

FURTHER OBSERVATIONS ON PLANTING SYSTEMS FOR BUDDING OF TESTED CLONES.

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In a previous number of this Journal* a short review of the position regarding the planting of buddings of "proved" clones was given. Since the publication of that review, further study and the collection of further data from tapping experiments on budded trees, make it possible to discuss more fully certain principles which govern planting policy when the planting material consists of buddings of well tested clones.

The distribution of buddings of different clones in a new planting, or in re-planting, will be determined to a great extent by the choice of clones and will depend mainly on the age of the clones selected. The age of a clone is reckoned from the time of planting of the first set of buddings from the selected parent tree or "mother tree." The older the clone the longer will be its history of performance and the more certain will be the knowledge of secondary characters in addition to yielding capacity.

During the past three years many suggestions for the best utilisation of buddings of the known high yielding clones have been made on the basis of which a number of different planting systems have been evolved. The main proposals can be broadly classified as:—

- I. Block or monoclonal planting, using only the most desirable of the oldest, tested clones.
- II. Mixed planting, using buddings of a number of promising clones, mixed in the same area in equal proportions.
- III. Mixed planting in which the principles underlying I and II are combined. Half of the planting consists of buddings of a single well tested clone and alternate plants are buddings of one, or more promising clones not yet sufficiently well tested for monoclonal planting.

* Mann, C. E. T. "A Short Review of the Present Position of the Planting of Buddings of Proved Clones," Quarterly Journal, Rubber Research Institute, Vol. 1, No. 4, 1929.

I. BLOCK OR MONOCLONE PLANTING.

The advantages claimed for this system are:—

- (1) Simplicity in establishment and control.
- (2) The optimum density of trees can be maintained, and the maximum yield per acre obtained, for each clone.
- (3) The system of tapping found by experiment to be the most suitable can be applied to the trees of each clone without difficulty.
- (4) The uniformity of the material should result in perfect tapping and satisfactory bark renewal.
- (5) In the event of a clone, satisfactory in all other respects, showing particular susceptibility to a specific disease, control of the disease in a pure planting will be relatively simple, probably more successful and certainly less costly than in a mixed planting.
- (6) Should a clone show symptoms of a serious fault within the first two, or possibly three years after planting successful re-budding with a superior clone might be carried out.
- (7) The system provides for the possibility of economic replanting in the event of a particular clone developing defects at maturity which render it unprofitable.
- (8) It is possible that seed taken from the trees in the centre of a pure planting may have a considerable ultimate value. The value of seed may be increased by establishing a small number of trees of a superior seed-parent clone in the centres of fairly large areas planted with single clones.

The objections raised against block planting are:—

- (1) Sufficient information is not yet available concerning any of the tested clones to eliminate completely the possibility of their ultimate failure to maintain satisfactory qualities in later years.
- (2) In block planting only the oldest tested clones can be used and many promising newer clones must be passed over for the time being, even though they show indications of a greater yielding capacity than the older clones when they reach comparable age.
- (3) Different clones show individual differences in the quality of their latices and difficulties in manufacture are likely to arise in dealing with large volumes of latex from single clones.

II. MIXED PLANTING.

Using equal numbers of buddings of a number of different clones thoroughly intermixed in the same area.

The advantages claimed for mixed planting are:—

- (1) The best of the oldest clones and the most promising of the newer clones may be established together without undue risk.
- (2) Thinning may be done systematically on the basis of the performance of the oldest trees of the clones represented in the new planting. Time will thus be saved in establishing new clones in commercial planting.
- (3) The fact that the different clones do not “winter” together or to the same degree will have the effect of evening-up the crops obtained over the wintering season.
- (4) From mixed budded areas the latex reaching the factory will be averaged and should give no difficulty in manufacture. Rubber of normal, uniform quality will be obtained.

The disadvantages of the system are:—

- (1) In establishment, even distribution of each clone must be arranged, therefore expensive supervision and control are required.
- (2) To ensure that a sufficiently large stand of trees per acre will remain after the elimination of unsatisfactory clones the initial density must be high.
- (3) Clones differ considerably in vigour and habit; a vigorous, spreading tree may easily impair the growth of neighbouring, less vigorous trees, even though the latter may be potentially the better producers.
- (4) The advantages of selective thinning on the basis of continued study of the performance of the oldest members of a clone are strictly limited. It may quite well happen that drastic removal of trees in a mixed area may become necessary before the oldest tested buddings of any of the clones used have developed undesirable traits or have yet yielded sufficient fresh information as to their productive capacity to show significant differences between each other. Underlying all thinning that has to be done at such a stage will be the feeling of uncertainty as to whether the least desirable trees are being removed. Eventually,

one or more clones may show signs of becoming uneconomic but by that time the optimum stand of trees per acre will probably have been reached, and the prospect of progressively falling crops will have to be faced.

- (5) The optimum tapping system for any single clone cannot be applied and therefore the maximum crop, consistent with the health of the trees, will not be obtained.
- (6) The control of disease, especially specific troubles to which certain clones may be particularly susceptible, will be increased in difficulty and cost.
- (7) Seed taken from mixed areas will probably be of less value than seed taken from the centres of pure plantings.

III. MIXED PLANTING.

(In which half of the planting material consists of a single well tested clone and the other half of buddings of one, or more, promising new clones).

(a) The advantages of using one well tested clone with one new promising clone.

- (1) There is no loss of time in establishing, in commercial planting, a new clone which promises to give a greater return than any of the oldest tested clones known at present.
- (2) Further data from the study of the oldest members of the clones will determine which of the clones should be eliminated.
- (3) The ultimate result of the elimination of either clone will be a monoclonal planting of a well tested clone and the disadvantages of mixing are avoided.

(b) Advantages of using one well tested clone with a number of newer promising clones.

- (1) and (2) The same remarks apply as for (a) (1) and (2) above.
- (3) Should none of the new clones prove superior to the oldest tested clone used then a pure planting of a reliable clone will result.
- (4) Should one or more of the newer clones prove superior to the old clone, then the result will be a mixed budded area capable of a greater production than an area planted with the single tested clone.

The main objections to the above systems are:—

- (1) Except that a high density of trees may have to be maintained for a considerable period the objections to (a) are only those which concern the possible difficulties which may be encountered in manufacture with latex from pure plantings.
- (2) When more than one clone is finally retained (b) the objections already raised against mixed planting (II) again apply.

Discussion.

As far as possible, the main points for and against the chief systems at present in use in the planting of buddings of tested clones have been presented and there appears to be a strong case in favour of block or monoclonal planting.

The main objection to block planting appears to rest on the assertion that none of the "proved" clones at present known have been under observation for a sufficiently long period to eliminate all chance of ultimate failure to maintain satisfactory performance.

The oldest tested clones are entering their fourteenth year, several are in their eleventh year and many of the promising younger clones are in their ninth year of age. Though it is true that the history of even the oldest clones is still incomplete, yet the satisfactory records of normal tapping extending over seven years and including periods of tapping on renewed bark constitute a reasonable assurance that budded trees of the best clones are likely to continue to behave normally in their response to the usual treatments. The objection to monoclonal planting on the grounds of incomplete knowledge of the full history of a clone might be applied with equal force to any system of planting in which buddings are used.

When the value of *Hevea brasiliensis* as a plantation crop was first realised, although the life of a rubber tree under plantation conditions was a subject of speculation, planters willingly risked the establishment of large areas of the promising new crop. Monoclonal planting of buddings of well tested clones may be regarded in a somewhat similar light.

In the oldest plantations signs of deterioration of the trees are evident but even in the worst areas certain trees can still be found in a vigorous productive condition. Individual trees appear to show considerable variation in the rate of decline under plantation conditions and since clones exhibit many of the characters of the parent trees from which they spring it is reasonably

certain that different clones will deteriorate at different rates. It is therefore quite conceivable that in a mixed area the trees of some clones may become unprofitable some years before signs of deterioration are evident in other clones. The total production of the area may fall below the economic limit in consequence. Re-planting may be the only solution of the problem and profitable trees of the better clones will have to be removed. This wastage could have been avoided had the original planting been on the monoclonal system.

The objection to monoclonal planting on the ground that latex from a single clone may present special difficulties in manufacture and possibly give an inferior product seems to require further supporting evidence. It is conceivable that latex from a single clone may even give a superior product. In any event it should prove relatively simple to arrange to treat in the factory a mixture of latex from the different clone blocks which will be comparable with the mixed latex which would be obtained from a mixed area containing the same clones.

By adopting the monoclonal planting system the possibility of using promising newer clones is not necessarily eliminated though this is frequently claimed to be a defect of this system. The simple modification, suggested in III, of planting a "safe" clone with a new clone overcomes the difficulty.

Conclusions.

The advantages of the block or monoclonal system of planting as applied to the oldest tested clones, considerably outweigh the disadvantages. It is therefore recommended that clones having a continuous and satisfactory tapping history extending over five years or more, during which time observations on secondary characters have revealed no defects in other respects, should be planted on the monoclonal or block system.

When it is desired to use younger clones of considerable promise, that have been under test for less than five years, the planting of blocks containing equal numbers of buddings of one of the oldest clones alternating with buddings of the new clone is recommended. Such plantings will be ultimately developed as monoclonal plantings as soon as it is possible to decide upon the relative merits of the two clones.

In circumstances where choice is restricted to newer clones mixed planting of a number of different clones must still be advised and though the ultimate production of such plantings may be entirely satisfactory, in comparison with pure plantings, maintenance and control are likely to be more difficult and expensive.