

## THE FIELD EXPERIMENTAL PROGRAMME FOR 1930-31.

The removal of the Institute to St. Coombs in the latter part of the year will make possible a considerable expansion in the field work contemplated by the staff. Although the appeal for information concerning field problems made by the writer at the Institute's conference in March, 1929 produced negligible results, plans for the experimental programme have been a matter of constant discussion and the definite proposals made by the staff were agreed upon by the Field Experimental Sub-Committee at a meeting on February 25th, 1930. The personnel of this Committee is made up of the Chairman of the Board, the Director and Agricultural Chemist on the staff side, the Visiting Agent and Superintendent on the estate side, and two planting members.

### PRELIMINARY DATA.

The experiments will begin as soon as personal supervision on the spot can be provided for, but in the meanwhile a good deal of preliminary work is being put in hand. As far as tea is concerned, work will commence with the pruning due in October. Suitable areas on the mature tea have already been reserved and will shortly be sub-divided into the necessary plots. Even such rudimentary work as plot division involves considerations of much importance from the point of view of the usefulness and accuracy of subsequent experiments, and the experience gained during the last two years on the Scrubs Uniformity Trial will be utilised to the full. The results of this trial, which has involved the collection of just over six-thousand yield records, have given indications of the best size and arrangement of plots to employ, that is to say, the formation which gives the smallest possibility of error with the most economical utilisation of land. It is now possible to say at what plot size diminution of error virtually ceases. Consequently, no useful purpose would be served by using plots of a larger and therefore more unmanageable size. Prior to the commencement of the experiment proper, this preliminary work will be pushed a stage further. The Scrubs results are of general application in so far as they show the trend of error with increasing enlargement of the plot. It does not necessarily follow that the actual size of the errors encountered on St. Coombs tea will be exactly of the same dimensions. Consequently, in addition to establishing plots which give the lowest error, it will be advisable to assess the magnitude of that error beforehand. This will be done by cropping the untreated plots for a period of at least three months before pruning and thus obtaining the actual errors associated with

the particular area of land. In the light of this more precise knowledge, a multiple of replications can be decided on which will give a final error value to the proposed experiment low enough to distinguish with certainty the validity of any response which subsequent treatments may produce. Work of this kind is as important in starting field experiments as the calculation of stresses and strains is for the engineer building a bridge, for without such investigation there is grave risk of both endeavours breaking down.

#### MANURIAL EXPERIMENTS.

The experiment which is assigned to this prepared site is manurial, and will involve two main questions:—

- (1) What are the relative availabilities of inorganic and organic artificial nitrogenous manures and their responses ?
- (2) What is the response of tea to potash ?

Since it is probable that as in other crops the response to nitrogen is conditioned by supplies of potash and *vice versa*, the experiment will provide for plots at varying levels of nitrogen and potash supply. The general scheme, as it affects nitrogen and potash in their quantitative aspects, may be summarised in the following diagram of the nine treatments proposed:—

	0	1	2	Units of potash
	00	01	02	
Units of	10	11	12	
Nitrogen	20	21	22	

Within the limits of the experiment, every possible combination of potash and nitrogen finds a place. The question of *kind* of nitrogen will be superimposed on this design. There are six plots receiving nitrogen. These will be divided between the three qualitative sources—sulphate of ammonia, cyanamide, and bloodmeal. These are all manures in common use and they involve respectively an increasing number of stages in decomposition before they are available to the plant as nitrate. In the division provision will be made so that over the whole experiment each kind of nitrogen will be associated with exactly the same range of potash and nitrogen quantities.

We may consider now the advantages that this somewhat complicated arrangement of treatments involves. We shall aim tentatively at a replication of sixfold. There will accordingly be 54 plots in all. Taking the question of the effect of increase in the amount of nitrogen as a first illustration, it will be seen that in each replication there are three plots receiving no nitrogen, three with one unit, and a like number with two units. These are associated with different amounts of potash, but each nitrogen treatment is associated with

similar potash groupings, and so for the purpose of nitrogen comparison they can be lumped together, i.e., the first horizontal row of the chart summed up can be compared with the second horizontal row, and so on. Taking replication into account, there are thus  $6 \times 3 = 18$  plots from which to argue about each level of nitrogen nutrition.

Similarly, with the other questions, as set out in the following table:—

	No. of comparable plots.
Nitrogen comparisons (quantities)	18
Potash comparisons (quantities)	18
Nitrogen comparisons (qualitative)	12

By thus making every plot dovetail into every question postulated, we have increased the effective replication in two cases threefold and in one twofold. This means a corresponding (though not proportional) reduction in error and a great gain in accuracy.

The results of this experiment will help in building up a scheme for a further manurial experiment which is of particular interest at present. A question that is being continually asked of the Institute is whether manure mixtures can be made less costly by substituting inorganic nitrogen fertilisers for the organic nitrogen which is largely used at present. In addition to the information culled from the previously described trial, it is important to know whether any differences in efficiency between inorganics like sulphate of ammonia and organics like whale guano and bloodmeal are levelled out in the presence of adequate supplies of organic matter. In order to put this to the test an experiment has been projected in which inorganic nitrogen is pitted against organic nitrogen on two areas similar in all respects, except that one is to be kept at a low humus content whilst the other will be artificially raised in humus content.

The tea upon which this experiment will be placed is not yet in bearing, and this gives a margin of time for preparing the high humus area. The type of green stuff employed is not vital, so in order to obtain quickly large quantities, nurseries of sunflower have been laid out which will be cut, weighed and carted on to the adjoining site. A study of the differential effects of the nitrogen manures on these two areas should give information of considerable practical interest.

#### COVER CROPS.

In the evidence given by the Institute to the Soil Erosion Committee an undertaking was given to further preventative schemes by arranging for experiments. This promise is to be implemented this coming season in two directions, whilst further plans are in mind for later work.

In stressing the possibilities of using cover crops as preventatives of erosion, the Institute is conscious that the choice of suitable species is a difficult one, and that the proper management of cover crops in tea under Ceylon conditions still requires a great deal of attention.

A site has been reserved for trying out a range of cover crops and for establishing plots upon which the growth, yield, response to cutting and cultivation, and general suitability can be tested, and on which the complementary soil amelioration can be followed stage by stage. It is realised that many planters have accumulated on their own estates valuable information regarding individual species. In the nature of things, however, the comparison of species and methods on different estates is hampered by variety of procedure. At St. Coombs, procedure can be standardised with benefit to the number of comparisons available. It will be of great service to the Institute if planters will place their knowledge at our disposal by writing to us, giving the names of species which have prospered on their estates. Details of methods of treatment, altitude and rainfall, and an intimation as to whether they could supply small quantities of seed will also be valued.

By such co-operation the time taken in finding and testing the most promising material will be considerably shortened.

#### DRAINAGE.

The second aspect of soil erosion prevention upon which experiments have been prepared is that of drainage. Until some detailed knowledge about the water absorption of tea soils and rates of percolation has been collected, it is very difficult to determine the relative efficacy of the various systems of drains now advocated. With a view to obtaining such data, an area of  $1\frac{1}{4}$  acres on a slope of 1 in 4 has been bunded into 10 ft. locks by means of concrete blocks. On the area concerned there are 80 such locks. The lock bottom is levelled in each case to increase capacity, and by the daily measurement of rainfall, run-off and percolation, the distribution of the precipitation will be followed from season to season. Since such systems appear not only to arrest soil but to affect the soil moisture balance, the actual soil moisture content and soil temperature will also be periodically examined.

This completes the immediate programme, preparatory work for which has already been set in hand. Details of progress will be reported in this journal from time to time.

T. EDEN,

*Secretary, Field Experimental Sub-Committee.*