Sampling For Site-Specific Application

David W. Franzen
Ted R. Peck

Agronomy Department
University of Illinois
Urbana, Illinois

The number of soil samples needed to represent the variability of a field has been a matter for discussion since at least the 1920’s. The nearly simultaneous development of the high speed computer, global positioning technology and variable rate fertilization equipment has spurred interest in variable rate fertilization. Fertilizer rate change boundaries need to reflect much of the variability in the field. Some commercial variable rate fertilization programs use sampling densities of between 11 and 16 samples per 16.2 ha. to help define these boundaries. Most programs, however, have relied on assumptions rather than knowledge of background sample support to derive their sampling density. The objective of this study was to examine the background variability in a 256 sample per 16.2 ha. grid in two Illinois fields and use this information to compare less dense grid fertility features with the original features to determine what sampling density would adequately describe the variability in these fields. The original 25 meter grid was compared to a 100 meter grid and a 66 meter grid. The 100 meter grid did not identify many important features of pH, PI and available K maps as described by the 25 meter grid. The 66 meter grid, however, best identified features and approximate fertility boundaries of the 25 meter grid. The 66 meter grid could be adopted without a great cost in economics, while improving the probability for returns by better identifying areas which would benefit from variable rate application.

When the professors within the Land-Grant colleges first met to discuss their agricultural schools’ objectives in 1877, the very first experimental subject proposed was the variability in crop yields due to soil heterogeneity (Hatch, 1967). Farmers have acknowledged that different parts of fields yield differently. Some of this variability can be attributed to soil type (Beckett & Webster, 1971), but some is the result of unseen differences in soil fertility levels (Reed & Rigney, 1947; Petersen & Calvin, 1986).

Researchers recognized long ago that often extensive sampling of a field could form the basis for spot fertilizer application, resulting in a savings of money and labor (Linsley & Bauer, 1929). As fertilizers became less expensive...