Kuk Tea Research Station

J. G. MORGAN

Agronomist-in-Charge, Kuk

Although tea is a comparative newcomer to Papua New Guinea, it has already proved to be a satisfactory cash crop, given certain conditions. To gain much needed information on cultural techniques suitable for the local environment and to attempt to improve the quality of planting material, a research station has been established by D.A.S.F. at Kuk, 12 miles from Mount Hagen.

Since experience at Garaina proved that tea could be grown commercially in Papua New Guinea a small industry has been established in the Highlands. All the tea grown at present is located in the vicinity of Mount Hagen, much of it on reclaimed swamps of the Wahgi Valley, and in the Southern Highlands near Mendi and Ialibu.

The crop is grown both by smallholders who would have, on average, about 1 acre planted to tea, and large estates of 800 acres or more employing 500 to 600 labourers.

IMPROVEMENT OF PLANTING MATERIAL

Populations of plants grown from seed are very variable as a seed results from the union of male and female factors and even if the two parents are known it is not possible to predict how the characteristics of the two parents will

Photo: D.I.E.S.

Plate 1.—Plucking on a tea estate. In Papua New Guinea, plucking is done by men, not women

Photo: D.I.E.S.

Plate II.—Two and a bud, the classical plucking standard. The finest teas can only be made from young tender leaves

be combined in the offspring. Tea is self-sterile, and pollen must be carried by wind and insects from one tree to another for seeds to develop. Pollen from a very vigorous tree may fertilize flowers on another very vigorous tree and the resulting seed may produce very weak plants. The opposite is also possible. In fact very little is known about the genetics of tea.

For this reason, the plant improvement programme at Kuk is based on the selection of high yielding medium to high quality clones. A clone is a population of plants all derived from the same seedling mother bush by means of vegetative propagation. Thus the resulting plant inherits all its characteristics from only one plant. With tea, the most common method of vegetative propagation is the single leaf cutting technique which involves planting a short piece of green stem about 4 cm long with a full leaf attached.

All tea at present planted in this country has grown from seed. Yields for mature seedling tea are expected to vary between approximately 450 and 1,100 kg per hectare. Thirty to forty years ago the average yield in Ceylon was about 480 kg per hectare. Now, largely through plant selection work, the average yield has doubled and yields as high as 3,600 kg/ha are possible on clonal experimental plots. It is not uncommon for selected areas on some estates to average 1,800 kg/ha. The aim of the selection programme at Kuk is to produce clones which will yield above 1,800 kg/ha per annum of made tea under average conditions. The quality of this tea will not be lower than that at present being obtained from seedling tea and hopefully it will be higher. The figures given above are for "made tea", which means the dried leaf that you buy in a shop. Approximately 5 lb of green leaves must be picked to make 1 lb of made tea. In other words, the green leaves contain roughly 80 per cent moisture.

The most rapid way of building up numbers of cuttings is by grafting scions taken from the selected clones onto seedling rootstocks. Various techniques have been tried at Kuk, some of these with reasonable success.

It is expected that both cuttings and scions will be available for off station trials in the near future.

FERTILIZER TRIALS

It is possible to achieve and maintain high yields only if fertilizer is applied to the tea. In some cases fertilizer may be necessary to provide elements not naturally occurring in sufficient quantities in the soil to supply the

needs of the tea bush. Fertilizer is also required to replace elements taken away in the harvested leaf.

The questions which need to be answered are: what elements are or are likely to become in short supply, what is the best fertilizer to apply to make up these deficiencies, how much and how often?

Apart from various fertilizer trials on the station itself, "off station" trials on estates are being established on the various soil types on which tea is grown commercially. At present, four major elements, nitrogen, phosphorus, potassium and sulphur are involved in these trials. While it is not possible to make any definite recommendations at this stage, recommendations on fertilizer practice will almost certainly be different for the different soil types.

Besides other elements, both nitrogen and sulphur appear to be necessary for high yields and ammonium sulphate is a convenient fertilizer as it supplies both elements. However, continued application of this fertilizer can be detrimental to the soil and results in reduced quality of the made teas. Other possible sources are being investigated.

For best results, newly planted tea, and tea not in production, probably benefits most from a fertilizer mixture different from that which gives the best response in tea in plucking. Trials are being conducted on fertilizer mixtures most suitable for newly planted stumps on two soil types.

It is not expected that phosphate fertilizers will be necessary in the foreseeable future and as mentioned earlier, work is proceeding to confirm this assumption. On the other hand there is evidence that potash deficiency will become a problem after four to five years plucking, unless this element has been provided in the fertilizer mixture.

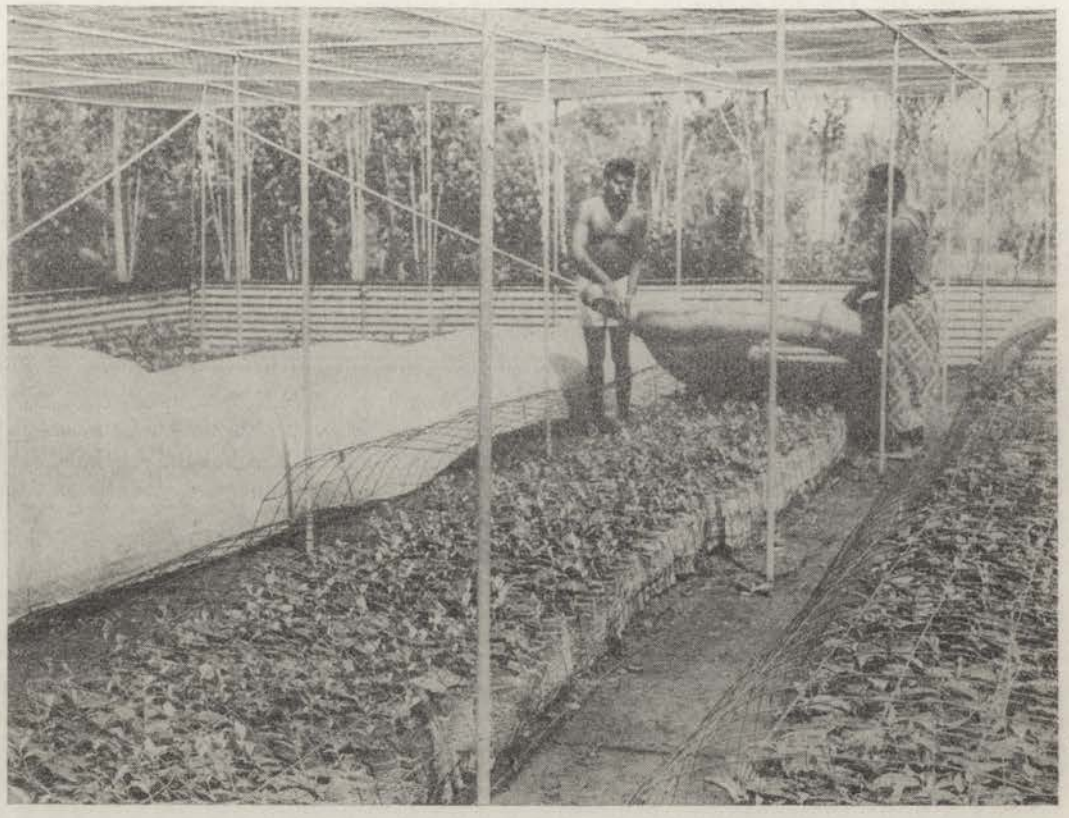

Plate III.—Young clonal plants in the nursery at Kuk. Before being transplanted to the field, the young plants must be "hardened off" by decreasing shade

CULTURAL TECHNIQUES

Spacing

Work carried out overseas has indicated that increasing the density of planting up to certain limits increases yield per hectare. Populations in Papua New Guinea vary between 6,600 and 12,000 bushes per hectare.

Overseas, very high densities are being used now for some new plantings, in some cases as many as 24,000 plants per hectare.

A trial at Kuk comparing 14 various spacings is in progress. Two methods of frame formation are included in this trial.

Frame Formation

A low wide spreading frame is a desirable characteristic in a tea bush as this increases the area over which the young shoots can be plucked. The aim should be to have the area being plucked in a field the same area as the field itself—that is, aim for a 100 per cent ground coverage. As the pluckers move through the tea it should open in front of them and close behind them. The sooner this is obtained the better as higher yields are obtained earlier and weeds cease to be a problem once light to them is cut off.

Frame formation can be done by a series of prunings which lead to branching or by a technique known as layering which involves bending young branches over sideways and pegging them into place. Vertical shoots then grow upwards from the buds on the bent branches. The layering technique gives earlier and higher yields and there is reason to believe that these higher yields are maintained in mature tea, at least for many years.

There are however, some disadvantages to layering. First of all weeding is made more difficult during the time the canopy is developing. The cost of layering in itself is higher than that for pruning.

On clonal plants that have been layered, tipping (the establishment of a level plucking table) can commence 18 months after the cutting was planted. This corresponds to the time seedling tea would normally be transplanted from the nursery to the field.

It is felt that while layering may not be worthwhile for seedling tea, it will definitely be worthwhile for high yielding clonal tea. Experiments to confirm or disprove this are progressing.

Herbicides

When herbicides are used, there is always some danger that the chemical will kill or severely damage the crop. Investigations at Kuk have shown that herbicides do exist which give excellent weed control and which even when sprayed directly onto the foliage tea at high concentrations have no detrimental effect.

Pests and Diseases

Tea is remarkably free of both pests and diseases in Papua New Guinea but some pests and diseases, which could develop into major problems, are present. Departmental staff are keeping a constant watch on the situation and would appreciate being advised of any unusual outbreaks which may occur. Staff at Kuk work in close liaison with the pathology laboratories in Port Moresby. An entomologist is stationed at Kuk.

MANUFACTURE

At present the only tea manufactured at Kuk is from small clonal plots so that an indication of quality can be obtained.

In commercial factory, manufacture consists essentially of four stages. First leaf is initially allowed to wither for 12-15 hours after which it is macerated so that cells are ruptured and the cell juices can come into contact with the oxygen in the air. This allows the leaf to ferment or oxidize. Following this the leaf is dried and sorted into various size grades.

It is unlikely that research into manufacturing techniques will be carried on at Kuk in the foreseeable future. Equipment to carry out such work is expensive and it is considered that the limited resources available would be put to more efficient use in solving more pressing problems.

Only small areas of tea are at present being plucked. This tea is not sold as the marketing expenses would be greater than the return obtained. No doubt, as large areas are brought into production, the leaf will be sold to recoup some of the expenditure on the station.

VISITORS WELCOME

The above is only a brief outline of what Kuk is all about. Visitors are always welcome and the staff are always keen to meet tea-growers, to discuss problems, to learn from them and to offer what help they can to those interested.