T1.2 SOIL SAMPLING

What is soil sampling?

Soil sampling is the process of taking a small sample of soil, which is then sent to a lab to determine the nutrient content. The soil can also be tested for the chemical, physical and biological properties, which are critical to plant nutrition. Basic plant nutrition requires the presence of nutrients such as nitrogen, phosphorus and potassium – soil sampling can also determine the pH levels of the soil alongside humus content, available lime, complete sulphur content and total CaCO3 (AWSM Farming, n.d.).

Soil analysis is done by taking soil samples and performing laboratory tests followed by interpretation of the results. Additional fertilizer and soil conservation recommendations can then be provided (AWSM Farming, n.d.).

Historically, soil sampling aimed to determine the average nutrient status and variability in a given field. Soil sampling for precision agriculture has the same goals with some modifications. Instead of a field, growers are interested in areas in fields. They are also interested in relating trends in soil fertilizer levels to other field properties that are predictable or easily measurable (University of Nebraska–Lincoln, n.d.).

How is soil sampling carried out?

Knowing the factors affecting soil nutrient levels, including soil type, topography, cropping history, manure, fertilizer application, and irrigation leveling will help the grower determine the most effective approach to taking samples. The basic principles of soil sampling still apply (University of Nebraska–Lincoln, n.d.):

Figure 1: Soil Sampling Equipment
Source: www.no-tillfarmer.com

- A sufficient number of samples must be collected to accurately characterize nutrient levels.
- Samples should be taken at the correct depth for immobile and mobile nutrients.
- Samples should be handled and stored to minimize contamination and degradation.

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The number of soil samples to be taken from a field may depend on the variability of the soil in the field. For example, intensive soil sampling can bring more profits to the farm if variations in soil structure, crop history, slope, and nutrient availability are large in the field. Information about these factors can help determine the number of samples and the soil sampling strategy to use. Recent advances in affordable precision agriculture technologies and tools - such as global positioning system (GPS), geostatistical tools, and the use of crop sensors to detect plant status and canopy color - have led to new precision soil sampling techniques. New innovative approaches to soil sampling have also been developed (Figure 2 and Figure 3).

Figure 2: Soil Sampling Machinery
Source: www.agronomy.org

The main purpose of using precision soil sampling is to enable variable fertilizer application rates based on needs in each zone in the field. Fertilizer application rates are tailored to what is needed in different parts of the field. Accurate soil sampling results in higher fertilizer use efficiency, reduced nutrient loss, and protection of surrounding natural resources. Precision soil sampling techniques use data from a variety of sources, including but not limited to: (1) yield monitors; (2) topographical maps; (3) electrical conductivity (EC); (4) spectral reflectance; (5) soil color; (6) soil nutrient status based on intensive sampling (Farmaha et al., 2020).

Precision sampling techniques allow a field to be divided into multiple homogeneous management zones and nutrients applied based on the likelihood that the crop will respond to changes in those zones.

A pair of Purdue University graduates have founded a company called Rogo Ag LLC. They have developed an autonomous Robotic soil sampler called "Smartcore".

Smartcore is designed to collect accurate, repeatable soil samples in fields and bring the samples directly to farmers or other growers. www.purdue.edu.

Figure 3: Robotic soil sampler

Main benefits of soil sampling

According to AWSM Farming (n.d.), there are a number of key benefits of soil sampling which include:

– Determining the levels of available nutrients currently available in the soil. Based on this, the farmer can add more nutrients to the soil, as well as determine more precisely which crops will give the best growth in that particular soil.

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- Precision agriculture relies on practices such as soil sampling, which allows growers to sample individual areas of a field to determine factors such as soil type and topography and to characterize nutrient levels.
- Grid sampling is one of the favorite methods of soil sampling and management, offering a relatively easy way to facilitate the operation. The samples taken during grid sampling can then be used to create a map that contains soil test values.

Links to relevant topics

AWSM Farming (n.d.). Soil Sampling. Retrieved from: https://www.awsmfarming.co.uk/agricultural-contracting-services/soil-sampling/. Accessed on 29.10.2022.

Farmaha B., S., Caughman, W., Park, D., (2020). Precision agriculture-based soil sampling strategies. Retrieved from: https://lgpress.clemson.edu/publication/precision-agriculture-based-soil-sampling-strategies/. Accessed on 29.10.2022.

University of Nebraska–Lincoln (n.d.). Soil Sampling for Precision Agriculture. Retrieved from: https://cropwatch.unl.edu/ssm/soilsampling. Accessed on 29.10.2022.

Key words

precision sampling
robotic soil sampler
soil nutrient status
soil structure

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