SELECTION AND SEED PRODUCTION POLICY IN ASSAM

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I have been asked to speak on the subject of tea breeding in Assam. This is a large and complex subject and I will therefore confine myself to general principles which affect the practical man.

Organised tea breeding at Tocklai started in 1940. We estimated 20 years before any results could be expected. I did not return from the Army until 1946 so that much delay was caused. Now we do not expect to produce anything noteworthy before 1965.

There will remain the question of trial in districts and also commercial production—it takes time for new baries to come into bearing.

Some principles have been established. We can see the possibility of selecting improved seed bearers—this really means the rejection of a large bulk of inferior material. More constructive breeding looks further ahead to the production of new kinds of plant not to be found naturally. However, this does not prevent us from sorting out the best from what we already possess.

I need not deal with practical procedure. The point I wish to make is that it is now very largely the duty of the Assam seed producer to do his own selection by methods which seem to be of immediate value. More difficult breeding problems can be left to the technician and to the future.

This means that the seed producer must learn how to select and must devote time to the examination of very large amounts of material. If necessary he must be prepared to do experimental manufactures of trial progeny; and then follow this by vegetative propagation of a few selected trees so as to make many acres of seed bari.

Companies devoted entirely to the commercial production of tea seed seem to be necessary for real progress. The presence of large and competitive seed companies in Assam has been very largely the reason for the Assam custom of replanting.

In the early days of the industry, talented practical men discovered that appreciable improvements could be made by very elementary selection. This started in the Surma Valley but eventually the greatest progress in the commercial production of seed was made in Upper Assam.

Nothing was done in some other districts which require a kind of plant different from that which was selected in Upper Assam.

In India, Upper Assam has attained pre-eminence in tea production. It is favoured by climate but has also been favoured by large scale production of the kind of seed required by that climate.

Experimental work at Tocklai has shown better methods of selection to be possible; and the planter is as eager now as in the past to take advantage of every possible improvement. Vegetative propagation is one of these possibilities.

Four seed baries are being established in Assam by vegetative propagation. In two instances a special staff has been employed since 1946 solely for the purposes of selection and vegetative propagation.

Other baries are being established by mass selection of seedlings. In all cases men have received some form of training for this work.

Those who are likely to lead are those who depend for their living upon the sale of seed—or who are obliged by contract to supply all the internal requirements of a company.

In the past, good seed has been produced by men willing to devote time and capital to the production of tea seed for sale in a competitive market. The same will apply to the future.

Because the progress possible at present depends upon a sorting out of existing material, it is best done in many centres and amongst material known to be of local merit.

This sorting out takes two forms:—

(1) Nursery selection of seedlings. Each tree in the new bari will be selected but will differ genetically in some respects from all others. Very large numbers of plants are required, those acceptable being of the order of one in a thousand. This means 999 rejects for every plant accepted. As wide spacing in the nursery is essential for rapid selection, we reckon that an acre of nursery is desirable for every acre of potential seed bari. Smaller nurseries can be used if the same amount of seed be more closely spaced with a lesser number of pathways; but this makes the selection of such a large amount of material more difficult.

The original nursery can be the site of the final bari, so that the land requirements are not so excessive as appears at first sight. The rejected plants can be removed and used as supplies.

(2) Selection of about ten desirable plants which are multiplied by vegetative propagation to make a polyclonal bari. The advantage of this method is that if the bari is successful then it can be repeated in any number of localities without the need for further selection.

There is a greater element of risk in this method. It is desirable to establish trial nurseries and necessary to build up nucleus clones to provide a supply of cuttings. At least five years initial work is required before one can hope to start on a new bari. This method is being used by one large tea seed company.

The best jats we can produce by either method will contain bushes which are superior to others in the jat. Similar superior bushes occur with lesser frequency in existing jats. Many of these will not breed true, or if seed is taken from them then a good deal of the superiority will be lost.

Such bushes can be propagated vegetatively. For this reason planters in Assam who are making new seed baries are also selecting leaf producing clones for vegetative propagation. The two methods are complementary.

Many of these clones will have individual merits likely to be in demand by the blender.

If improved seed be generally used then individual advantage will be lost. In these circumstances 20 acres of a clone selected on a particular garden is likely to give a distinctive mark to that garden and to be of great value during quality periods.

For this reason great attention is being paid to garden selection and propagation of clones.

Probably one quarter of all the acreage in Assam is useful for selection. We estimate that every 14 acres of this fraction contains one bush of outstanding merit—easy to propagate, of reasonable yield and likely to make tea which will be in demand.

Some gardens are making a practice of working through 14 acres (or thereabouts) annually. Something of the order of 4,000 bushes are selected on the basis of hair on the leaf. This gives a heavy bias towards the kind of plant which is required in Assam.

Selection amongst these 4,000 bushes is then repeated for yield by methods essentially the same as those used in Ceylon. The anticipated selection is of the order of 200 bushes. Cuttings from these are tested for ease of propagation. This is followed by a small scale yield estimate based upon early stages of growth of the cuttings. This is combined with miniature manufacture and tasters' reports. After this, a nucleus clone of about 300 bushes is aimed at. This is to be the source of cuttings for replanting in the garden.

As the outcome of work along these lines, sections of the order of five to ten acres are now being planted by a few gardens.

Our earlier methods differed somewhat from the procedure which I have outlined. Various modifications are possible according to circumstances. A slightly different procedure is being used on a large scale by the Scientific Officer of one company. But in all cases the magnitude of the work is of the order which I have indicated. It is being done on tea gardens by the tea garden staff.

There have, naturally, been some set-backs. People have failed to handle material properly and have lost cuttings or plants. This is why it is necessary for the practical man to get on with the work, as no progress is possible until sufficient horticultural skill has been acquired.

One company employs a special staff for this work.

In one garden in Darjeeling propagation was so successful that seed orders were cancelled. Tea seed is not grown in the Darjeeling district. Clones raised on the garden were more successful than imported seed.

The characteristics of Darjeeling tea probably depend upon a hybrid plant and in these circumstances it may be better to use clones.

Further advances are always possible by further research. Progress depends upon using existing improvement. One does not refuse to make a motor car because research on turbine engines is not complete. The research worker produces a blueprint. It is the practical man who has to take off his coat and make the cars in quantity.

My impression of the tea industry is that very often the practical man does nothing and gives the reason that he is waiting for research to be completed. In the progressive part of the tea industry research will never be complete.

Practical application of vegetative propagation will carry us a long way forward. In Assam, local selection of the unique bush which we suppose to occur in every 14 acres would make use of existing knowledge and would also provide the breeder with material of great value for making further advances.

Not to do this might handicap future breeding as no research station could possibly select over so much material as already exists on tea estates.

The broad policy which I have indicated is that which is developing in Assam. It deals with the practical exploitation of valuable combinations of cup characters which exist naturally and are easy to grow and are adapted to the district in which they are selected.

In time the trade might ask the breeder to produce an unusual balance of several attributes all combined in one plant—possibly to do away with the blender. Such a plant, if produced, might, in the first place, fail to develop an adequate root system. This would be a problem to engage the research staff, rather than the selection of existing material by known methods.

In short, research policy is visualised as the production of unusual kinds of plant by what one might call synthetic breeding. This must be regarded as a long term but very necessary policy.

By practical advance we mean the immediate exploitation of present knowledge. We expect the practical man to do this.

Immediate improvements in seed supply are possible. For this we think several specialised and competitive seed companies are necessary.

We think improved seed is not sufficient and garden selection of vegetative clones should proceed continuously.

To realise the possible practical advances needs a precise and objective programme. We think this should be devised by company representatives in consultation with the scientific staff at Tocklai. A particular programme applicable to the requirements and circumstances of the company should be laid down. We consider this must be made the sole duty of some person with administrative ability and horticultural talent.

In conclusion I must emphasize that the outcome of the applied work now in progress in Assam remains to be seen.

So far as it is possible to draw conclusions from experimental work on a limited scale, then the applied work is justified.

Replanting is a fixed policy in Assam and is always going on. Once a section is replanted it does not pay to uproot for many years even if much better material is available. It is therefore essential for us to make immediate use of even the slightest improvement or possible improvement.

At the close of this address a number of questions were put to Dr. Wight by the Director. In view of their general interest Dr. Wight's answers are reproduced below:—

Question 1.—Does Dr. Wight think that anything would be gained by putting out our best clones, say 2024, into seed bearer areas?

Answer.—Many of the clones selected for vegetative propagation will not breed true. If they are introduced into an existing seed bearing area the result might be to make the jat more mixed than before. Used by itself, a single clone is likely to produce either no seed at all or else a very small amount of inferior seed of poor germination.

Question 2.—Would Dr. Wight advise us to put out mixed areas, say 2024 and 2025?

Answer.—This question is essentially the same as the foregoing, but by using only two clones, the danger of obtaining unsatisfactory results is greatly increased.

The choice of a pair of suitable seed bearing clones is work for a specialist, and would take about 20 years.

There is no guarantee whatever that clones suitable for vegetative propagation will be suitable for seed production. I would say that most clones selected for vegetative propagation are unsuitable for seed production.

I have examined 2024 and 2025 and consider that a combination of these two might give very unsatisfactory seed.

Question 3.—Does Dr. Wight think that the T.R.I. could achieve anything by running comparative nursery trials of seed taken from existing seed gardens?

Answer.—Similar work in North-east India has taken seven years. A large area of land was occupied by the trials. After what I have seen of seed bearers in Ceylon I would say that the time and land would be better used for tea breeding. Seven years comparative trials would produce nothing new and would be one third of the estimated time required to produce improved seed bearers.