



SOIL SAMPLING GUIDE

JULY 2022

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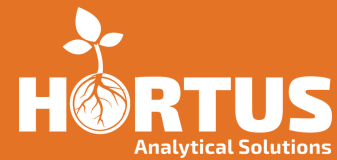
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HORTUS SOIL SAMPLING

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1.0 When to Sample:

The time of soil sampling will depend on a number of factors. The following are general guidelines. In trouble-shooting situations, plant tissue samples should be taken at the same time as surface and sub-surface soil samples.

Avoid sampling within 3 months of liming or 2 months of applying fertiliser

Southern Pasture and Cereals:

In Southern Australia, soil sampling is usually conducted in the late summer or early autumn after the opening seasonal rains.

Northern Grain and Cotton:

In Queensland and North-West NSW, sample 3-4 weeks before planting if the intention is to determine planting (phosphorus) requirements, earlier if pre-plant nitrogen requirements need to be determined.

Pasture:

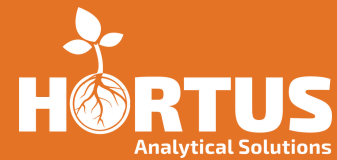
For phosphorus, sample about one month before the planned time for topdressing, usually autumn or spring.

Vegetables:

For horticultural row crops, soil sampling is required several weeks prior to planting, to determine basal fertiliser requirements. However, if there is a likely requirement for lime or gypsum, sampling is required 2 to 3 months prior to planting to provide enough time for effective soil amelioration. Sub-surface samples are also recommended in situations where salinity or acidity are potential problems.

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Tree Crops:

For horticultural tree crops, soil sampling is generally required in late winter or early spring or at the same time as is recommended for plant tissue sampling. Sub-surface samples are also recommended at this time where required.

Sugar Cane:

For plant cane, sample about one month before planting to determine planting fertiliser requirements. If soil amendments, eg lime, are likely to be required, sample soon after harvest so corrective action can be taken at the start of the fallow period. Alternatively, eg for "plough out and replant" cane, consider sampling during the last ratoon. For ratoon cane, sample soon after harvest in the May to October period. Where sampling as part of a routine monitoring program, sample as near as possible to the same time of year on each occasion samples are taken.

2.0 Selecting Areas for Sampling:

When considering which production areas to sample there are a number of factors to consider. Ideally, it would be great to sample every production unit or soil type, however time and costs may make this approach unfavourable.

In selecting areas for soil sampling consider the following:

- Sample high and low yield areas separately,
- Don't mix soil samples from different production systems, or areas which have been farmed separately
- Where different soil types occur within the same paddock or production system sample each separately,
- When establishing a new crop, consider sampling the sub-surface as well as the surface, to identify any salt or structural problems at depth.
- When trouble-shooting (especially for horticultural crops) take soil samples (surface and subsurface) along with plant tissue samples from both the good and the poor areas.

Take care not to sample from the following situations:

- Unusual areas, eg. stock camps, dam sites, within 10 to 20 m of current and old fence lines, timber burns, headlands, the corners of paddocks which have been cultivated or planted from the perimeter inwards, poorly drained areas, gilgais or melon holes, etc.
- Areas of poor growth or excessively good growth, eg. dung and urine patches in crops or pastures.
- Areas of differing soil type, drainage patterns, fertiliser usage and cut and fill areas.

3.0 So, what is a Representative Soil Sample?

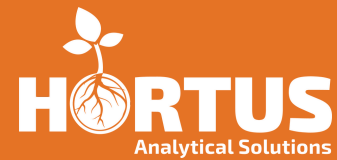
A representative sample consists of a large number of soil cores taken from within a uniform area of a soil type or paddock of concern. For surface samples, it is important that at least 25 cores be taken, as it has been proven that samples made up of less than 20 cores often do not correctly represent the sampled area. If a sample is taken from a large area (say 50 or more hectares), it is often advisable to take more than 40 cores to make up one sample. Collected cores are then mixed thoroughly together and a subsample is taken to send to the laboratory. The sampling pattern and depth reflect that used when the field calibration of soil tests was conducted by the researchers. For sub-soil samples, 8-10 cores will usually suffice, as subsoils show less variability than surface soils.

4.0 Where to Sample General Procedures:

For pastures, prepared seedbeds, and winter cereals and other crops grown at narrow row spacing (<25cm), under zero or minimum till, samples should be taken across a representative part of the whole area in a zig zag or grid pattern, or by taking cores across a permanently marked transect.

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Sampling soils in fields under row-crops or permanent beds can give misleading results. Where the location of the fertiliser band is known, a representative sample consists of cores taken from within the fertiliser band and between the fertiliser band.

The number of cores, S , taken between the rows for every soil core taken within the row is determined by the equation:

$$S = \text{row spacing (cm)} \times 0.262,$$

ie. for 100 cm row spacing, take 26 cores between the rows for every 1 core taken in the row (fertiliser band).

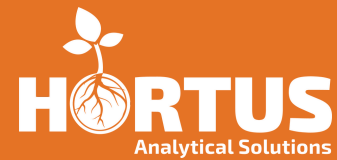
When the location of the fertiliser band is not known, the best practice is to collect sub-samples in pairs, the first one at random and the second at a distance of half the band spacing and perpendicular ie. at right angles to the band direction.

Where **beds are permanent or already in place**, in **furrow irrigated soils**, it is advisable to remove the top 5 cm of soil from the sampling position before sampling, as salts will have concentrated in this layer of soil in water drawn to the surface by evaporation.

For **tree crops**, soil samples should be taken from the zone of maximum root growth and fertilization, extending from about 30 cm from the base of the tree to just outside or 30 cm beyond the drip zone of the tree. Where under-tree sprinklers are used to apply water and fertiliser, sample cores should be taken from the wetted zone, where most of the feeding roots are growing.

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For Trouble-shooting

When trouble-shooting or wishing to compare one soil type/poor growing crop or area/paddock with another, always take two separate, representative samples. Plant and water samples may also assist in resolving the problem.

For Monitoring

Soil fertility can vary within a field, so comparisons between one sampling time and another can be less meaningful where soil testing is used as a monitoring tool, particularly in large paddocks. This can be overcome to a large extent by selecting a smaller and permanent monitoring site, the position of which is recorded for future reference. A simple form of monitoring site is to use a permanently marked transect, eg between two posts or objects.

Alternatively, in large cropping and **pasture paddocks**, select 4 or 5 sites typical of different areas of the paddock and take separate samples from these. Each should be 10 to 15 m in diameter (no more than 20 m). Mark the locations on a map and label samples A, B, C, D. When the results are back, select the most typical representative site(s) for future sampling

Avoid using steel posts or stakes within paddocks as markers, as they attract stock or be knocked out of the ground by animals or machinery, or cause injury or damage if concealed by tall grass. White painted discs or metal plates placed flat on ground may be suitable in permanent pasture.

When monitoring tree crops, soils from around 20 to 25 typical trees (marked for future reference) should be sampled. These samples need to be from the same variety, root stock, crop age, and soil type.

5.0 Depth of Sampling:

The soil sampling depth for any crop is based on the depth sampled when the soil test calibration experiments were conducted and generally relates to the zone of maximum feeding root activity. This will vary for each crop and pasture type. To assist in making reliable and meaningful fertiliser recommendations, the soil sampling depth used in local fertiliser response trials should be used when soil sampling.

In most situations, it is the topsoil which is of most interest when soil sampling. The topsoil is defined as the most recently formed soil, containing organic matter (humus) and is of highest nutritional value to plants. Most fertilisers are applied to the soil surface, or incorporated into the topsoil by cultivation.

Nutrients such as phosphorus are concentrated in the top-soil. It is this layer of soil in which the fibrous feeding roots of most crops are located. Topsoil sampling depth varies depending on the crop grown, but generally ranges from 0 to 25 cm.

Sub-surface sampling may also be necessary to check for salinity, sodicity, acidity and nutrient deficiencies or toxicities which may affect growth, particularly of deep rooted species. Deep or subsurface sampling is also commonly used for cotton and cereal crops to measure the nitrate nitrogen status of the profile. Sub-surface sampling may also be used in pasture and annual horticultural row crops when investigating areas susceptible to salinity or soil acidity and where structural problems may limit plant growth.

6.0 Sampling Tools

There are at least three types of soil samplers available and the use of these is recommended where possible, as they not only simplify sampling, but they also can increase sampling accuracy and reduce the possibility of contamination.

Shallow Probe

The shallow steel sampler is suitable for taking surface samples from a wider range of soil conditions, to depths of up to 30 cm.

The depth is set by moving the adjustable foot to the required level. The sample is then taken by treading on the foot until it is against the soil surface, then pull the sampler out and invert it into a bag or bucket to empty the sample.

Deep Soil Probe (Thin-Walled)

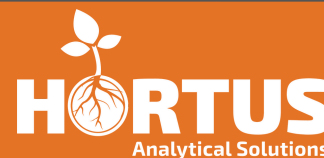
Sometimes it is necessary to take samples below the topsoil ie to a depth greater than 15 to 25 cm, so nutrients and soil conditions can be examined in the sub-soil. Using the thin-walled deep sampling probe, under the right soil conditions, soil samples can be taken to a depth of 60 cm or to the depth of the wetting front (moist soils with more than 10% clay).

These samplers work better if they are lightly oiled with a low nitrogen oil which can be applied using a 12 gauge shot gun cleaning rod. The low nitrogen oil can also be used on the surface soil sampler.

Sub-soils are generally less variable than surface soils, so only 8 to 10 cores are usually necessary for deep sampling.

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Hydraulic Probes & Motor Driven Augers

Hydraulic probes are used primarily to take profile soil samples for soil nitrate, sulfate, salinity and sodicity assessments. Samples are generally taken down to 60 or 90 cm using a hydraulic probe device mounted onto a vehicle.

In grain and cotton areas, many dealers are equipped with hydraulic probes. As for sub soil samples, 8 – 10 cores is usually required for deep sampling to give a representative sample. Use a low nitrogen oil to lubricate probe tubes.

Hand held motor driven augers are also used to take profile soil samples.

Soil Sampling with a Shovel or Auger

At times, it is not possible to use the normal sampling equipment, because the soil is too hard to penetrate or the soil is too dry (for sands) to stay in the tube or too heavy to get out of the sampler.

In these cases, samples can be collected using a spade or trowel, or a jarret auger. Dig a hole to the depth required, then cut a vertical 2 cm slice of soil from the face of the hole. Trim away soil from both sides of the spade, leaving a 2.5 cm strip of soil down the middle of the spade, which becomes the sub-sample required. The same number of sites should be sampled as when using the tube – type samplers ie 25 plus.

7.0 How to Take a Soil Sample:

1. Ensure your hands and equipment are clean before commencing sampling.
2. Select an area for sampling which is typical or representative of the area.
3. Using the metal sample probe, take at least 25 cores to the same depth across the area of concern, in a grid, spiral or zigzag pattern or along a transect with permanently marked ends. The more cores taken, the more accurately the final sample will represent the paddock.
4. Scrape away surface debris, undecomposed stubble or other organic matter, but do not disturb the soil surface. If the soil is “fluffy” from cultivation, tamp the soil firmly with your boot.
5. Push tapered sample tube, narrow end first, into the soil to the desired depth, give a half turn and slowly withdraw it from the hole.
6. If soil tends to fall out of the tube before it is completely withdrawn, place hand over top of tube and raise slowly or in dry sandy soil, tip the tube sideways to hold the core in.
7. Tip the tube upside down over a clean plastic bucket, or directly into a clean plastic bag, emptying contents out of the handle end of the tube. If a core appears atypical of the rest, then discard the core and take another. Do not collect into a galvanized bucket.
8. After collecting 25 or more cores in the bucket, break up cores into small crumbs and mix them thoroughly into a composite sample.
9. If the sample is too large, select a representative sub-sample by the quartering technique or by taking 100 g of the sample, placing it in the sample bag, remixing the remainder, then taking another 100 g sub-sample, continuing the process until the required amount is obtained. Transfer the representative sub-sample into the soil sample bag provided (about 500 g is required by the laboratory).

10. Complete the Analysis Request Form by inserting the Dealer Store details, the grower's name and contact details and the sample identification. You should also advise the laboratory the test name and other requested details of the sampled site. Place this form with the soil sample(s) in a suitable padded bag or envelope for transport. Send the pack to Novum Life Sciences via a reliable Express Courier service or Express Post for overnight to 3-day delivery.
11. The dealer who takes the sample should also record all the relevant site details for each sample. Information of relevance is: crop or pasture species to be grown (or growing), row spacing, details of previous year's fertiliser and soil amendment application, rainfall, whether irrigated or not, stubble amount and treatment, rotations, weeds, diseases and insect pests present and the control methods used and any other management practices which may affect the soil's nutrient status.

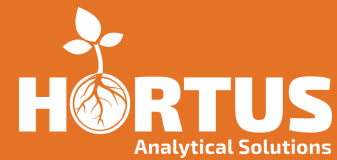
8.0 Sample Handling and Transport

Once a sample is collected, the main objective is to dispatch it to the laboratory as quickly as possible, so it reaches the laboratory in a condition as close as possible to that when it was collected.

Soil samples are best kept in plastic bags, but because most samples contain moisture, microbial activity will continue while suitable temperatures prevail.

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Don't expose the sample to extreme heat, eg. on the dashboard, in the back of a utility or truck, or leave it in a locked up vehicle during the heat of the day. It is recommended that bagged soil samples be transferred to an esky or cool box, containing cooler bricks or dry ice, as soon after sampling as possible. Carry one with you in your vehicle if some time will lapse between when you take the sample and return home. Samples can be transferred to a refrigerator or freezer for storage overnight or until ready to dispatch.

This procedure is particularly important where nitrate-nitrogen and sulfate-sulfur tests are required.

The chances of biologically-induced changes to the chemical properties of the soil are reduced if this advice is heeded.

Remember to send samples on the day of sampling or the next day. Avoid posting samples late in the week eg on a Friday (as they will sit in the Post Office or in transit over the weekend). If soil samples are taken late in the week, store them in the fridge or freezer over the weekend.

Complete your online sample submission form:
<https://au.agpro.technology/Login>

Write the Reference number on your sample bag and Post your Samples to :

**Locked Bag 3901
Bundaberg
Queensland 4670**