There are several stages in the process of calibrating a soil test procedure. One occurs in the laboratory where adsorption isotherms are obtained for specific soils using the soil test procedure. Based upon these laboratory results, preliminary studies are then conducted in the greenhouse with crops such as corn (*Zea mays* L.) and millet (*Setaria italica*) to determine the rates of fertilizer required to obtain optimal fertilizer response. A third phase is conducted in the field to see if the optimal rates obtained in the greenhouse should be adjusted for field conditions. Although response surfaces could theoretically be used in the greenhouse, it is the field phase of research where response surfaces become most useful.

It is usually necessary to conduct a series of experiments in a network of sites in order to calibrate soil tests. Similar experimental and treatment design throughout the series is necessary, as is similar management of the experiments. A paper describing several closely related methods of calibrating soil test data with field response for such a series of sites was presented approximately 10 years ago by Nelson and Anderson (1977) at the 1975 ASA meetings in Knoxville, TN. Their approach was to relate delta yield to the soil test determinations for a series of sites. *Delta yield* was defined as the difference between the yield of the treatment having no fertilizer and the yield of the treatment with all factors at adequate, but not excessive, levels. The advantage of working with delta yields rather than actual yields was that much of the among-site variation in levels of actual yields was due to factors other than fertilizer, such as climate and permanent soil properties. Two points on the response curve defined the delta yield, which was the only use of the response curve. Emphasis was placed more on the soil test data and their interpretation than upon the yield response curve. One soil nutrient was calibrated at a time, although multinutrient calibration was discussed briefly.

The approach in this chapter is to describe the response to added fertilizer by fitting a response surface mathematically to the yields obtained from the single experiment or to the yields obtained from all of the sites of the

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