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SOIL SAMPLING STRATEGIES FOR PRECISION SOIL TESTING

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ABSTRACT

A number of soil sampling procedures (stratified random, zigzag, strip and regular grid) were compared with the traditional random soil sampling and composite soil sampling. Soil samples were collected from an area of about 3.5 hectare at the Agricultural Research Institute, Dera Ismail Khan and analyzed for lime content, electrical conductivity, AB-DTPA extractable P and NH_4OAc extractable K. The data were analyzed statistically using classical and geostatistical techniques. The mean values of different soil properties were the lowest in the soil samples collected by simple random method. For all the sampling methods, variability (CV) was minimum for lime content and maximum for AB-DTPA extractable P Zigzag, strip, and regular grid system at a spacing of 25 m x 25 m were consistently better, as indicated by the ratio, method CV/ random CV, than random distribution method. The composite soil sample values of soil properties were not found to be the correct estimates. Regular systems required relatively consistent number of samples to accurately estimate the mean value of a soil property. Geostatistical analysis indicated the spatial distribution of lime content and random distribution of other soil properties. The spherical model for lime content semivariogram had a range value of 56 m.

INTRODUCTION

Soil samples are collected to make inferences regarding the productivity status of an area, to predict the response to applied nutrients or remedial treatments, and to investigate soil problems. In case of homogeneous fields where the variation of soil selection of an extractant cannot predict 100% of the variation of plant growth vs. soil test values (Fitts, 1956). Therefore, a recommendation based on an excellent soil sampling procedure can be compromised by laboratory or interpretative shortcomings. Therefore, the precision of field sampling is a major limiting factor in a soil testing programme.

This research was conducted to compare various soil sampling procedures to improve soil testing programme, and to study the spatial patterns of some selected soil properties. The findings may lead to an improved soil testing programme and help in understanding the variability patterns in the field.

MATERIALS AND METHODS

The work was carried out on a 3.5 hectares field located at the Agriculture Research Institute, Dera Ismail Khan during 1991.

Soil Sampling: A total of 88 surface (0-20 cm depth) samples (Table 1) were collected using simple random sampling, stratified random sampling, zigzag sampling, strip sampling and regular grid system (Figure.1). Five sampling cores were taken at each sampling point within 1 m^2 and mixed. One composite soil sample was also prepared from the six samples collected by the random sampling method. The data obtained from soil samples collected by regular grid system (25m x 25m) were used to produce two additional data sets