



# Soil Sampling and Analysis

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**S**oil analysis can provide important information about physical conditions, fertility (nutrient) status, and chemical properties that affect a soil's suitability for growing plants. Four steps associated with soil testing include: 1) soil sample collection, 2) laboratory analysis, 3) interpretation of results, and 4) fertilizer or other management recommendations. We'll look at soil sample collection and analysis.

## SOIL SAMPLE COLLECTION

The first step in soil analysis is soil sample collection. It's important to realize that only a tiny portion of a field is actually analyzed in the laboratory. Thus, collecting a representative soil sample is critical for accurate results.

The most common method is composite sampling. Sub-samples are collected from randomly selected locations in the field. The sub-samples are thoroughly mixed to obtain a representative sample and analysis of this sample gives average values for the entire area. Although the actual number of sub-samples depends on field size and uniformity, no less than 5 sub-samples should be taken, and 15 to 25 are preferred. Usually samples are collected to a depth of about 6 to 8 inches or to the effective rooting depth.

Soil samples should be immediately air-dried at room temperature for two to three days and should not be heated or dried in an oven. If samples cannot be dried immediately, they can be refrigerated for several days and taken to a laboratory as soon as possible.

The primary consideration for timing of soil sample collection is convenience. Collect samples early enough to allow for interpretation and soil management adjustments. Status of some soil nutrients can change quickly, whereas others do not. For example, phosphorus levels in soil are unlikely to change rapidly and frequent testing is unnecessary. Nitrogen levels, on the other hand, change very quickly and only very recent tests will reflect current plant-available levels. When making substantial changes to soil fertility levels, it is a good idea to make the change over a period of two to three years, retesting the soil annually.

Otherwise, occasional testing (once every few years) is adequate in the absence of any noticeable nutritional deficiencies.

## SAMPLE ANALYSIS

A soil test determines the soil's nutrient supplying capacity by mixing soil during the analysis with a very strong extracting solution (often an acid or a combination of acids). The soil reacts with the extracting solution, releasing some of the nutrients. As soil supplies most of the mineral nutrition for higher plants through the plant's root system, the extracted nutrient concentration is evaluated based on research that relates plant utilization to soil nutrient concentrations. This works well for some nutrients, but is less accurate for others. Nutrients supplied from soil organic matter (OM) decomposition (such as nitrogen and sulfur) depend more on the rate of OM decomposition than on extractable levels of these nutrients.

Standard or routine soil tests vary from laboratory to laboratory, but generally include soil texture; electrical conductivity (EC, a measure of soil salinity); soil pH; available phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg); sodium (Na); cation exchange capacity (CEC); and often an analysis of OM content. Most laboratories offer nitrogen (N), sulfur (S), and micronutrient analyses for additional cost.

The methods used to test soils vary depending on soil chemical properties which are affected by geographic region. A listing of local soil test laboratories that use methods suitable for local soils can be found in the University of Arizona publication, "Laboratories Conducting Soil, Plant, Feed or Water Testing" (AZ1111) <http://cats.arizona.edu/pubs/garden/az1111.pdf>.

## STANDARD SOIL TESTS

### Soil Texture

Soil texture reflects the amounts of various sized particles (sand, silt, and clay) in the soil. Relative amounts of these particles are used to categorize soil into textural classes. Listed generally from most clayey to most sandy these are clay, silty clay, sandy clay, silty clay loam, clay

# Soil Sampling And Methods Of Analysis

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Lawrence H. Keith, 1996-09-26 The popular first edition of this book contained approximately 600 analyte method summaries This new edition contains twice as many new EPA approved methods for testing and analyzing industrial chemicals pesticides herbicides dioxins and PCBs and is a printed version of the EPA's Sampling and Analysis Methods Database Each analyte method summary contains all of the information required to stand alone as a reference Thus in addition to a brief summary of each method descriptions include required instrumentation interferences sampling containers preservation techniques maximum holding times detection levels accuracy precision quality control requirements EPA reference and when available EPA contacts with phone numbers Each summarized report is a stand alone document

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Kim H. Tan, 2005-04-29 As with the highly popular original this new edition of Soil Sampling Preparation and Analysis provides students with an exceptionally clear description of the sampling and analysis methods most commonly used in modern soil laboratories around the world What sets it apart as the first choice of professors is the grounding it offers in fundamental principles professional protocols and specific procedures What makes it especially popular with students is that it spares them from having to tote large volumes for the sake of a page or two Fully revised to introduce the latest advances the text is lucidly illustrated with original results garnered from years of hands on experiments conducted by the author and his students In response to requests from active users of the first edition these new features have been added Three new chapters on soil and plant test methods A focus on testing and analysis limited to edaphology as opposed to edaphology and pedology as a whole in the ecosystem Information and insight reflecting the author's expertise on electron microscopy and nuclear magnetic resonance Extensive revisions and expansion to include recent advances and shifting interests in the field Soil Sampling Preparation and Analysis is divided into three sections the first covers principles of soil sampling sources of errors and variability of results the second explains common procedures for extraction and analysis in soil plant testing and the last covers instrumentation While Professor Tan designed and further honed the book to serve the

practical needs of students with this volume he also provides them with an essential reference that will continue to serve them throughout their training and into their careers      **Soil Fertility Decline in the Tropics** Alfred E. Hartemink, 2003 Wide coverage of soils and perennial cropping systems in the tropics Synthesis of decades of research Challenges assumptions on the benefits of plantations for soil fertility It is generally assumed that soil fertility decline is widespread in the tropics and that this is largely associated with annual cropping and subsistence farming In contrast perennial plant cover as in plantation agriculture provides better protection for the soil This book reviews these concepts focusing on soil chemical changes under different land use systems in the tropics These include perennial crops annual crops and forest plantations Two case studies on sisal plantations in Tanzania and sugar cane in Papua New Guinea are presented for detailed analysis The author demonstrates that soil fertility decline is also a problem on plantations      **Handbook on Metalloproteins** Ivano Bertini, Astrid Sigel, 2001-06-29 This Handbook on Metalloproteins focuses on the available structural information of proteins and their metal ion coordination spheres It centers on the metal ions indispensable for life but also considers metal ions used as substitution probes in studies of metalloproteins Emphasizing the structure function relationship the book covers the common and distinct characteristics of metallo enzymes proteins and amino acids bonded to copper zinc iron and more

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