

THE EXPANSION OF CEYLON TEA PRODUCTION THE PROSPECTS FOR REPLANTING AND NEW PLANTING

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Mr. Lamb has just drawn your attention to the fact that, owing to her lack of primary mineral resources, Ceylon must look to the expansion of her existing agricultural industries to support and improve the standard of living of her rapidly growing population. Manufactured tea now accounts for considerably more than 50 per cent. of the value of all exports, a fact which clearly indicates the predominant position held by our industry in the economic life of this country. Predominance in any field carries with it equivalent responsibilities, with the consequence that Ceylon may be expected to place most of her hopes of future prosperity on your shoulders gentlemen. Let us hope your backs are broad enough!

How is this responsibility to be discharged? To this question there would appear to be only one answer—by growing more and still better tea. Given our objective, how are we to set about its achievement? Here there would appear to be several alternatives open to us:—

First to raise the levels of yields given by our existing tea areas. This is largely a matter of correct bush management and manuring, coupled with proper attention to the control of pests and diseases. Much advice has been given by the Institute in this connection and I do not therefore propose to discuss future developments in this direction today. However, I think we may justly claim that the continual increases in crops secured over the past few years are practical proof of the general soundness of our advice.

Secondly by the replanting of wornout and uneconomic tea areas. In an article in the May, 1954 issue of 'World Crops' I pointed out that there was every reason to accept the principle that there was an economic limit to the life of the tea bush. This is largely a consequence of the cumulative effects of damage resulting from pruning and forking operations and of pest and disease attack. This gradual deterioration is naturally accelerated under low-country conditions, with the result that the useful economic life of the bush is much shorter at low elevations. Mr. Walter will be enlarging on this point later on. Anyway once the principle of there being an economic limit to the life of the bush is acknowledged, then the necessity for all estates to accept the idea of periodic replanting or else to maintain a full re-supplying programme becomes self-evident.

Unfortunately not all estates have been able to maintain a satisfactory re-supplying programme in the past. This failure has undoubtedly led to a serious decline in yields and has probably brought many of the poorest fields below the minimum economic yield level. That this lamentable state of affairs does actually exist can, of course, only be fully confirmed by determining the working costs and returns given by each individual field. However, I am not aware that any estates

keep their accounts in this elaborate manner and certainly none of you would bless me if I suggested that they should. Still I think you will all agree that as yields go up the cost of production falls. Assuming the converse to be equally true, this means that, for an estate with fields yielding from say 400 pounds per acre to 1,200 pounds per acre, the cost per pound of the tea produced from the 400 pounds per acre fields will be much higher than the cost per pound of that produced from the 1,200 pounds per acre fields. This being so, it is not unreasonable to suggest that, on the basis of the average sale prices realised for their made teas over, say, the past five years, many of the lowest yielding estate fields have been being worked at a loss.

Such uneconomic fields obviously require replanting with better and higher yielding material, or else they should be thrown out of production and turned over to growing green manures, firewood or any other crop which will give an economic return.

Possibly, with the higher prices for made tea now being realised, some of these previously uneconomic fields are now actually making a profit and you may be tempted to defer any consideration of the necessity for replanting. Such complacency is dangerous, since we have no guarantee that present high prices will continue. Furthermore the return for each rupee spent in working such poor fields must be much less than is obtained from money expended in maintaining your present high yielding fields in good agricultural condition.

Finally we come to *the expansion of the existing tea areas by new planting*. There is almost no suitable land still available for planting in tea up-country, so that it is inevitable that most of the future expansion of our industry will perforce have to take place at lower elevations. Much of this is likely to be in the low-country proper, where there are still large undeveloped tracts of crown land available, and where there is much wornout and uneconomic rubber, which is in urgent need of replanting. I trust I shall not be hurting the feelings of our friends at the Rubber Research Institute by telling you that, judging from the enquiries we are now receiving, many low-country estates are considering the replanting of such areas in tea to be a more attractive proposition than is replanting in rubber.

In what follows, however, I propose merely to discuss more general matters in connection with replanting and new planting, since Mr. Walter will be dealing with the various problems peculiar to the low-country later on.

Now, as you are doubtless aware, replanting or opening new land in tea is today an expensive operation. I do not think that I shall be far wrong if I suggest, that to do the job properly—and I must stress that it is not worth doing it if it is not done properly—may well involve capital expenditure of up to Rs. 5,000/- to Rs. 6,000/- per acre on difficult land. Well, gentlemen, expenditure of this order is a serious matter requiring careful consideration. Obviously before such expenditure can be justified there must be prospects of securing reasonable returns on the capital invested. To ensure this it would appear that yields from the newly planted areas considerably in excess of the present all Ceylon average of between 600 and 700 pounds per acre are essential. To be on the safe side yields of nearly twice this figure, or say, 1,200 pounds per acre or over may well have to be aimed at.

Can this target be attained? On the assumption that correct agricultural methods are employed and that the climatic and soil conditions are suitable for growing tea, I think that the answer lies mainly in the use of intrinsically high yielding, high quality planting material.

At the present time two entirely different types of planting material are available to us. These are plants produced from seed in the ordinary natural way, and clonal plants produced from single node cuttings by the methods of vegetative propagation.

Now I am fully aware that, given the choice, most of you would prefer to plant up with seed rather than to be put to the additional trouble of producing the necessary supplies of rooted V.P. cuttings in your nurseries. But, if we use the seed currently available in this country, can we be reasonably satisfied that the plants produced from it will give us the high yields and good manufacturing quality that we require to make our replanting or new planting an economic success? I am afraid that the answer must be a categorical NO.

The reason for this lies in the very hybrid nature of our tea. Many years ago Dr. C. P. Cohen Stuart, who was then working on selection in Java, wrote—'Ceylon tea is an awful medley of tea hybrids and Ceylon as a seed producing country stands in very bad repute among Java planters'.

Well gentlemen, no scientific breeding work has ever been carried out on Ceylon tea, so that I cannot believe that any improvement in our seed supplies can possibly have occurred since Dr. Cohen Stuart's damning comments were first made.

Anyway, from your own observations, you will be well aware of the vast range of different types of bushes which can be seen in most of our fields. However, you may not be equally well aware that the difference in type between bush and bush is paralleled by as marked a difference in yield. For example on a uniform area, comprising 1,000 bushes, of St. Coombs tea, Tubbs, recording individual bush yields, found a ten-fold range of variation in yield between bushes. Thus a large proportion of the bushes produced from seed turn out to be merely passengers.

What are the prospects of effecting any improvement in the present standard of Ceylon seed? Well gentlemen, I have been in correspondence with Dr. Wight, who is in charge of the selection and breeding work at Tocklai, and who will be addressing you later on this subject, and his opinion is that he cannot see anything practical coming from a breeding programme in less than 20 years. Results expected in 20 years time are, however, of no use to us here today and we are thus forced to look to vegetative propagation to provide us with the high yielding, high quality planting material we need.

In relying on selected vegetatively propagated material to meet our future planting requirements we are in fact only following modern scientific horticultural practice. In this connection I would like to read to you again the words of my old East Malling colleague, R. J. Garner, now one of the foremost authorities on the propagation of horticultural crops, which I quoted in my article dealing with the difficulties of clonal seed production in the last *Tea Quarterly*.

He writes:—

'In an orderly world the unpredictable variability of seedling plants will not much longer be tolerated.' The use of clonal scion varieties is recognised as essential and recent work with fruit tree rootstocks and 'strains' of small fruits and other subjects grown on their own roots has made clear the advantages to be gained by the use of selected varieties propagated vegetatively. In years to come it seems likely that we shall insist on having all our woody and many of our herbaceous plants vegetatively propagated including perhaps forest trees and hedge plants'.

Anyway, its now time that I started to give you some idea of what the T.R.I. has already achieved in the way of providing you with the essential high yielding, high quality, selected V.P. clonal planting material.

At our last Conference I gave you details of the test yields of some of our St. Coombs 1947 series clones during their second year of plucking. I am now able to show you the full yields of these same clones for their first three year cycle in bearing. (Table 1).

Table 1—1947 series St. Coombs Clones—1st Cycle.

Clone No.	CALCULATED YIELDS, LBS/ACRE				Manufacturing quality	Rooting	Resistance to blister blight
	1st Yr.	2nd Yr.	3rd Yr.	Yearly Avg.			
2024	1240	2295	2655	2063	Above average	V. good	Very high
2025	745	1830	2310	1628	Average	Good	High
2023	645	1685	2030	1453	Above average	V. good	Average
2021	810	1500	1800	1370	Above average	Good	High
2022	860	1650	1535	1348	Above average	Good	Very high

You will note that all these clones have given an average yield for their first cycle well above the target figure of 1,200 lbs. per acre I suggested earlier we should aim at. Furthermore their other characteristics such as manufacturing quality, rooting ability and resistance to blister blight are fully up to the standards we are likely to require.

That these high yield levels can not only be maintained but still further increased is shown by the yield figures given by these clones for the first year of their second cycle. (Table 2).

Table 2—1947 series St. Coombs Clones—Yields 2nd Cycle—1st year.

Clone No.	Calculated yields, lbs/acre
2024	3995
2025	3200
2023	2475
2021	2045
2022	2310

Some of these yields, such as those given by clones 2024 and 2025, are so astonishingly high as to require no further comment on my part!

Up till now all the figures given you for the yields of our clonal material have been derived solely from test line pluckings and must therefore be treated with a certain amount of reserve. However, a few years ago approval was given to a policy of pulling out year by year a proportion of the older tea on St. Coombs and replanting with clonal material. Now we have a total of some 13 acres replanted with 13 different clones. Part of this area, planted in May, 1952, has been in bearing since July, 1954 and I am therefore able to give you for the first time today comparative field scale yields, obtained under normal estate conditions, for some representative T.R.I. clones. (Table 3).

Table 3—St. Coombs Clonal Yields—lbs./acre for 1st six months bearing.

Clone No.	Estate scale plantings	Clonal test lines
18	79	173
23	257	355
25	364	372
216	233	140
740	204	149
777	275	206
1114	332	149
1526	485	132
2024	518	446

These yields are for the first six months of plucking only and, for comparison purposes, I have included in the right hand column of the table the yields obtained from our test line pluckings over the equivalent period. You will note that, with the exception of the first three clones in the table, all the others have given higher yields under ordinary field conditions than when they were test plucked. This is most encouraging, since it indicates that, for the early stages of bearing at any rate, our test figures may well be on the conservative side.

Apart from these specific St. Coombs selections, other clones now under test, including many selections from outside estates, appear to be very promising as can be judged from the data for the better clones in our 1948 blister resistant test area. (Table 4).

Table 4—*St. Coombs 1948 Blister Resistant Test Area.*

Clone No.	CALCULATED YIELDS, LBS/ACRE				Rooting	Resistance to blister blight
	1st Yr.	2nd Yr.	3rd Yr.	Yearly Avg.		
S106	1435	2705	3665	2601	Good	Low
KEN 16/3	1700	1800	2490	1997	Average	Average
TK48	1040	1735	2410	1728	Good	Average
KEW 4/A4	940	1815	2390	1715	Good	Very high
D	1050	1535	2230	1605	Good	Very high
KEN 15/2	825	1550	2330	1568	Good	Average
OK4	940	1320	2225	1495	Good	Very high
1526	875	1220	2045	1380	Average	Very high

The highest yielding clone of this series, No. S106, is particularly interesting since it is a low-country selection from Sirikandura Estate. It has actually been planted up on a field scale on Sirikandura and Mr. Walter will be giving you more details of its performance in his talk. You will note that S 106 is the only one of these clones showing below average resistance to blister blight, but fortunately this is of rather less importance under low-country conditions. Otherwise all these clones show generally satisfactory characteristics.

Most of the objections to the wider use of V.P. material appear to be based on the theory that the plants are more difficult both to handle and establish than seedlings. In fact we have frequently had complaints from districts like Uva that it is quite impossible to use V.P. material as the plants cannot survive the drought. This prejudice is, I feel, quite unjustified and is mainly based on the fact that no attempts have been made so far to select for drought resistance. This is a matter which will naturally receive our attention as soon as the projected clonal proving station at Passara is in operation. However, the fact that suitable clonal material can be established without difficulty under Uva conditions is clearly shown by the following information kindly supplied to me by the Superintendent of Gonakelle Group, Mr. Deaker: A new clearing, on old patna land, was planted on the contour at a spacing of 4' x 2' in November, 1952, and brought into bearing in April, 1954. A total of 15 different clones, including T.R.I. Clones Nos. 777, 1114, 1294, 1526 and 2024, were distributed in 46 blocks. Casualties were extremely few and the drought resisting characteristics of the clones planted can be judged from the fact that, out of a total stand of 23,020 plants, only 306 supplies were needed in 1954. Incidentally, referring to clone 2024, Mr. Deaker states that it is outstanding and that its growth and vigour has to be seen to be believed.

There may, however, be marginal areas where, owing to the fact that they carry considerable reserves of food in their cotyledons, seedlings may be easier to establish than properly selected clonal material. In such areas I think it is matter for serious consideration as to whether the climatic conditions are really suitable for planting tea at all. To grow at its best tea requires a minimum of 70 to 80 inches of reasonably well distributed rainfall per annum, and where such conditions do not usually prevail persistent high yields cannot be expected. The suitability or

otherwise of the climatic conditions in the area should, therefore, be fully considered before expending large sums on planting operations.

Apart from our avowed policy of trying to develop proved clonal material suitable for planting under the different conditions prevailing in the up-country, in the low-country and in Uva, we are also trying to simplify and standardize nursery technique. If this can be achieved, then the layout and management of the large nurseries covering several acres which will be required when planting operations are undertaken will be rendered much easier for all concerned.

At the present moment experiments are being carried out with a view to developing a simple standardised type of bed shading. This is particularly important, since, in many areas in which large scale planting operations may be expected to be undertaken, it may well prove impossible to obtain adequate supplies of the naturally occurring bracken fern (*Gleichenia linearis*) now commonly used as nursery shade. One of the most promising alternatives to fern shading would appear to be the use of a light iron framework covered with an open mesh coir fabric. The frames are made as standard half-hoop sections, which are connected together along the length of the bed by a series of light round iron rods, 6 feet long, fitting loosely into slots welded on to the tops of the hoops. The whole framework is thus light and easily moveable, while it can be extended to fit any length of nursery bed by the addition of extra half-hoops and connecting rods. It is of course practically indestructible and capable of being used over and over again. The woven coir fabric is a local product, costing approximately Rs. 2/- per square yard, which can be obtained in a number of different sized meshes. It is thus a relatively simple matter to obtain the correct light intensity to give the best results in any particular locality. Incidentally experience to date tends to indicate that a rather closer weave is required under low-country conditions than is required up-country. Hardening off of the cuttings can of course be accomplished by replacing the initial fairly close weave by a much more open one. Given reasonable care this material should also last for a number of years.

Watering of a large nursery is also a considerable problem and, if carried out by hand, is not only unreliable but wasteful of labour. Accordingly experiments with various types of modern overhead irrigation equipment have been carried out on St. Coombs. Of the systems so far tried out, the B.O.I.L. oscillating line system, manufactured by Messrs. British Overhead Irrigation, Limited, would appear to be easily the most suitable for large scale nursery watering. The equipment comprises a 1½ inches diameter watering line made up from a series of 16 feet 6 inches long light alloy pipes fitted with evenly spaced nozzles, and joined by means of quick release couplings. The line rests loosely on a number of supports and is turned slowly from side to side by means of the oscillator unit, which is worked by the normal water pressure. A rectangular area of 25 to 30 feet deep on either side of the line, and up to 100 yards or so in length, can be uniformly watered in one operation. 100 yards of line will cover about 1/3 acre and the whole installation can be moved into a new position in a few minutes. Depending on the water pressure available, the equivalent of up to one sixth of an inch of rain can be put down in one hour. One unit, which complete with engine driven pump costs about £300 without import duty, should thus be capable of watering several acres of nursery.

Let me conclude by summing up the advantages which the use of properly selected vegetatively propagated clonal material for all new planting purposes would appear to offer over the unselected Ceylon seed currently available. These are:—

- (1) Much higher potential yields.
- (2) Better quality in the made teas.
- (3) More rapid growth and hence a reduction in the time required to bring an area into bearing.
- (4) Resistance to diseases such as blister blight and tolerance to pests such as the meadow cecidworm.
- (5) Complete uniformity among all the plants of any one clone.