CALIBRATION OF SOIL TEST METHODS FOR THE DETERMINATION OF PHOSPHATE AND POTASH STATUS

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INTRODUCTION

Intensive agriculture requires accurate advice on fertilizer requirements. If the advice is based on soil analyses much attention has to be paid to the agricultural "calibration" of these analyses.

The correlations between the analyses and the behaviour of the crops have to be established under normal farming conditions. Inevitably these conditions vary and calibration must therefore be performed on various soils and under various soil conditions. The following is an account of such calibration work carried out in the Netherlands.

METHODS

The general procedure in an investigation of this kind consists of the laying out of a series of field trials, on one soil group, all carrying the same crop. Such experiments are of one year's duration and are completed by further experiments which are continued for several years. The short-term experiments give the most direct information on the value of soil analyses. The long-term experiments make possible a comparison between the different crops of one rotation, and also the determination of changes in soil status under continued yearly fertilizer dressings of different magnitude.

Frequently the lay-out of the experiment is influenced by previous information. For example it is known that the availability of potash to the crop depends both on the potash status and on the lime status
of the soil. Care should therefore be taken that these factors are correctly related in the investigation.

The trial fields must be selected in such a way that there is considerable variation in the potash values as well as in the other factors mentioned. The selection of the fields therefore requires preliminary soil analyses. If extensive soil analyses, in relation to agricultural practice, have previously been carried out on soils in the region where it is intended to establish the experiments, then data from such analyses may be a valuable help in selecting the trial fields.

The number of trial fields required for an adequate experiment depends on the number of factors which are expected to be operative, the extent of the correlations between these factors and the extent of their influence and interactions. Experience has taught us that at least ab. 30 trial fields are necessary for a limited area.

Care should be taken that the proportion of the various categories of trial fields is relatively equal, i.e. as far as possible equal numbers of fields which are poor, moderate, or rich in potash (and also poor or rich in lime, clay, or humus), should be selected even if some categories are rare in the particular region being investigated. An effort is also made to avoid correlations between the principal factors to be studied. If, for example, there is an evident correlation between potash and clay content, then an attempt is made to select the trial fields in such a way that both at high and low potash content there is ample variation in the other factor and vice versa. Another aim is to acquire an even distribution from a geographical point of view.

Fig. 1 shows an example in which the fields intended for experimentation have been selected from the results of previous soil analyses. The choice was made from the graphs obtained by plotting the potash value against both the lime content and clay content (particles less than 16 μ) and also the two latter against each other. If 3 factors are involved, the combinations selected to be included in an experiment will, therefore, have to be evenly distributed over a cube.

The lay-out of the trial fields can be simple. In the above-mentioned experiments concerning potash, each field contained 10 plots, each of 25 square metres. Four plots received no dressing of potash; of the remainder, duplicate plots received 60, 150, 300 kg K₂O per