



Soil analysis and soil carbon

What should you be looking for when getting your soil tested?

Soil sampling is a useful management tool that can be used prior to establishing a vineyard and also throughout the productive life of grapevines. Soil analysis can provide critical information about the key properties of soil, nutrient status, fertiliser requirements or to monitor the efficacy of soil amelioration, for example the addition of lime or gypsum.



WHEN IS THE BEST TIME TO TAKE SOIL SAMPLES?

Soil sampling can be done at any time of the year, although late winter and spring are the best times to show the soil status at the beginning of the season. It is also beneficial to collect samples at these times because the soil has been 'flushed' of accumulated salts and other mobile nutrients.

WHAT SHOULD I CONSIDER WHEN TAKING SOIL SAMPLES?

A consistent and appropriate soil sampling technique is essential to ensure accurate results. Sampling sites need to be chosen based on what it is that you want to investigate. For example, if an area of the vineyard had poorly performing vines, samples should be collected from both the good and poor performing areas for comparison.

At a minimum, different soil types within a vineyard should be treated as different sampling areas. Within those, either representative sites should be sampled and combined if an overall

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picture of the soil status is required, or 'problem' areas may be sampled separately to determine the characteristics of the soils in those areas.

When soil sampling for nutrient analysis, the main determining factor is the depth of vine roots, as any nutrients past that point are not available to the plant. It is a good idea to dig a hole or a selection of holes and see where the roots predominate. However, as it is not always possible to sample at the bottom of the root zone, particularly where roots extend more than one metre into the profile. Compromises can be made, for example, sampling to 50cm may be adequate as the majority of the fibrous roots are usually within the top 50cm of most soils. This is, however, a generalisation, so where there is any doubt, focus on shallower rather than deeper samples given that nutrients will tend to be in greater supply in the upper parts of the soil profile.

It is also a good idea to separate surface and sub-surface soil samples, as they will have different properties. Sampling where soils are obviously different and most vine roots are observed is the best approach, but if this is not possible a good rule of thumb is to sample at 5-15cm, 25-35cm and 55-65cm.

WHAT IS ORGANIC CARBON IN THE SOIL AND HOW IMPORTANT IS IT?

Soil organic matter is one of the key results gained from soil analysis. It represents a measure of the material in the soil derived from living species. This includes the decomposing remains of plants and animals in various stages of breakdown, the cells and tissues of soil

Table 1. Organic matter levels (%) in different soil types. Adapted from Baldock and Skjemstad, 1999.

	Sand	Sandy loam	Loam	Clay loam/clay
Low	0.9	1.2	1.6	2.1
Moderate	0.9-1.7	1.2-2.4	1.6-3.1	2.1-3.4
High	>1.7	>2.4	>3.1	>3.4

organisms and substances made by plant roots and soil microbes.

Well-decomposed organic matter forms humus — a dark-brown, porous, spongy material that has a pleasant earthy smell. Soil organic matter is generally measured as the amount of carbon in the soil and it plays many beneficial roles, including:

- Providing food for soil microbes;
- Providing nutrients to plants (particularly nitrogen, phosphorus and sulfur);
- Stabilising soil structure and increasing water holding capacity;
- Making it easier for water to enter the soil;
- Reducing run-off and erosion;
- Improving the soil's ability to hold nutrients and thereby reducing pollution potential;
- Helping to buffer soil against changes in pH; and
- Possibly protecting plants against disease.

HOW MUCH SOIL CARBON IS NEEDED?

Table 1 provides a guide to the organic matter levels (%) considered to be high, medium and low for several different soil types found in South Australia. Due to the inherent variability between samples, it is often more useful to compare results from different sites within the vineyard,

remembering that in a general sense more organic matter usually means a 'healthier' soil. It is also worthwhile noting that:

- Most Australian soils are low in organic matter by world standards — a reflection of our geological/biophysical history and our climate;
- It can be difficult to increase the (stable) fraction of organic matter in soil. Organic materials such as mulch or straw usually have to be applied at high levels (e.g. several tonnes per hectare) for many years to appreciably increase organic carbon levels; and
- When looking at options to maintain or raise organic matter levels, an option to consider is growing grasses and other plants with fibrous root systems in the vineyard as cover crops or swards. The roots of such plants and their attendant soil microorganisms are significant contributors to organic matter levels within the soil.

For more information about soil carbon or soil analysis, contact the AWRI helpdesk on helpdesk@awri.com.au or 08 8313 6600.

Reference:

Baldock, J.A., Skjemstad, J.O. 1999. Soil Organic Carbon/Soil Organic Matter. Peverill, K.I., Sparrow, L.A., Reuter, D.J. (eds.) Soil Analysis: an Interpretation Manual. Melbourne: CSIRO Publishing: 159-70.

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