n	n	n	n
1931	x	x	n	n	n	n	n	n	n	n
1932	x	x	x	n	n	n	n	n	n	n
1933	≐	x	x	x	n	n	n	n	n	n
1934	0	≐	x	x	x	n	n	n	n	n
1935		0	≐	x	x	x	n	n	n	n
1936			0	≐	x	x	x	n	n	n
1937				0	≐	x	x	x	n	n
1938					0	≐	x	x	x	n
1939						0	≐	x	x	x
1940							0	≐	x	x
1941								0	≐	x
1942									0	≐
1943										0

n=tapped normally.
x=tapped both sides to normal depth.
≐ =final tapping.
0=trees cut out.

EXPECTATION OF CROP UNDER HEAVY TAPPING SUGGESTED

(Previous Yield taken as 300 lb. per acre)

Plot	...	A	B	C	D	E	F	G	H	I	J	Total	
1930	...	450	300	300	300	300	300	300	300	300	300	3150	
1931	...	450	450	300	300	300	300	300	300	300	300	3300	
1932	...	450	450	450	300	300	300	300	300	300	300	3450	
1933	...	750	450	450	450	300	300	300	300	300	300	3900	
1934	...		750	450	450	450	300	300	300	300	300	3600	
1935	...			750	450	450	450	300	300	300	300	3300	
1936	...				750	450	450	450	300	300	300	3000	
1937	...					750	450	450	450	300	300	2700	
1938	...						750	450	450	450	300	2400	
1939	...							750	450	450	450	2100	
1940	...								750	450	450	1650	
1941	...	700								750	450	1900	
1942	...	850	700								750	2300	
1943	...	1000	850	700								2550	39300
1944	...	1000	1000	850	700							3550	
1945	...	1000	1000	1000	850	700						4550	
1946	...	1000	1000	1000	1000	850	700					5550	
1947	...	1000	1000	1000	1000	1000	850	700				6550	
1948	...	1000	1000	1000	1000	1000	1000	850	700			7550	
1949	...	1000	1000	1000	1000	1000	1000	1000	850	700		8550	
1950	...	1000	1000	1000	1000	1000	1000	1000	1000	850	700	9550	
1951	...	1000	1000	1000	1000	1000	1000	1000	1000	1000	850	9850	
1952	...	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10000	105000*

* Yield for the same period without replanting 69,000 lb.

COSTS

Complete removal of trees (including loppings of leafy twigs and stacking any firewood to be burnt (generous)	Rs.	150·00
Trench cutting, 30 chains @ Rs. 5/- (generous)	,,	150·00
Filling and making of Adco	,,	40·00
Cover crops, seed and planting	,,	15·00
Planting	,,	5·00
Weeding @ Rs. 12/- for 3 years	,,	36·00
,, @ ,, 4/- ,, ,, ,, ...	,,	12·00
Lopping green manures first year. ...	,,	4·00
,, ,, ,, subsequent years @ 5/-	,,	25·00
Budding @ -/05 per plant (excluding cost of budwood)	,,	6·25
Nurseries	,,	20·00
Seed @ -/01 each	,,	3·00
Baskets (?)	,,	2·00
Roads remaking	,,	10·00
Manuring 1st year	,,	6·00
,, 2nd ,, ...	,,	10·50
,, 3rd ,, ...	,,	19·50
,, 4th ,, ...	,,	19·50
,, 5th ,, ...	,,	30·00
,, 6th ,, ...	,,	38·00
	Rs.	601·75

A stump-removing wrench should be obtained and the cost distributed among the acres. This is included in the above.

It is presumed that unless the whole of an estate is being replanted there will be no general charges set down against the area in question.

PROBABLE DISTRIBUTION OF COSTS

Block		1	2	3	4	5	6	7	8	9	10	Total
Year.												
1931	1st ...	423·25	—	—	—	—	—	—	—	—	—	423·25
1932	2nd ...	27·50	423·25	—	—	—	—	—	—	—	—	450·75
1933	3rd ...	36·50	27·50	432·25	—	—	—	—	—	—	—	487·25
1934	4th ...	28·50	36·50	27·50	423·25	—	—	—	—	—	—	515·75
1935	5th ...	39·00	28·50	36·50	27·50	423·25	—	—	—	—	—	554·75
1936	6th ...	47·00	39·00	28·50	36·50	27·50	423·25	—	—	—	—	601·75
1937	7th ...	—	47·00	39·00	28·50	36·50	27·50	423·25	—	—	—	601·75
1938	8th ...	—	—	47·00	39·00	28·50	36·50	27·50	423 25	—	—	601·75
1939	9th ...	—	—		47·00	39·00	28·50	36·50	27·50	423·25	—	601·75
1940	10th ...	—	—	—	—	47·00	39·00	28·50	36·50	27·50	423·25	601·75
1941	11th ...	—	—	—	—	—	47·00	39·00	28·50	36·50	27·50	178·50
1942	12th ...	—	—	—	—	—	—	47·00	39·00	28·50	36·50	151·00
1943	13th ...	—	—	—	—	—	—	—	47·00	39·00	28·50	114·50
1944	14th ...	—	—	—	—	—	—	—	—	47·00	39·00	86·00
1945	15th ...	—	—	—	—	—	—	—	—	—	47·00	47·00
											Rs.	6,017·50

This means that assuming that each year's clearing extended to only one acre the total cost of bringing the whole 10 acres into bearing would be Rs. 6,017-50 distributed as above. As mentioned already this estimate is on the generous side.

TIME-TABLE

The one-acre blocks are labelled ABC . . . . J

Year	...	Tapping both sides	Final Tapping	Cut out	Bud-wood nursery	Plant supply nursery	Budding	Plant out
1930	...	A			Plant			
1931	...	AB			Bud	For A		
1932	...	ABC			Bud	,, B		
1933	...	BCD	A			,, C	For A	
1934	...	CDE	B	A		,, D	,, B	A
1935	...	DEF	C	B		,, E	,, C	B
1936	...	EFG	D	C		,, F	,, D	C
1937	...	FGH	E	D		,, G	,, E	D
1938	...	GHI	F	E		,, H	,, F	E
1939	...	HIJ	G	F		,, I	,, G	F
1940	...	IJ	H	G		,, J	,, H	G
1941	...	J	I	H			,, I	H
1942	...		J	I			,, J	I
1943	...			J				J

LAYOUT OF THE LAND

Year Planted (10-year programme)

CLONES	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Tji 1	Tji 1 1930.									
Tji 16	Tji 16 1930.									
AV. 49	AV. 49 1930.									
AV. 50	AV. 50 1930.									
BD. 5	BD. 5 1930.									
BD. 10	BD. 10 1930.									

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 31st OCTOBER, 1930

Province, &c.	Disease	No. of Cases up to Date since Jan. 1st 1930	Fresh Cases	Recoveries	Deaths	Balance Ill	No. Shot
Western	Rinderpest	1151	251	202	760	31	158
	Foot-and-mouth disease	262	...	252	10	...	...
	Anthrax	...	...	...	...	...	...
	Piroplasmosis	...	...	...	...	...	...
	Rabies (Dogs)	...	...	...	...	...	...
Colombo Municipality	Rinderpest	..	...	...	...	...	...
	Foot-and-mouth disease	447	...	434	12	...	1
	Anthrax	28	4	...	28	...	...
	Haemorrhagic Septicaemia	6	...	...	6	...	...
	Black Quarter	2	...	...	2	...	...
	Bovine Tuberculosis	1	...	...	1	...	...
	Rabies (Dogs)	11	...	...	...	...	11
Cattle Quarantine Station	Rinderpest	..	...	...	...	...	...
	Foot-and-mouth disease	...	..	...	...	...	...
	Anthrax	652 *	52	...	652	...	...
Central	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	650	...	648	2	...	...
	Anthrax	1	...	...	1	...	...
	Piroplasmosis	4	...	1	3	...	...
	Rabies (Dogs)	12	1	...	10	...	2
Southern	Rinderpest	295	12	66	225	4	...
	Foot-and-mouth disease	269	...	263	6	...	...
	Anthrax	...	...	...	...	...	...
	Rabies (Dogs)	3	2	...	2	...	1
Northern	Rinderpest	4	...	3	1	...	...
	Foot-and-mouth disease	2975	...	2905	70	...	...
	Anthrax	...	...	...	...	...	...
	Black Quarter	224	...	...	224	...	...
	Rabies (Dogs)	3	...	..	...	...	3
Eastern	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	100	...	98	2	...	...
	Anthrax	...	...	...	...	...	...
North-Western	Rinderpest	5833	760	290	4629	34	880
	Foot-and-mouth disease	135	...	135	...	..	...
	Anthrax	...	...	...	...	...	...
	Pleuro-Pneumonia (in Goats)	50	...	...	50	...	...
North-Central	Rinderpest	763	509	63	594	9	97
	Foot-and-mouth disease	1069	...	1045	24	...	...
	Anthrax	...	...	...	...	...	...
Uva	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	72	...	72	...	...	...
	Anthrax	...	...	...	...	...	...
	Rabies (Dogs)	3	1	...	...	...	3
Sabaragamuwa	Rinderpest	63	...	7	54	...	2
	Foot-and-mouth disease	1455	...	1445	10	...	...
	Anthrax	..	...	...	...	...	...
	Haemorrhagic Septicaemia	65	15	...	65	...	...
	Rabies (Dogs)	14 †	1	...	4	...	10

* 1 case in a buffalo—Rest sheep and goats. † 1 case—a calf.

G. V. S. Office,
Colombo, 10th November, 1930.

G. W. STURGESS,
Government Veterinary Surgeon.

METEOROLOGICAL REPORT

OCTOBER, 1930

Station	Temperature				Humidity		Amount of Cloud	Rainfall		
	Mean Maximum	Difference from Average	Mean Minimum	Difference from Average	Day	Night (from Minimum)		Amount	No. of Rainy Days	Difference from Average
	°	°	°	°	%	%		Inches		Inches
Colombo	84·4	+0·1	73·9	−0·6	82	93	8·8	33·38	26	+20·28
Puttalam	84·6	−1·0	74·0	−0·7	83	95	7·3	13·68	25	+ 4·94
Mannar	86·0	−1·2	76·3	−0·6	79	91	8·7	16·24	16	+ 8·57
Jaffna	83·9	−0·3	75·4	−2·2	84	93	7·2	19·89	20	+10·60
Trincomalee	85·6	−1·8	74·5	+0·8	79	90	6·8	17·25	23	+ 9·01
Batticaloa	85·6	−1·0	74·4	+0·1	75	93	7·0	13·25	22	+ 6·81
Hambantota	85·3	−0·2	74·4	+0·1	80	93	6·0	2·63	18	− 2·10
Galle	82·2	−0·5	74·5	−0·8	86	93	7·0	10·11	21	− 2·90
Ratnapura	86·3	+0·7	72·4	−0·7	82	95	7·5	28·05	26	+ 9·45
A'pura	86·8	−1·8	73·7	+0·1	78	93	8·7	15·46	22	+ 5·95
Kurunegala	85·7	−1·3	72·7	−0·1	78	95	8·3	30·89	26	+15·46
Kandy	82·7	+0·3	68·6	+0·2	78	95	7·7	17·71	26	+ 6·20
Badulla	81·1	−1·5	66·0	+1·2	80	97	6·8	16·92	25	+ 7·37
Diyatalawa	75·5	+0·3	60·6	+0·4	80	91	7·6	15·87	27	+ 6·00
Hakgala	68·5	−1·5	56·5	+1·3	86	88	6·3	27·16	28	+15·23
N'Eliya	67·0	+0·3	52·5	+1·5	86	97	8·5	18·64	27	+ 7·78

The rainfall of October was above average at almost every station in the Island, the excess being most marked in the Ambegamuwa, Watawala, and Matale districts, and along the west coast from Colombo to Chilaw. Besides the above areas, totals for the month that were more than 15 inches above their average were common throughout the Kelani Valley, and in the Northern Province.

The excess was quite definite throughout, but was least marked in the E.P. and S.P., where one or two stations (though not the majority) were below average.

During the first few days of the month there was heavy rain near the coast, and figures included over 10 inches at the Colombo stations on the 3rd, on which day falls of over 5 inches were recorded at Chilaw, Maggona, Angoda and intermediate places. From the 5th to the 21st (and particularly on the 14th) rain occurred in the form of irregularly distributed thunderstorms, but on the morning of the 21st a depression was located with its centre north-east of the Island. The depression moved westward and crossed the Indian coast near Negapatam on the 24th. It caused heavy rain in Ceylon with consequent flooding, and though its worst efforts were on the 21st to 23rd, it continued to give considerable rain up to the 29th, after which the last two days of the month were practically clear. More than fifty stations recorded falls of at least 5 inches in a day during the passage of this depression, the highest figures being 10·3 at Oonoogaloya, 10·2 at Point Pedro, and 10·1 at Chavakachcheri.

One indirect result of the depression was that the accompanying squalls on the west coast were from the west or south-west.

A. J. BAMFORD,
Superintendent, Observatory.