

AN APPRAISAL OF TEA RESEARCH IN CEYLON

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Objectives

The chief objective of Agricultural Commodity Research must always be the mundane one of increasing profits per acre from the crop under investigation. The Tea Research Institute of Ceylon is trying to do just this for the industry by a 'down to earth' policy using the following three pronged attack. Firstly by increasing yields, secondly by improving quality and thirdly by reducing expenditure. This policy is being implemented by research programmes of a short, medium and long term nature in the following subjects—Soil and Plant Chemistry, Agronomy, Horticultural Botany, Plant Physiology, Plant Pathology, Nematology, Entomology, Biochemistry and Factory Technology. Covering all these activities is the fundamental discipline of Mathematical Statistics—the universal tool of research workers.

Increasing Yields

It is well known that every single operation connected with tea is controversial and that there are almost as many right ways of doing things as there are planters. As far as tea is concerned truth is many-sided and the search for what is best in all circumstances will go on for ever. Meanwhile the results of over 40 years of experimentation have given the tea industry of Ceylon a solid foundation for rational estate operations. The work of the Institute on fertilizers has culminated in their vast consumption by the tea industry with corresponding increases in crop. Even greater increases are anticipated over the next decade when thousands of acres of high yielding clonal tea will come into bearing. The yield potential of this tea is of the order of 6000 lb made tea per acre, but to achieve this, very heavy dressings of fertilizer must be applied. Amounts of nitrogen up to 500 lb per acre are involved and much detailed experimentation is going on to obtain the maximum amount of tea per pound of nitrogen applied. This study involves the balance of nitrogen with other nutrient elements such as potassium, phosphorus, calcium, magnesium and sulphur and the trace elements manganese, boron and zinc. In connection with the last element the Institute has recently demonstrated that a highly profitable response can be obtained by spraying tea bushes with only 10 lb per acre of zinc sulphate. This gave a yield increase of 10% which might be more than the increases produced by all the other fertilizers applied together.

Following on this, it must be emphasized that it is highly improbable that yields above 3000 lb per acre will ever be obtained from stands of old seedling tea no matter how well fed they might be. The ultimate in yield will only be reached with clonal bushes or from their seedling progeny; so far, clones selected by the TRI are outstanding. The 2020 series of clones might almost be termed 'golden bushes' because they do so well under all the ecological regimes in which tea is grown in Ceylon. Naturally their individual characteristics vary but their yield potential is approximately the same. Seedling progeny from crosses between these clones offer an even more promising, albeit long-term approach to maximal yield.

Removing Adverse Factors

One way of increasing profits in agriculture is the obvious one of removing those factors which are reducing them. In Ceylon there are many such factors, which if not kept under control would not only have reduced profits to *nil* but would probably

have wiped out the industry altogether. The TRI is justly proud of its role in saving the industry from the fate which overcame the coffee industry 90 years ago. During the year following October 1946, every estate was affected by the invading Blister Blight fungus *Exobasidium vexans* Masec. During the following year methods were worked out, largely by the TRI, to control this disease effectively with copper sprays. From then on, economies in spraying costs have been made by using motorised sprayers and timing applications carefully in relation to hours of sunshine. Another serious fungus disease in up-country tea is "Red Root" (*Poria*), but TRI workers have found the answer to this in soil fumigation. The same answer applies to the control of a more widespread pest—meadow eelworm. In this case the TRI has found that a considerable measure of control can be obtained by planting Guatemala grass for up to two years prior to replanting tea.

Insect pests could have been nearly as devastating to Ceylon tea as the fungus diseases. By far the worst is shot-hole borer which is prevalent in the low and mid-country estates. If the TRI had not found an effective means of control by spraying, tea in these areas would have been derelict by now. Unfortunately spraying some times kills parasites of the Tortrix moth—another, but less serious tea pest and so deprecations from this often follow shot-hole borer control. However, other sprays were soon found to take care of Tortrix. But yet other pests may follow, such as red spider and scarlet mites. Again control measures have been worked out by the TRI. Concurrently with chemical control, which is immediately effective, even if it does have troublesome side issues the TRI is ever mindful of the need for biological control methods, although these mean very long term research activities.

Improving Quality

Just as the ultimate in yield will be given by clonal bushes, even more so is this true when quality is considered. Flavour, quality and ability to make tea easily (fermentability) are part of the genetic make-up of each bush in more or less degree. The selection of bushes with the highest abundance of these desirable features is the objective of the Plant Propagation Division of the TRI. Coupled with selection for highest yield, this should lead eventually to clones even more 'Golden' than the 2020 series.

Despite the fact that quality is inherent in most good clones it is no use having quality unless it can be used to the full, so as to give more profit to the grower. To exploit quality to its utmost, factory processes must be so geared that none of it is lost on the way to making saleable tea. Much research is going on at the TRI in improving factory processes and thereby giving quality its full share in increasing profits per acre. Concurrently with factory investigations a very intensive research programme is being conducted on the intricate biochemistry of tea manufacture—all aimed at improving the final product. Biochemical studies are not confined to factory processes but they go right back to the growing bush. This may seem very long-term research but it is a subject that will pay off handsomely in the long run.

Reducing Expenditure

Reducing expenditure is an exercise of which managements are ever conscious, especially in these days of continuously rising costs. All the time-honoured practices involved in the growing of tea are coming under the close scrutiny of the TRI scientists. Prominent among these practices are pruning, tipping and plucking, the fundamental study of which is engaging much time of the Plant Physiology Division. This Division is also intimately concerned with the vexed question of shading tea. Shade trees over tea are very costly to plant, costly to maintain and even more costly to remove. A mass of scientific evidence is building up from many countries against

shade for plantation crops. Shade over tea in East Africa and Ceylon reduces yield, it reduces quality and it reduces response to nitrogen. The tempo of experimentation on the economics of shade is being stepped up by the TRI, because if all the results obtained elsewhere can be shown to apply in Ceylon, millions of rupees would be saved. The mulching value of shade-tree leaves has been shown to be very doubtful and even non-existent in the case of *Grevillea*. Since the leaves and twigs of tea bushes are extremely rich in nitrogen and potassium, it would seem that the best mulch for tea is *tea*. This brings us to yet another old and controversial point with which the TRI is much concerned, that is the removal and burning of tea prunings. On mid and up-country estates these are burnt by labourers as domestic fuel. A full assessment of the loss of valuable plant nutrients is being made, first indications are that the Island's tea fertilizer bill could be affected to the tune of millions of pounds sterling and that this enormous sum could be saved if means were devised to return prunings to the soil.

All over the world the challenge of weed control is being met by chemicals. There are at least a dozen effective ones for specific groups of weeds and specific methods of control. The TRI has been rather conservative on this subject in the past but the needs of the industry are becoming so urgent, especially in low and mid-country districts that at least two full-time research workers will soon be dealing with herbicides.

Advisory Services

Following Assam experience, the Tea Research Institute of Ceylon is building up an efficient advisory service to deal with the day-to-day queries of planters. Information is fed into the Advisory Division from the Research Divisions; and also the Advisory Division in collaboration with the Research Divisions is helping to improve the premises on which its advice is based by a comprehensive programme of field experimentation. Details of these experiments will be given in the next issue of *The Tea Quarterly*.

The purpose of this article has been to indicate briefly that by a judicious combination of short, medium and long term, 'down to earth' experimental work, the interests of the tea industry are being covered and how more gross profits per acre accrue continuously from the results of this work.