



Vineyard activities 1: Taking soil samples

Current titles in this Vineyard activity guides Vitinote series include:

1. Taking soil samples
2. Measuring soil pH
3. Measuring soil salinity
4. Measuring organic carbon in soil
5. Assessing soil structure
6. Measuring soil porosity
7. Measuring soil strength
8. Measuring the infiltration rate of water into soil
9. Examining grapevine root systems
10. Monitoring soil moisture

To gain an accurate breakdown of the physical, chemical and biological components of soil a consistent and appropriate sampling technique is essential.

A simple method of sampling is preferred in vineyards as there is limited space under vines and between rows.

In vineyards where nutrients are supplied exclusively via fertigation, sufficient information can be gathered if samples are taken in the vine row where most of the vine roots are located.

Grapevine roots are generally not confined to one vine row and, depending on soil conditions, may extend over several row widths.

It is best to take soil samples between the row and the wheel track in irrigated vineyards, and anywhere in non-irrigated vineyards.

EQUIPMENT

- Sampling tool (preferably a soil auger or core sampler, although a shovel or trowel can be used)
- Buckets for sample collection
- Plastic sheet for mixing
- Plastic bags for transportation
- Recording sheet and pen

The soil sampling tool used will depend on what is readily available, but consideration must

be given to the method suited to the measurements required from the sample. Equipment options are detailed in a table over the page.

TIMING

Autumn and spring are the best times for soil sampling, as winter can be too wet and in summer the ground may be too hard. Although, soil sampling can be done at any time of the year.

WHERE TO SAMPLE

Sampling sites should be chosen according to what needs to be investigated. At a minimum, different soil types within a vineyard should be treated as different sampling units.

Within each soil type, representative sites should be sampled and combined to give an overall picture of soil status, or 'problem' areas should be sampled separately to determine their characteristics. Information that helps determine sampling locations include:

- an EM38 soil survey (the best source)
- local expertise of the vineyard manager and his/her consultant
- yield maps
- remotely sensed imagery (e.g. from the phylloxera board or a range of commercial providers)

Table 1. Soil sampling tool options.

Screw type soil auger	These augers are either mechanically or manually operated and are used to get an averaged sample down the profile. It is difficult to differentiate between soil layers using screw type augers.
Edelman soil auger (Dutch auger)	A reasonably intact sample with only slight mixing is obtained with this type of auger. Various designs and sizes are available to suit different soil textures. Sample can be taken from 10cm to over 1m depth.
Soil core sampler	A soil core sampler is used to obtain intact soil cores to a shallow depth (~10cm–50cm). It is made up of a section of metal tubing with a sharpened beveled tip with provision for pushing it down into the soil either by stepping onto a ‘foot bar’, hitting with a sledge hammer on the top, or using a jack hammer. Alternatively, there are hydraulic soil core samplers available which are used to obtain intact soil cores up to ~3m in depth. These are generally mounted on a tractor or trailer, making them difficult to use in the vine row due to restricted maneuverability of this machinery. The hydraulic soil sampler is more appropriate for between row sampling.
Shovel/trowel	Care needs to be taken when sampling soils with a shovel to ensure that the sample is not biased to the top or the bottom of the soil profile. The sample must be evenly distributed through the depth of sampling so that measurements of the soil properties are representative. This is best achieved by digging a hole with the shovel and then removing soil samples from the walls of the hole using a trowel.

METHOD

1. Clear away weeds and other loose organic material so the soil surface is uncovered.
2. Take at least three soil samples (approximately six cups of soil) at each site and place samples in a plastic bucket. Depending on what information is required, it may be necessary to take samples from different depths in the soil profile and keep these separate for analysis.
3. Label the bucket with the date, property, depth and location in the vineyard or site designation. The labeling system for samples should be clear (e.g. B1R5P10 = block/site 1, row 5, panel 10, or GPS coordinates).
4. Take samples to a sheltered place to dry without being contaminated by other soils or fertiliser. Spread each sample on a plastic sheet to air dry (approx. 24 hours at 20°C). You will need one plastic sheet per sample. Make sure the plastic sheets are also clearly labelled. A good way to do this is with a paper luggage tag.
5. When soil is dry, break up any clods, remove stones and mix the sample well; use the plastic sheet to move the soil around. When mixing, be careful not to crush the soil aggregates too much, as intact soil aggregates are required to test dispersion and slaking (breakdown of structure upon wetting).

6. Most laboratories require approximately two cups per sample of the mixed soil for analysis (e.g. after mixing, discard half, remix and remove two cups). Place the two cups in a plastic bag with the date, property, depth (if relevant) and location in the vineyard or site designation clearly marked.
7. Check with your State Government Department of Agriculture or Primary Industries for contact details of laboratories in your state or region.
8. Check with the laboratory to ensure samples can be legally sent. If you are in a Phylloxera Risk Zone (PRZ) or Phylloxera Infested Zone (PIZ) consult the National Phylloxera Management Protocol before sending – www.phylloxera.com.au/

Note: Sample sizes or sampling methods for different laboratories may vary. Check with the laboratory used to see if they request a certain quantity of soil, or specify a certain collection method.

NUMBER OF SAMPLES TO TAKE

When determining how many samples to send to the laboratory for analysis, or the number of analyses to carry out, there is a balance between time, cost and statistical accuracy. Although more samples do provide results with greater accuracy, cost also plays a role, i.e. the cost per sample will influence the number of samples analysed.

DEPTH OF SAMPLE REQUIRED

When sampling for nutrient analysis, depth of vine roots is the determining factor as nutrients past that point are unavailable to the plant. It is a good idea to dig a hole or selection of holes to see where the roots predominate.

Some assumptions may have to be made to determine depth of roots:

- age of vine
- soil type (if hard/dense B horizon, roots may have a limited depth)
- soil pH (large changes in pH at a certain depth may restrict root growth)
- soil salinity (high salinity levels at depth will restrict root growth and/or performance)

However, as it is not always possible to sample at the bottom of the root zone, particularly where roots extend more than 1m into the profile, compromises can be made (i.e. sampling to 50cm may be adequate as the majority of the fibrous roots are usually within the top 50cm of most soils).

However, this is a generalisation so where there is doubt, focus on shallower rather than deeper samples, given that nutrients tend to be in greater supply in the upper parts of the soil profile.

Note: It is a good idea to separate surface and subsurface soil samples, as they have different physical and chemical properties. Sampling where soils are obviously different and most vine roots are observed is the best approach, if this is not possible a good rule of thumb is to sample at 5–15cm, 25–35cm and 55–65cm depth (these boundaries are conservative to ensure samples are actually different layers).

When interpreting the results, it is important to remember that surface layers will generally have higher nutrient levels than subsurface layers.

FURTHER INFORMATION

Product or service information is provided to inform the viticulture industry about available resources, and should not be interpreted as an endorsement.

The information in this Vitinote has been trialed by viticulturalists as part of the Cooperative Research Centre for Viticulture's Viticare On Farm Trials project. For information about On Farm Trials, visit www.crcv.com.au/viticare/

A key reference on these topics is:

- Nicholas P (Ed.) (2004) Soil, irrigation and nutrition, Grape Production Series 2, SARDI, Adelaide.

Another useful reference is:

- Nicholas P, Magarey PA and Wachtel M, (Eds.) (1994) Diseases and pests, Grape Production Series 1, Hyde Park Press, Adelaide (a glove box edition of this book is also available).

Both of these publications are available from Winetitles, 08 8292 0888, or visit www.winetitles.com.au.

Water management for grapevine production: Research to Practice® and *Grapevine nutrition: Research to Practice®* are training programs whose delivery can be fine-tuned to suit each region. They include topics on soil management issues.

Visit the web site at www.crcv.com.au/viticare/vitinotes/ for updates and more Vitinote titles.

ACKNOWLEDGEMENTS

The Cooperative Research Centre for Viticulture would like to acknowledge Rob Bramley in the production of the Vineyard activity guides Vitinote series.

©2006 Cooperative Research Centre for Viticulture

The CRC for Viticulture is a joint venture between the following core participants, working with a wide range of supporting partners.



AWRI



Government of South Australia
Primary Industries and Resources SA



THE UNIVERSITY
OF ADELAIDE
AUSTRALIA



Victoria
The Place To Be



Wine Grape Growers' Australia
WUGA



Winemakers' Federation of Australia

For the Industry by the Industry



Australian Government

Grape and Wine Research and
Development Corporation