Soil Sampling

FACT SHEET 2

Soil sampling to identify the chemical composition of your soil, either the plant available nutrients or the total nutrient pool can be a valuable source of information on which to make informed decisions. Informed decisions regarding the need for inputs and the appropriate type of soil amendment or management to be applied.

Why sample your soil

The chemical composition and the balance of soil nutrients in your soil is one of the important factors contributing to plant growth and productivity.

There may be a range of reasons for conducting a soil chemical analysis and the protocols for sample collection will vary depending on the purpose of the sampling, that is the questions you are asking regarding the chemistry of your soil.

If you want to look at changes or monitor the health and condition of your soil over time the approach to sampling will be different to identifying the appropriate nutrients and rate to apply to address any nutrient deficiencies or excesses to potentially increase plant production.

Your approach to soil chemical sampling will depend on the questions you want to answer regarding your soil

Soil type and condition can vary significantly across the landscape, between and within paddocks. If you're unsure of soil type changes look at the vegetation. Different species of plants or the condition of plants may provide clues to changes in the soil. When sampling soil different areas should be considered individually, based on factors such as soil type, position in the landscape and relative productivity.

How to sample your soil

Consider the areas you intend to sample and if a range of soil types exist. Collect separate samples from each soil type or, if sampling a paddock, collect soil from the predominant soil type.

For the soil test to be a reliable indicator of your soil your sample must be representative of the paddock or area sampled. As a minimum, at least 20 cores or subsamples should be collected and thoroughly mixed. The more cores collected the more reliable the sample.

The equipment needed for sampling includes a soil corer or spade, a small bucket or plastic bag to collect the cores a sample container or bag to be submitted to the laboratory, labels and recording sheet.

Figure 1: A soil corer and appropriate use.

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Ensure all equipment used is clean and cleaned between sample collection. Mix the bulked sample cores thoroughly and transfer the required amount of soil, usually between 200 and 500g, into a container which will often be provided by your laboratory or a clean plastic bag. Be sure to minimise your handling of the soil during this process.

Collect a representative sample

Use of a soil corer is preferred to ensure consistency of each subsample (core). If you don't have access to a corer try to be consistent in your use of a spade to take a uniform slice up to 20mm thick to the required depth. For pastures and crops core samples should be to at least 10cm and up to 15cm depth. All subsamples must be to the same depth and that depth recorded at the time of sampling.

Samples should be collected from representative areas. Avoid areas of obviously higher or lower productivity (unless this is the specific area of interest for sampling), animal camps or tracks, areas close to gateways, water points or fences. Avoid any unusual areas such as depressions or wetter areas, patches that may have been burnt or where fertilser may have previously been stockpiled.

If fertiliser or other soil amendments have been applied to the area in the previous 3-4 months it's best to postpone sampling these areas. Areas that have different fertiliser or management histories should be sampled separately. Different topographical locations, hills and flats should be sampled separately.

When collecting each core remove the surface material, plants and or litter, so that the tip of the corer goes into bare soil at the sample site. Sample between plants where possible. In cropped paddocks cores should be collected between plants within rows.

Ensure that samples are clearly labelled and record by mapping or GPS the location and date of soil sample collection for future reference. Samples should be submitted for chemical analysis as soon as possible after collection.

Subsoil samples

Subsoil samples may be required to investigate any subsoil constraints. These may include any toxicities or pH issues at depth. Generally there is less variability in subsoil so fewer cores will likely be required to achieve a representative sample.

When taking subsoil samples you can consider sampling specific depths or take the approach of sampling different soil horizons where changes in chemistry are more likely to be more obvious with textural or colour changes. Also keep in mind that the depth of different horizons will likely vary across an area.

When to sample

Soil samples should ideally be collected during autumn or spring avoiding periods of extreme wet or dry soil conditions. If planning soil treatments or a fertiliser program, samples should be collected at least one month prior to allow time to determine treatment requirements, product purchase and application.

If sampling pre planting, soils should be sampled 1-2 months in advance. Follow up samples from the same location may be taken every 2-3 years afterwards. Ideally these samples should be collected during the same seasonal period, in similar environmental and soil moisture conditions.

Where to sample

The sampling strategy you employ will depend on the variability of soils and topography of the paddock as well as the purpose of the soil testing. A number of approaches may be employed.

Single transect is the simplest of strategies applied in a relatively uniform, in terms of soil type, paddock. Two markers, e.g. trees or posts can be identified and core samples collected between these points, the GPS locations of these points recorded. A single or multiple transects may run through a paddock. Transect sampling allows for the sampling line to be confidently revisited in subsequent years to monitor changes in fertility.

Figure 2: A single transect across a uniform paddock.

As an example, a single transect across a relatively uniform 10ha paddock may be 400m long. Samples may be collected at 20m intervals to achieve a representative sample across the site.

Figure 3: Multiple transects across a uniform paddock.

Zigzag sampling provides the best coverage of an area if care is taken with the sample collection. This is often the best strategy for collecting samples to diagnose nutrient deficiencies or excesses if a fertiliser or soil amendment program is planned.

Figure 4: Example of zigzag sampling strategy.

Be sure to differentiate between different soil types or topography within a paddock.

Individual bulked samples may be collected using the transect or zigzag methods, whatever gives you the best representation of the soil in the area for the purpose of the testing.

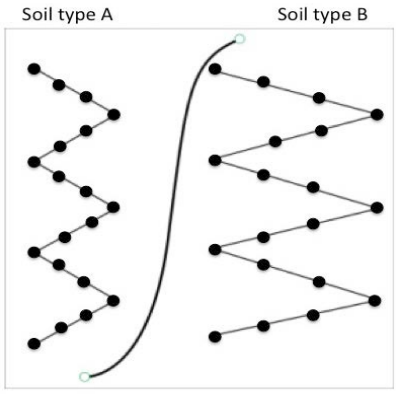

Figure 5: Sampling different soil types within a paddock.

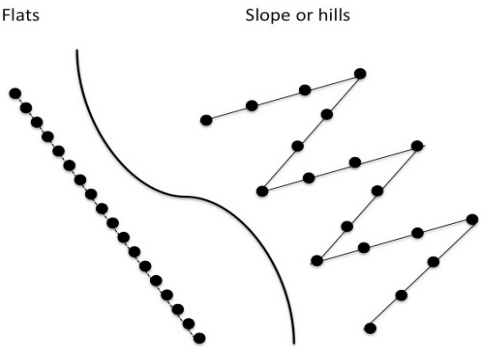

Figure 6: Sampling different land types within a paddock.

All the soil sampling methods mentioned above involve random sampling. The potential for replicate samples to be collected over time will depend on the level of your recording relating to sample collection.

Grid sampling allows for a systematic, non random, approach to soil sampling which can be applied on a whole paddock basis or for sampling relatively smaller areas. It allows for a higher degree of precision where repeat samples are collected over time.

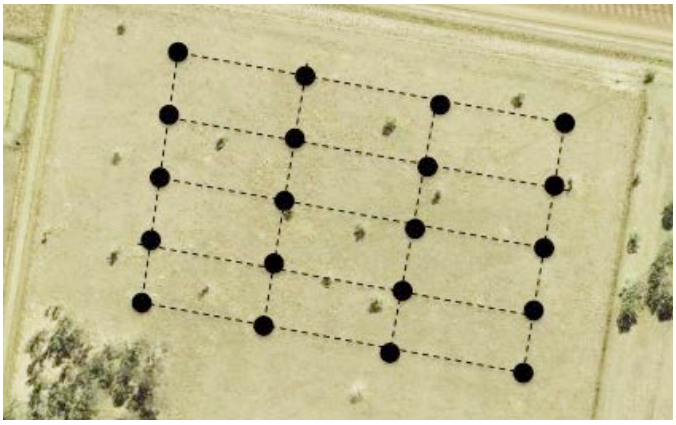

Figure 7: Grid sampling.

Grid sampling is most accurate for monitoring changes over time, particularly over small areas. It is applicable for experimental trials, in precision agriculture situations or prior to undertaking development projects

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Fact sheet 2

What to test

Different laboratories offer a range of analytical services. Ensure that the laboratory you choose provides the analyses you require to deliver the information you need about your soil.

A standard soil test analysis generally provides information on a range of plant available nutrients. For most elements the plant available pool is less than the total amount in the soil. Some elements are chemically or physically bound and not present in a form readily available for plant uptake.

More information on soil chemistry, nutrient availability and soil test interpretation is provided in Factsheet 3 of this series.

TYPE	TESTS INCLUDED
Basic test	Organic matter, pH, EC Plant available macro nutrient levels; nitrogen (N), phosphorus (P), potassium (K), sulphur (S)
Standard test	Organic matter, pH, EC Plant available macro nutrient levels; N, P, K, S Exchangable sodium (Na), calcium (Ca), magnesium (Mg), potassium (K), Aluminium (Al) cation exchange capacity (CEC) Total carbon, total nitrogen and C:N ratio
Standard test plus trace elements	Includes all elements in the standard test plus plant available micronutrients; iron, copper, boron, manganese, zinc, silicon.
Total nutrients	Includes all elements in the standard test plus trace elements and analysis of the total soil nutrient pool.

The type of soil test you select will depend on the information you require.

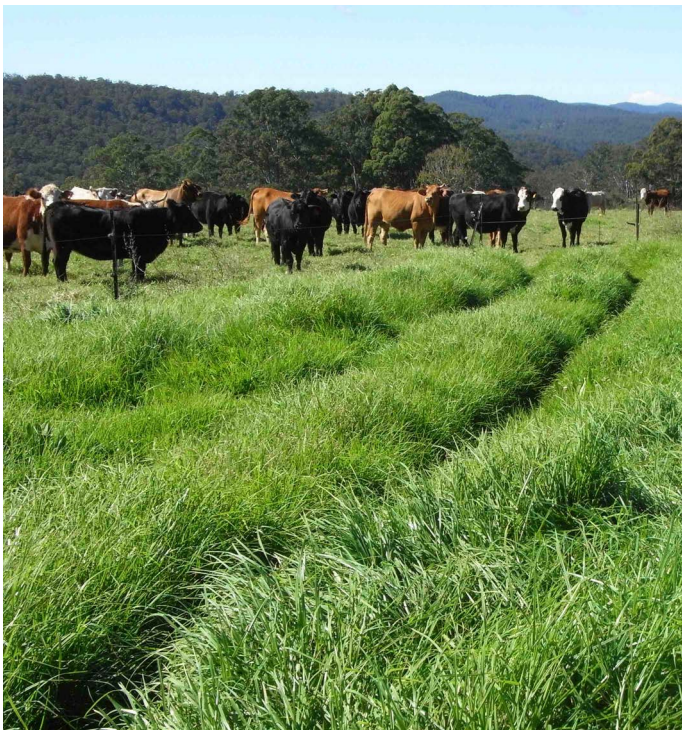

Figure 8: A soil chemical analysis of an area will provide otherwise unavailable information on which to make informed decisions to improve soil health and productivity.

This is the second of a series of 12 Factsheets which cover a range of topics detailing the critical elements for soil health and a range of soil processes. They are designed to help you achieve effective soil function and increase productivity.

More Information

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