



Taking soil samples

Viti-note Summary:

- Equipment
- Timing
- Where to sample
- Method
- Number of samples to take
- Depth of sample required

Other topics in this Viti-Notes series include:

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- A method for examining grapevine root systems
- Soil moisture monitoring
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A consistent and appropriate soil sampling technique is essential to give accurate results of the physical, chemical and biological components of soil. Generally in vineyards, a simple method of soil sampling is preferred due to the limited space available under vines and between rows. Where nutrients are supplied exclusively via fertigation, sufficient information may be gathered if soil samples are taken in the vine row—where most of the vine roots are located. However, grapevine roots are generally not confined to the vine row, and, depending on soil conditions, may extend over several row widths. It is best to take soil samples from the zone between the row and the wheel track in irrigated

vineyards, and from anywhere in non-irrigated vineyards.

Equipment

A tool for taking a soil sample (preferably a soil auger or core sampler, although a shovel or trowel can be used), buckets for sample collection, plastic sheet for mixing, labeled plastic bags to transport samples to the laboratory, and recording sheet and pen. Generally the soil sampling tool used will depend upon what is readily available but consideration must be given to an appropriate method to suit the measurements that will be taken on the soil sample. Equipment options are outlined in table 1.

Table 1. Soil extraction methods.

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 (or 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. Samples can be taken from 10cm to over 1m depth.
Soil core sampler	Used to obtain intact soil cores to a shallow depth (~10cm – 50cm). 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.

Timing

Soil sampling can be done at any time of the year, although autumn and spring are the best times, as winter can be too wet and in summer the ground may be too hard.

Where to sample

Sampling sites need to be chosen based on what it is that you want to investigate. At a minimum, different soil types within a vineyard should be treated as different sampling units. Within those, either representative sites should be sampled and combined if an overall picture of the soil status is required, or 'problem' areas may be sampled separately to determine the characteristics of the soils in those areas. Sources of information to guide the choice of sampling locations include:

- The local expertise of the vineyard manager and his/her consultant;
- Yield maps;
- Remotely sensed imagery (e.g. from the Phylloxera and Grape Industry Board or commercial providers);
- From an EM38 soil survey (this is perhaps the best source).

Method

1. Clear away any weeds and other loose organic material, until the soil surface is uncovered.
2. Take at least 3 soil samples (approximately six cupfuls of soil) at each selected site and place samples in a plastic bucket. Depending on what you wish to find out it may be necessary to take samples from different depths in the soil profile and to keep these depths separate for analysis.
3. Label the plastic bucket with the date, property, depth, and location in the vineyard or site designation. The labeling system for samples should clearly identify where they came from (eg. B1R5P10 = block/site 1, row 5, panel 10, or using GPS coordinates).
4. Take the buckets of soil from each plot to a shed or sheltered place for drying. Spread the sample on a plastic sheet to air dry (approx. 24 hours at 20°C). You will need one plastic sheet per sample site, especially if the soil is wet. Make sure the plastic sheets are labelled so that you know where the sample came from. A good way to do this is to use a paper luggage tag. Place the samples and sheets where they can dry without being contaminated by other soil or fertiliser.

5. When the soil has dried break up any clods, pick out stones, and mix the sample well using the plastic sheet to move the soil around. When mixing soil, be careful not to crush the soil aggregates too much, as intact soil aggregates are required for tests of dispersion and slaking (breakdown of structure upon wetting).
6. Most laboratories require approximately 2 cupfuls per sample of the mixed soil for analysis (eg. after mixing, discard half, remix and remove two cupfuls). Place the 2 cupfuls in a plastic bag with the date, property, depth if relevant and location in the vineyard or site designation clearly marked on the bag.
7. Check with your State Government Department of Agriculture or Primary Industries for contact details of suitable laboratories in your state or region.
8. Check with the specific laboratory to make sure sample(s) can legally be sent. If you are within a Phylloxera Risk Zone (PRZ) or Phylloxera Infested Zone (PIZ) then consult the National Phylloxera Management Protocol at www.phylloxera.com.au before sending.

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 should be sent to the laboratory for analysis, or the number of analyses that you carry out, there is a balance between the time, cost and statistical accuracy. Although more samples do relate to greater precision in the results obtained, economics also plays a major role, i.e. the cost per sample will influence the number of samples you have analysed.

Depth of sample required

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 selection of holes and 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, e.g. 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 generalization, 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.

NOTE: IT IS A GOOD IDEA TO SEPARATE SURFACE AND SUBSURFACE SOIL SAMPLES, AS THEY WILL HAVE DIFFERENT PHYSICAL AND CHEMICAL PROPERTIES. SAMPLING WHERE SOILS ARE OBVIOUSLY DIFFERENT AND MOST VINE ROOTS ARE OBSERVED IS THE BEST APPROACH, BUT IF SUCH OBSERVATION IS NOT POSSIBLE, OR IF IT IS DIFFICULT TO SEPARATE SURFACE FROM SUBSURFACE LAYERS, A GOOD RULE OF THUMB IS SAMPLE AT 5-15CM, 25-35 AND 55-65CM DEPTHS (THESE BOUNDARIES ARE CONSERVATIVE TO ENSURE THAT THE SAMPLES TAKEN ARE ACTUALLY DIFFERENT LAYERS).

When the results of the analyses are available, it is important to remember when interpreting them that surface layers will generally have higher nutrient levels than those in the subsurface.

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Further information

Nicholas, P. 2004. Soil, irrigation and nutrition. Adelaide: Winetitles.

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