
# GRID SOIL SAMPLING: HOW SMALL? HOW OFTEN? HOW USEFUL?

**Contributed by Dr. Steve Philips**
**Director, IPNI North America Program**

**Part 1 (of 2 part series)**

As variable-rate fertilization increases around the U.S., some of the most common questions being asked are related to grid soil sampling. In a grid sampling strategy, the field is divided into areas of a pre-defined size and soil samples are collected from each grid area using one of several sampling strategies, i.e. grid point, grid cell, offset grid point, etc. Like traditional soil sampling, the objective of grid sampling is to assess the nutrient status of the field. The difference is that instead of a single average value for the entire field, a contour map is created using GIS software that shows the range and pattern of soil nutrient status, which is used to establish management zones within the field.

What grid size should I use? This is an important question, as grid size will affect the cost of establishing the program. Ideally, the grid size will be small enough to accurately capture the range of nutrient status in the field; more highly variable fields should use a smaller grid size, while grid size in less variable fields can be larger. Research in Nebraska showed that increasing sampling density from 4.2 to 42 samples/A resulted in 45% of the field receiving a different N fertilizer rate recommendation and the average N fertilizer rate for the entire field was reduced by 14 lb N/A. However at another site, sampling densities of 14 samples/A and 1 sample/3.7A resulted in only 18% of the field receiving a different N recommendation and no change in the average N rate for the field.

Choosing a grid size is a bit of a catch-22, as it is helpful to know something about spatial variability in the field to select the optimum grid size; however, the very purpose of grid sampling is to determine spatial variability. Commercial services typically offer grid sampling ranging from 1 to 4 A/sample (8 to 10 soil cores/sample); however, university research suggests that for a soil nutrient map to remain valuable for several years, grid size should be 1 to 1.5 A/sample and not exceed 2.5 A/sample.

How often should I grid sample? As mentioned earlier, a soil nutrient map established at the optimum grid size to accurately capture the spatial variability in a field should last for several years. Multiple university guidelines suggest that grid sampling for P and K be repeated every 4 to 5 years, while pH maps are usually good for 8 to 10 years. In years between grid sampling, additional data layers can be used to refine management zones and guide directed soil sampling where needed. Knowledge on changes in soil type; yield map data; satellite, crop sensor, or UAS-based imagery; and field scouting knowledge can significantly improve nutrient management decisions.

Multiple data layers can help identify non-fertility factors such as compaction, pests, and soil textural changes that may affect nutrient status. Directed soil sampling (a composite sample collected from a specifically targeted management zone) based on multiple data layers can confirm where additional fertilizer is needed due to unusually high crop removal or nutrient losses.

How useful is grid sampling? Considering the challenge of selecting the optimum grid size and the potentially high cost, couldn't I just use directed zone sampling based on other data? Both grid and directed soil sampling are valid options for precision agriculture. Both also have their advantages and disadvantages. Grid sampling can be labor intensive and expensive, and arbitrarily selected grid sizes might not be small enough to accurately capture the nutrient availability in the field. Directed zone sampling is often more economical, but requires field knowledge and a higher skill level to incorporate multiple data layers. Directed soil sampling may also miss fertility patterns that could have been detected with an initial grid sample. Choosing the right precision soil sampling strategy depends on time and cost; who will be doing the work and what support is available; what information is available; and what equipment is available (some variable rate application equipment is controlled by software based on grid samples).

Regardless of the strategy used, precision soil sampling is an effective tool for managing the spatial variability in soil nutrients. Grid and directed zone soil sampling are simple first steps that growers can use to collect valuable information about their farms when establishing a precision agriculture program. *Applying fertilizer at the right rate and in the right place in the field based on spatial variability results in a more efficient and effective use of resources that can have economic, environmental, and social benefits for a sustainable agricultural system*.

Compliments of Advantage International TT #8