

T1.4 ZONE SAMPLING

What is zone sampling?

Zone sampling is a site-specific sampling scheme that is designed to split a field into zones containing similar soil or crop characteristics. Zones are managed as separate areas within the field and are often based on areas that exhibit similar field variability due to inherent soil properties (e.g. soil texture and drainage), management history (e.g. drainage, land shaping, spreader patterns, and previous land use), or historic production levels. (Austin et al., 2020).

A zone soil sample is basically the evolution of the composite soil sampling method. Originally we had features that were as easy to see as drainage. Nowadays, soil texture mapping and yield analysis provide many added layers on which to base management zones. The key is to refine the boundaries of the area as you learn more about the field (Cropquest, n.d.). Management zone sampling is an attempt to improve on traditional soil map unit sampling by using information that can be collected using precision agriculture technologies (Ferguson et al., 2000).

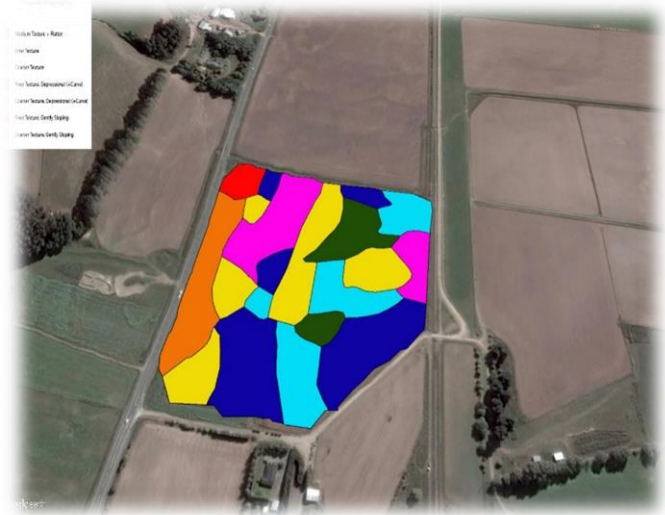


Figure 1: Zone samlipng
Source: www.smartagsolutions.co.nz

Zone sampling uses zones of different sizes and shapes to define a sampling area. Each zone includes areas with similar soil properties or production characteristics known to vary within the field (elevation, yield from previous crop or soil type). Compared to cell or point sampling, zone sampling generally reduces the number of samples needed to quantify spatial variability in soil properties. In zone sampling, composite samples are collected in areas of similar production, soil or management. Zones often include areas with different management histories, constantly changing crop yields, or different topographical positions, such as hills or floodplains.

When developing sampling areas, one must consider the consistency or "stability" of the various factors affecting yield. Zones using factors that do not consistently affect yield may unnecessarily influence the soil sampling scheme compared to grid cell or point sampling. This method samples 15-to 20-cores within the zone, or approximately one core per acre.

Types of zone sampling

According to Dinkins (2008), there are several types of zone sampling:

- **Soil series:** Soil series zone sampling identifies areas within and between fields that are unique from each other by using soil surveys and topographic maps. Each soil series differs in its soil properties and will likely have different levels of available nutrients. Therefore, separate soil samples for each soil series in a field are collected. Soil test results may then be area-weighted based on the acreage of each soil series.

- **Topographic unit sampling:** Fields vary in natural features such as elevation, hilltops, slopes, or depressions. Topographic/geographic unit sampling assumes these features differ in soil characteristics and therefore uses these features to establish unique zones. There are basically two different types of topographic/geographic unit sampling: area-based and point-based sampling. Area-based soil sampling means that more than one soil sample is collected and composited from near the center of each topographic zone, whereas point-based soil sampling only collects one sample from the center of each topographic zone (Dinkins, 2008).

Main benefits of zone sampling

Zone sampling can reduce the number of samples and sampling costs while maintaining acceptable information about nutrient variability within a field. For example, regions of fields that have had different crop histories, yield or fertilizer treatments, and/or that vary substantially in slope, texture, depth, and/or soil color should be separately sampled and therefore established as a zone. This approach is compatible with the fact that soils are sampled not only for P and K but also for other nutrients and for purposes other than fertilization. Sampling by zone assumes that sampling units can be identified on the basis of areas with different soil or crop characteristics across a field and that patterns are likely to remain temporally stable. Specific criteria used to delineate management zones, other than soil survey maps, vary depending on tools available to producers, their costs, and on how they adapt to the particular conditions of the region or field (Mallarino et al., 2001).

Zone sampling reduces the number of samples required while still recognizing zones of differing nutrient status and fertility requirements. It typically defines smaller, more detailed areas compared to those defined under standard sampling guidelines. Multiple spatial data layers are usually combined (for example, historic yield and soil type) to develop zones (Austin et al., 2020).

List to relevant topics

Austin, R., Gatiboni, L., Havlin, J., (2020). Soil Sampling Strategies for Site-Specific Field Management. NC State Extension Publications. August 10, 2020 AG-439-36. Retrieved from: <https://content.ces.ncsu.edu/soil-sampling-strategies-for-site-specific-field-management>. Accessed on 22.10.2022.

Cropquest (n.d.). Zone soil sampling. Retrieved from: <https://www.cropquest.com/precision-ag-services/zone-soil-sampling/>. Accessed on 26.10.2022.

Dinkins C.P, (2008). Soil Sampling Strategies. Self-learning resource from Montana State University Extension. New April 2008 1000-408SA. Retrieved from: www.animalrangeextension.montana.edu. Accessed on 26.10.2022.

Ferguson R., B., Hergert Gary W., (2000) Soil Sampling for Precision Agriculture. Retrieved from: https://www.researchgate.net/publication/282227550_EC00-154_Precision_Agriculture_Soil_Sampling_for_Precision_Agriculture. Accessed on 27.09.2022.

Mallarino, A., 2001. Management zones soil sampling: a better alternative to grid and soil type sampling? Presented at the 13th Annual Integrated Crop Management Conference. December 5-6, 2001, Iowa State University Extension, Ames, IA.

Key words

management zone sampling

soil series

topographic unit sampling