

EXTENSION EXPERIMENTS

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The desire of scientists for extension experiments has been expressed for many years past, and as early as 1957 the author reported the emphasis laid on this subject by Professor F. Hardy (Tolhurst 1958). 1965 saw the adoption of such a scheme, introduced by Dr E. M. Chenery, on the lines of experimentation adopted in East Africa. In these matters time does not always produce the wisdom of maturity: it may in fact have the opposite effect. There is reason to believe that some of our ideas need drastic reappraisal in the light of future trends in production, and unless there is firm guidance from experimental results the industry may find its development hampered.

Development of a comprehensive programme of agronomic experiments on the Institute's own land is well under way. Results already quoted have shown how different experiments, investigating the effects of similar treatments, may give answers difficult to reconcile one with the other. We fully expect to come across still more examples of this as our newer experiments reach maturity. The reason is, undoubtedly, that different types of tea grown in different areas will not respond in the same way to similar experimental treatments. If the Industry is to be given more agronomically sound advice, we must be able to translate the results of our complex experiments to conditions found in practice. The only practicable way of doing this within a reasonable period is to have as many simple experiments as possible in the major districts. These will supplement the findings of investigations done on our own stations, which are still increasing their activities.

The scheme put forward in 1965, which appears to have met with encouraging support from the Industry, covers two types of experimentation which estates could carry out themselves, with the minimum of assistance from the Institute. We have, of course, at times carried out more detailed experiments on estates with valuable results. This is extravagant in the demand on trained staff and it would be of no benefit to anyone if we were to rely solely on this type of investigation now. The policy is to aim for a large number of very simple experiments. Future development of the scheme will probably be guided by our assessment of the success of the first steps.

In order to encourage still more interest in the scheme we list the experiments which are now being laid down. Specialist field experiments, *eg* in Entomology and Plant Pathology are not included. These continue to be carried out by the Divisions concerned according to their established methods. Notes will then follow on the simplest type of experiment which estates could do entirely on their own and on a provisional basal fertilizer mixture which would be a necessary adjunct to certain experiments. The mathematical principles underlying these experiments have already been explained (see Kanapathipillai 1965).

Extension experiments

Series 1—*To find the yield response to N at three levels, applied as three different fertilizers: sulphate of ammonia (S/A); urea; calcium ammonium nitrate (CAN)*

The basic experiment duplicates the above nine combinations of treatments. From experience it has been found that 18 plots, each of up to 200 bushes, are relatively easy to mark out in seedling tea, without running the risk of siting some plots in abnormal areas.

N levels for vigorous seedling tea are presently contemplated at:

120; 240; 360 lb N per acre per annum. These levels may be scaled up or down as local conditions suggest: other nutrients to be applied as a basal mixture (see below).

Series 2—*To find the yield response to three levels of N on soil adjusted to three levels of pH*

The design is the same as for Series 1.

Either S/A or CAN will be used according to local requirements, at the same N levels as noted for Series 1. Soil pH will be adjusted by Limbux, the quantities to be determined after frequent pH analysis of the plots. Limbux will be used because its action is so much quicker than dolomite. The choice in practice between these two liming fertilizers would depend on several factors, not least of which would be the degree of yield response to be expected to a rise in soil pH.

Series 3—*To find the yield response to combinations of N, P and K, each at three levels*

The experiment would be arranged in three sub-blocks of 9 plots each, with the addition of an extra zero-N plot to each sub-block.

Levels of N: as above

P : 0, 30, 60 lb P_2O_5

K : 0, 60, 120 lb K_2O

Again, scaling in either direction may be done.

Series 4—*To find the yield response to four levels of N in the presence and absence of shade trees*

The eight treatment combinations are quadruplicated. The larger number of plots, 32, in this series acts as compensation for the fact that only two levels of shade are (at present) being compared, and for the inevitable unevenness of stand of trees. Given an even stand of trees, especially low shade, a design incorporating 4 levels of shade (one to be zero) would be employed: duplicated to 32 plots also. Levels of N are in Series 1, with zero-N in addition.

Series 5—*Experiments are contemplated to investigate the effect of establishing tea after rehabilitation with different crops and for different periods (including zero)*

Other experiments can be designed to suit particular requirements.

The Institute, represented by the Divisions of Agricultural Chemistry, Plant Physiology, the Low-country service and the District Advisory Officer (Uva), undertakes to mark out the plots in conjunction with the estate staff. Advice and assistance is given where necessary until the technique of collecting and weighing small quantities of flush becomes familiar. Record sheets are provided by the Institute and will be collected periodically for assessment. Fertilizer is provided and the application supervised by the Institute. To increase the precision of assessment of results from these simple experiments, we would record plucks for at least three months before differential treatments are started. The time apparently lost would be more than paid for.

Paired fields or halved fields

It is already clear that the initial stages of establishing the above type of experiment are going to take so long that, to avoid loss of interest in the scheme, we urge estates to give serious consideration to a simpler scheme.

Two treatments can be compared roughly by applying one to each field of a pair. The pair of fields should be chosen, obviously, to be as similar as possible bearing in mind anticipated potential as well as past performance. The more pairs which an estate can select, the more value can be expected. Apart from the treatments themselves, all operations must be as similar as possible. Splitting a field could give greater precision, as long as the yields of the new units are recorded separately for at least 6 months in order to be able to estimate their relative performances.

Even if an estate already runs one of the extension experiments, it is probable that the additional information from paired-field comparison would be valuable. An experiment proper can, after all, only really represent the response of one type of tea, grown in one spot on the estate. Obvious choices for paired treatments are

S/A versus CAN (rates adjusted to give the same quantity of N)

Two levels of N (same fertilizer in each field)

Two stands of shade trees.

The Institute would be glad to offer advice on these and other comparisons.

Basal fertilizer mixture

In some of the above experiments, including the paired-field type, it would be necessary to apply certain nutrients as a basal mixture or as a foliar spray (zinc). For example, both CAN and urca are too hygroscopic to be mixed with other fertilizers in practice. The following mixture is suggested as a convenient supplement for experiments comparing, say,

S/A with CAN

Two levels of N

Provisional basal mixture

60% muriate of potash	150 lb
Saphosphosphate	70 lb
Dolomite	224 lb
Fertilizer borate	4 lb
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The rate of use is not fixed and can be adjusted to any desired level. If applied at 4 cwt per acre per annum, 90 lb K_2O and nearly 20 lb P_2O_5 will be supplied.

Do not mix the basal mixture with sulphate of ammonia in the bag.

Application can be made once a year and if necessary in dry weather, but the start of an anticipated long dry period should be avoided. The height of the monsoon should also be avoided, as there would be risk of loss of the potash by leaching.

This mixture is intended as the basis for various proportions of nutrients, and we hope we can avoid the usual tendency of the Industry to adhere rigidly to what is clearly labelled 'Provisional'. The use of 50% muriate will, while retaining the same bulk, reduce the K_2O to 75 lb, for example: 4 cwt per acre is quoted as a convenient rate and has no other significance: borate is included as a prophylactic and in some districts (particularly outside Uva) has no firm scientific support—it may be wiser to retain the borate, but there is no compulsion, *etc.*

The idea of separate applications of different nutrients appears to be gaining support in the Industry. Some estates are trying it out on whole divisions and large groups on whole estates, and in time it will no doubt be accepted as a means of increasing the flexibility of fertilizer programmes, quite apart from its use in experimental areas.

References

- KANAPATHIPILLAI, P. (1965). Extension experiments—their nature and meaning. *Tea Quart.* **36**: 141-143.
- TOLHURST, J. A. H. (1958). Report of the Agricultural Chemist for 1957. *Rep. Tea Res. Inst. Ceylon*: 28-32.