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## XIII. The Technique of Field Experiments

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### Discussion

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might be ascertained over one or two years by combining the results of such regional trials. The accuracy of such estimation will be all the greater if the number of trials is large and if the weather conditions vary to a considerable degree in the various districts of the region under consideration.

To sum up one may say that the routine methods of trials as at present largely practised do not meet our modern demands for accuracy. A search should be made for regions where the agricultural and climatic conditions are practically the same. In such regions a large number of experiments should be organised according to the same method. Only in this way can the real efficiency of fertilisers be ascertained. This is specially obvious when we are considering the effects of one particular plant food applied in different forms or at different times, where the effects may differ only to a very small degree and where the influence of the weather may be many times greater than such small differences due specifically to the fertiliser.

It is obvious that such a scheme of fertiliser experiments should be very carefully organised and carried out with meticulous care. This, however, is not impossible in practice, given a suitable staff of qualified workers. The number of agricultural institutes capable of carrying out such a scheme in this country is not sufficient to cover the whole country, and it will be necessary for fertiliser makers to engage in this work for themselves, but if such institutes as already exist could be persuaded to organise a large number of exact trials on a carefully conceived and uniform plan such work would go a long way towards providing the farmer with really reliable evidence of the practical value to him of modern chemical fertilisers.

## DISCUSSION

Dr. E. S. BEAVEN (Warminster), whose well known half drill strip method has been used by the National Institute of Agricultural Botany in their variety trials for many years, opened the discussion. On the grounds of ease of manipulation in the field he strongly preferred a systematic arrangement to the randomised system used by the Rothamsted workers. The statistician was a good servant but a bad master. He considered that the justification for agricultural experiments lay in the degree to which they helped the farmer's pocket. Continental workers had been ahead of this country in carrying out replicated experiments with a uniform plan at numerous scattered centres. He instanced the early work done on this plan in Denmark with Barley varieties.

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Dr. E. M. CROWTHER (Rothamsted) stressed the need for co-ordinated fertiliser experiments at a number of centres in order to provide material for chemical work on the available nutrients in soils. He mentioned the experimental rings as developed in Germany, where the financial support comes from the farmers themselves. An increasing amount of chemical work was now being done on the produce of experimental plots, and changes in the composition of the crop were frequently found even when no significant yield difference was demonstrated. For example, phosphates applied to hay had only a small effect on the yield in the first year, but in some areas almost doubled the amount of protein, and usually increased the content of  $P_2O_5$ . He mentioned recent lawn mowing trials where the degree of precision attained had been very satisfactory.

Mr. HOLME (Kenya).—On considering the papers he was in some doubt as to the best way of conducting field work. He doubted if Imperial Departments could provide the personnel to carry out work on the lines described. The experimental work done in the past may not have been of a high enough standard for the laboratory worker, but it had produced substantial results for farmers who were looking for large increases and had no interest in improvements of the order of 2 or 3 per cent. He instanced the good service which the strip method of experimentation had performed in the Transvaal, and emphasised the importance of conducting a simple uniformity trial before accepting a new experimental area.

Dr. WISHART (Rothamsted) defended the complex experiments as conducted at Rothamsted on the grounds that it was the complex experiments which provided the smallest standard errors. The value of Dr. Beaven's half drill method lay in its high degree of replication (at least ten-fold). If the Rothamsted manurial experiments could be replicated to such a degree it would be an advantage, but at present, with the large number of treatments involved, this was not practicable.

Dr. IMMER (U.S.A.) described the system of simple tests on ordinary farms carried out by Extension Agronomists with new varieties of cereals put out by the plant breeding stations. Single strips were sown at a large number of farms scattered over the State. Taken collectively, the information brought conviction and a 12 to 15 per cent. increase over the ordinary varieties was shown. The trials also demonstrated the parts of the State most suited to the new varieties.