SEED SUPPLY IN RELATION TO SUPPLYING AND REPLANTING*

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In agreeing to your Chairman's request for a talk on Replanting and Selection, it appeared to me that the members of the Sabaragamuwa Planters' Association would be particularly interested in the matter of the type of material available for use, for not only are you seed producers, but you are also large consumers of seed. Practically all tea plants are grown from seed, though as I shall mention later, this is not the only method. It behoves us, therefore, to consider the implications involved in the use of seed, and the sources from which the seed is derived.

Variations of two sorts occur between different tea bushes — those due to differences in environment and those due to differences in the inherited character and reaction of the bush to its environment.

In the first class fall all those differences due to external causes such as differences in the fertility of the soil, in its widest sense, and differences in elevation, aspect, shade and so on. You are all well aware that very large differences in the yield and the quality

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of made tea result from differences in fertility of the soil and in the factors associated with elevation respectively. Moreover, not only do these differences occur in the quantity and quality of the crop, but even the very appearance of the leaves on the bush may be altered. Add to such effects as these the fact that the appearance of the bush alters with the length of time that has elapsed since the last pruning, and one might almost marvel that we can recognise the tea bush as such.

Nevertheless, we know that there are certain fundamental combinations of general characters which enable us to distinguish a tea plant from other plants of somewhat similar appearance, and it is upon those combinations that the systems of taxonomic botany were built up. But this constancy of general characters is not found when minuter characters are examined. Just as we are distinguishable from monkeys, but recognisable as individuals, so individual seedling tea bushes, though recognisable as tea and grown under the same conditions, will be found to differ. We thus recognise the existence of differences in character due, not only to varying environments from plant to plant, but also to varying *inherited* constitution between individual plants of tea.

To continue the analogy with human beings, it may be pointed out that geographic races — ill-defined, it is admitted, but still recognisable, occur within the species, just as in human beings. Complication, which in Ceylon has reached an appalling complexity, is due to the fact that the races, differing within themselves, have been allowed to cross until our tea fields represent a sort of minced and reblended league of nations. To add to one's bewilderment, records of the origin of the parents of bushes are almost completely lacking, judging from the almost complete silence which greeted the Institute's repeated request for information on the history and character of existing Ceylon jâts.

It would take too long to attempt to convert anyone now who believes that what was good enough will be good enough. But those of you who wish to improve upon the present situation will realise that it is a matter of urgency that preliminary steps be taken in regard to the sources of seed within the Island.

When we consider the matter, we realise that in the course of the many years that tea has grown in Ceylon no variety has been produced which is recognisable as such. Which of you could name with certainty or even reasonable probability the various so-called "jâts" present in a mixture of seedlings or mature bushes from different sources? Such a situation speaks for itself.

To my mind, the course of improvement should lie along the lines:—

(a) Improving the uniformity of existing bearers;

(b) Starting roughly improved bearer areas;

(c) Replacing these with areas of better and more uniform types as they are produced.

You will note that I do not envisage any finality to tea selection, for I do not believe there will be any in our lifetimes. The race will go to him who keeps on going and who goes fastest, although we must not forget to render a libation to luck — the prime arbiter of selection work.

The partial selection of existing bearers can be done by eye, with a view to eliminating those types which depart markedly from the type it is desired to produce under that jât name. I have heard it suggested that the elimination of 2 per cent or 5 per cent will be sufficient to greatly increase uniformity. Well, I have yet to see bearers which I would agree could be improved as they should be so easily — 20 per cent to 30 per cent would often be nearer the mark.

Such elimination would *not* be regular, but it would increase the average spacing of the bearers, which in Ceylon is often far too close. Bearers should on the average have not less than 100 square feet of soil surface per tree, and with a vigorous jât on good soil, this may well be increased.

When eye selection, and where necessary, additional spacing has been carried out, the second method of testing existing bearers may be applied, namely the progeny test. By this is denoted the comparison of the bearers by a rough test of the character of their progeny. In a self-fertilised plant this test would be of great value, but in tea, which is mainly cross-fertilised, the results will not be so plain. Since, however, we are interested in bearers only from the point of view of the character of their progeny, it is a test well worth applying. It is suggested that, when the bearers have been properly spaced, a small nursery bed is made up in the immediate vicinity of each bearer and a definite number — say 100 — of seeds picked from each bearer planted in the bed adjacent to it. After six months those bearers whose seed have shown markedly bad germination should be eliminated, as the bearer may be partly responsible for complete or partial infertility of its seed. After a year, those bearers giving a large percentage of bad type seedlings, or very variable seedlings, should be removed. A further and final selection may be carried out when the seedlings are about 2 years old.

By this method, the improvement at first effected by eye selection of the bearers will be extended and rendered more marked during the subsequent two to three years, and the final product will be about as good as it is possible to obtain by selection among existing bearers. It will be noted that this method not only provides a partial test of the character of each bearer, but it obviates labelling, etc. All cultivation and manure applied to the beds will benefit both the bearers and the stumps and thus the money is likely to give a direct return in addition.

The difficulty of cross-pollination may be roughly surmounted by eliminating those bearers which throw a large proportion of poorer type seedlings, but not those showing relatively very few.

Having achieved, as far as is possible with existing bearers, the desired increase in uniformity, the question of seed-bearer treatment arises. It was, I believe, on the last occasion I visited this Planters' Association that I was questioned upon the subject of seed-bearer treatment, and so I take this opportunity of dealing with the subject.

Pruning should not be indulged in more than is necessary to space branches and admit a sufficiency of light to ripening fruit. Bearers which persist in running up into "beanpoles" are best cut out, for it is likely that they may be deficient in that character of free branching which is the basis of plucking. Even in high Indian jâts which are relatively even I have noted very marked differences in the "bushiness" of young seed-bearers. If an early yield of seed from young seed-bearers is desired, pruning to produce several leaders may be omitted and the tree allowed to spread from a central stem. The Institute is sometimes consulted on the subject of pruning seed-bearers with a view to increasing vigour or to remedy die-back in the upper portions of the bearers. I am inclined to think that in the majority of cases the condition is due, not to any need for pruning, but to the persistent policy of starvation that some seed-bearer areas appear to have sometimes been subjected to in the fallacious belief that their cropping value was permanently in inverse ratio to their vegetative growth.

The size of the seed, and possibly the number set, will be considerably influenced by the amount of leaf in the immediate vicinity of the individual fruit. What is required are well-spaced flowers, not in superabundance, with a generous amount of leaf to manufacture the store of foodstuffs in the developing cotyledons, which will provide the nourishment of the germinating seedling. Also, it must be remembered that the seed is rich in nitrogen, phosphorus, and potash. To help the Institute in dealing with this

matter, I would here make a request for two sorts of aid. Firstly, freshly fallen seed from bearers that have been heavily manured for several years past, and from bearers that have been little, if at all, manured is required for analysis. Dr. Eden and I will be very grateful for anything you can do to help us in this matter. Secondly, what yields of seed are obtained from seed-bearers at different elevations and in different districts in Ceylon? India appear to obtain between 400 and 800 lbs. per acre, but I have heard of figures higher than this. Information is sought upon this subject and will be gratefully acknowledged.

At the present time, about 80 lbs. of nitrogen, 64 lbs. of phosphoric acid and 40 lbs. of potash are suggested per acre of seed-bearers and in some cases even more may be temporarily desirable. The ratio of 10:8:5 has no magic value, but is at least nearer the mark than some I have seen. In passing, it may be noted that there is no more need for complicated mixtures for seed-bearers than there is in the case of bearing tea. With regard to time of application, there is evidence from other crops that an application just before flower opening may assist the set of fruit. It is, therefore, suggested that the manure be applied in 2 or 3 equal doses during the year, one to be applied with a very shallow forking one month before the period of maximum flower opening. The remainder of the manure will then be applied 6, or 4 and 8 months after, with one normal forking.

The question of grading the size of seed has received little attention in Ceylon — possibly owing to a desire to get as many seeds as possible for one's money. But graded seed has many advantages — large seed may be used for seed-at-stake, for instance, and the smaller for nurseries. And the possibility must not be lost sight of (it is under investigation) that in our present mixed seed-bearers, low jât types may occur more frequently in small seed than in large, owing to the tendency of such types to produce a smaller seed. That, however, has yet to be proved. The Institute is at present making enquiries as to suitable grading meshes, and when they are found, the information will be available to those who desire it.

The following calculation is a very rough one, but is given for the benefit of those of you who are attracted by manifest advantages of having sufficient seed bearers of their own to provide partly or wholly their needs for supplying.

On a basis of 2 per cent supplying, *i.e.*, replacement once in 50 years which under low-country conditions is to say the least of it, conservative. when the bush number is 3,500, an average of 70

vacancies will occur per annum. Having one's own seed-bearers permits of cheap and easy *selection* of the seedlings and, assuming that only the 50 per cent best seedlings are used, and that supplying is 50 per cent permanently successful, 280 seeds per acre per annum will be required. In the absence of exact data about the yield of seed-bearers in Ceylon. the suggested yield of 500 seeds per annum per bearer must be taken with caution, but if this is accepted for well-spaced and well-manured large bearers, it means that at least one bearer for every two acres of bearing tea is required. Giving each bearer 100 square feet, this means that 1/870th of the acreage would be thus utilised — surely not an excessive proportion.

If replanting becomes a major issue in Ceylon, those who possess their own bearers will, I think, congratulate themselves, for they will at least have sufficient seed to maintain their supplying programme cheaply and efficiently, whatever the price of seed should rise to. And if no greater demand for seed does eventuate and things remain as they are, I would still, were I the fortunate owner of an estate, spend a great deal of time and trouble in seeing that I had as the source of seed my own bearers — and no haphazard ones at that. but ones carefully selected at the present stage for uniformity and for yield, and, if possible, later for the quality of their manufactured product.

I may mention here that the latter test — for quality — is likely to be materially assisted by methods of vegetative propagation of individual bushes which have been worked out and are suitable for small-scale work. The possibility of planting of larger areas with clones propagated by cuttings or by seedling grafts is, however, at present still a dream of the future.

I know this question of the quality of the manufactured product will be in your minds, and I will not say more now of selection than that a provisional circular is being prepared which will be sent to those who, knowing that such a task will require a great deal of work are still keenly interested. If after perusal. they are still ready to tackle the job, then we will provide all the help and advice the limitations of time and small staff permit of. Instead I will now outline my views, I claim no more for them, upon quality and yield as regards selection.

I definitely envisage no standing still on selection once the work is started and when I say "select for uniformity and yield" it is but the first step on attempting to combine yield and a good character of made tea. Yield without quality and quality without yield are likely to be equally useless to us. Methods feasible for selection for yield have, owing to their relative simplicity, been worked out in detail

in forms suitable for estate use. Methods of selection on the basis of the character of the made tea have been investigated by Mr. Lamb, whose part in this and in the analysis of made tea characters published in the last bulletin, I desire fully to acknowledge. These methods are as yet preliminary in nature and will probably remain of laboratory character. So I consider our best policy is to get on with selection for uniformity and yield, and to take the first opportunity of planting out the progeny of selected bearers in areas large enough to permit of ordinary manufacture. Meanwhile the Institute will do what it can to propagate and test any high yielding clonal material given to it. But I may here give the warning that the Institute considers it useless for it to offer to test seedling progeny on a small scale — by the time the bushes were in bearing, the bearers would probably have been reselected and all the work and time would be wasted.

The part of the scientist in so vast a field as this is, in my opinion, to aid and guide the processes of selection which estates can carry out, while elaborating and testing methods and applying those methods of critical investigation, where feasible, that are impracticable on estates. In other words, progress depends neither on Industry or Research alone, but on that happy co-operation of the two, which has so far and will, I believe, in the future, mark this question of selection in Ceylon.