

WHY SOIL SAMPLE?

The answer to this question should guide the way a sample is taken. Soil sampling and analysis is a valuable Nutrient Advantage tool, providing insight into the nutrient and general fertility status of surface (and if analysed, sub-surface) soil layers.

Soil analysis is normally undertaken for one of three reasons. These are:-

- **Predictive** - to check on the soils fertility or nutrient status, to better determine or predict nutrient requirements;
- **Monitoring** - to assess the suitability of current management practices over time, adjusting existing fertiliser programs if necessary to ensure optimum yields are achieved; or
- **Diagnostic** - to determine the reason for poor growth (trouble-shooting), or to check on accumulation of mineral elements toxic to plants.

The end result, and perhaps prime objective, is to arrive at a fertiliser recommendation tailored to the individual requirements of each production system.

The benefits of soil sampling to the farmer are:

- Establish the current nutrient status of the soil to provide the basis for future strategies.
- Indicate the ameliorants required to correct a soil's possible physical and chemical property imbalances.
- Determine factors that may be limiting crop production or produce quality.
- Identify opportunities to improve farm profitability through efficient soil fertility management.
- Develop an appropriate nutrient plan for the farm based on productivity targets.
- Monitor the progress of nutrient strategies over time and indicate any need to fine-tune inputs.
- Determine the better fertiliser form &/or application method to suit particular situations.
- Assists in the planning process through improved budgeting of farm financial resources.

These benefits may result in better farm management through more cost effective nutrient decisions

WHAT YOU WILL NEED – SOIL SAMPLING EQUIPMENT

- Clean core sampler (probe) to collect topsoil samples
- Screw driver and clean plastic bucket to remove and collect soil from the sampler
- Small spade to remove any excessive debris
- Small hand auger for subsoils
- Hydraulic sampler to collect deep soil nitrogen samples
- Sample collection bag, Submission Form, plastic pocket – all available from the Nutrient Advantage Help Desk on 1800 803 453 or your local Incitec Pivot Agent or Dealer.
- Core maintenance equipment such as a cleaning brush, silicon spray

Make sure to clean the probe with a brush after use and give the probe a light spray inside and out with silicon spray to prevent rust before being stored.

SAFETY WITH SAMPLING

Sampling involves physical work in the outdoors. A common sense approach is required, as for all work on farm, with due consideration to:

- Exposure to the elements, including the sun. Wear appropriate clothing, a hat, and sunscreen during the summer months, stay hydrated
- Sampling near hazards eg high voltage / gas lines / communication cables
- Paddock/block hazards including electric/barbwire fences, steep ground, pot holes, wet grass, channels/drains;
- Observe re-entry periods in crops that have been sprayed with pesticides, e.g. insecticides;
- Wash your hands between taking different samples, and before eating;
- Keep your back straight when taking soil samples and during lifting operations;
- Be aware of the presence of and on the lookout for farm animals, e.g. dogs, bulls, and native fauna, e.g. snakes, and maintain appropriate distances.
- Make sure you have First Aid Kit available.

A NOTE ON QUARANTINE

Nutrient Advantage Laboratory is not an AQIS Approved Premises and therefore we do not accept quarantine soil samples.

In the case of domestic quarantine samples, the onus is on the submitter to make sure a sample is not from a quarantine risk area or has the appropriate permit when submitted to the Nutrient Advantage Laboratory.

- Domestic samples should comply with the Department of Environment & Primary Industries' [Plant Quarantine Manual](#) which can be found on www.depi.vic.gov.au
- To keep up to date with State Quarantine risks go to the Quarantine Domestic website www.quarantinedomestic.gov.au
- To obtain a permit for the removal of soil material from a quarantine risk control area contact Department of Environment & Primary Industries, Victoria on 136 186.
- All Quarantine samples despatched to the Laboratory should be accompanied by the relevant AQIS or State Permit documents and Irradiation Certificate (if required in line with the Plant Quarantine Manual guidelines) together with the appropriate sample submission paperwork for analysis.

COLLECTING A SOIL SAMPLE

- Establish appropriate sampling program (see Section A below)
- Ensure the Sample Submission Form is fully completed.
- The correct sampling and handling procedures must be followed (see Section B below).
- Accurate information is essential.

Nutrient recommendations are only as good as both the quality of the representative sample taken and the detail of the associated sample information supplied.

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 to 30 cores be taken. 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, it is often advisable to take more than 40 cores, to make-up one sample.

If the collected cores exceed approximately 500 grams in weight, they should then be mixed thoroughly together and a representative subsample is taken, to send to the laboratory.

If the collected cores are approximately 500 grams in weight, they can be sent to the laboratory without the need for sub-sampling.

The sampling depth reflects that used when the field calibration of soil tests were conducted by the researchers.

For **sub-soil samples**, 8-10 cores will usually suffice, as subsoils typically show less variability than surface soils.

A. SOIL SAMPLING STRATEGY FOR THE WHOLE FARM

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 subsurface soil samples.

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.

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.

If relevant, avoid sampling within 3 months of liming or 2 months of applying fertiliser.

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 sub-surface) along with plant tissue from both the good and the poor areas. Also consider water analysis.

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.

When to Sample:**Generalised Timings:****1. Orchards and Vineyards**

- **Pre-plant** – A top soil and subsoil sample should be carried out prior to planting. The top soil sample identifies the nutrient status of the soil, while the subsoil sample provides an insight into potential problems (acidity or alkalinity, sodicity or salinity) and what measures are needed to be taken (ripping lime/gypsum to depth).
- **Establishment** – Once the crop has been planted & prior to bearing, a topsoil sample should be taken to ensure that the ameliorants and other inputs have incorporated into the soil.
- **Mature (bearing)** – Once the crop or vine crop is producing a crop, soil sampling is used for monitoring or diagnostic purposes, most beneficial when used in conjunction with plant tissue testing. Soil testing should occur every 2-3 years. Sampling of soil should be taken from the areas where fertilisers or ameliorants have been previously applied or where root growth proliferates.

2. Vegetables and row crops

- Take a topsoil sample from the different management or production 'zones' well in advance to planting/sowing.
 - a) At least, 2-3 months prior to planting (if ameliorants are suspected to be required)
 - b) At least, 1 month prior to planting (if **no** ameliorants are likely to be required)

Where to Sample:

General Procedure:

- a) For **prepared seedbeds**, and 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.
- b) For **row-crops or permanent beds** sampling results can potentially give misleading results. To avoid this issue, where the location of the fertiliser band is known, the most representative sample consists of “S” number cores collected on the following basis:

$$S = \text{Fertiliser Band Spacing (cm)} \times 0.262$$

where “S” is the number of soil cores taken between the fertiliser bands, for every one soil core taken in the fertiliser band

Reference = 'Soil Analysis: an Interpretation Manual' (1999). Ed's K.I. Peverill, L.A. Sparrow and D.J. Reuter. (CSIRO Publishing: Melbourne).

- c) For **tree crops**, soil samples should be taken from the zone of maximum root growth and fertilisation, 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.

B. SAMPLING PROTOCOL

Each sample collected should comprise a minimum of 500gm of soil.

Surface Sample Depths (cm)				25-30 cores (minimum)		
	Vic	NSW	Qld/NT	SA	WA	Tas
Vegetables	0-15	0-15	0-15	0-15	0-15	0-15
Tree Crops	0-15	0-15	0-15	0-15	0-10	0-15
Tree Crops – Prior to establishment, sample 0-30 cm						

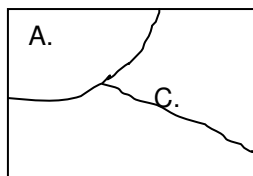
Subsoil Sample Depths (cm)				8-10 cores (minimum)		
	Vic	NSW	Qld/NT	SA	WA	Tas
Vegetables	15-30	15-30	15-30	15-30	15-30	15-30
Tree Crops	15-90	15-90	15-90	15-90	10-60	15-90

Banana Sub-tropical (i.e. S Qld & N NSW) shallow = 0-10cm & deep = 10-20cm
 Banana Tropical (i.e. N Qld) shallow = 0-25cm & deep = n/a

Sampling strategies examples & their characteristics.

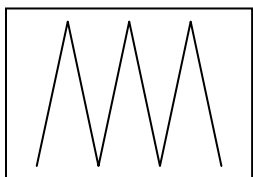
1. Select the most appropriate sampling pattern, as described in the following diagrams:

- **Zone Zone**



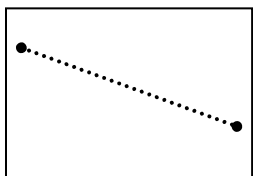
This design is used for changes in soil types and trends across sampling areas (precision farming). Samples are taken from each zone and analysed separately. This design should be adopted in **all** sampling strategies, and should utilise one of the sampling methods below.

- **Zigzag**



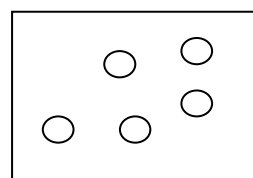
If care is taken this provides good coverage of the sampling area, making it the ideal design for diagnostic sampling. The degree and type of bias vary with experience of operator. Generally use on areas less than 10ha.

- **Transect**



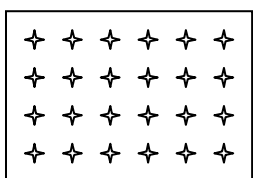
Spot samples are taken at regular intervals along a defined transect. This design allows the same or different operators to repeat the sampling with good precision. Transect sampling is the simplest sampling method as the same sample line can be used each season for monitoring fertility trends.

- **Cluster**



This design involves sampling around several points within a sampling area. Where sampling points are defined (dGPS or plotted on map), cluster sampling can produce low variability. However, the results are less likely to be representative of the sampled area.

- **Grid**



This design is systematic, with individual samples taken at regular intervals across the sampling area and analysed separately. It is used in precision farming and can help overcome landscape or yield variation, particularly if there is a trend across the sampling area. This design can be expensive if many sampling points are defined.

B. SAMPLING PROTOCOL (continued)

2. Using the corer/auger, take soil sample cores and remove thatch/leaves and other debris.
3. Place the cores into a clean bucket and break soil into small crumbs.
4. Mix sample thoroughly by tipping sample back and forth between two buckets, or by mixing on a plastic sheet (avoid using hands unless gloved).
5. Use a separate, pre-labelled bag for each sample.
6. After filling with soil, securely seal the bag with the press seal.
7. Areas that should be sampled separately are:
 - Different soil types, topography or blocks.
 - Areas that have been management differently i.e. used varying cropping practices, had ameliorant, mill by-product, or fertiliser applied differently.
8. Avoid unusual areas such as:
 - Very wet conditions, stock tracks, windbreaks, fertiliser dump sites or headlands.
 - Areas within 20 metres of fence lines, gates, dams, troughs or trees.
9. Areas that have been fertilised or limed should not be sampled until a minimum of 8 weeks has elapsed since application.

GETTING THE SAMPLE TO THE LABORATORY

1. Ensure that you have 500 grams of soil per sample in each bag. Extra soil is used during preparation time at the laboratory for flushing grinders to avoid contamination.
2. Fill out the appropriate submission form making sure to supply the correct customer account number.
3. Fill out ONE Form for a maximum of three samples taken from the **same paddock** or with the same histories. These samples can be all topsoils, deep soil nitrogen tests or subsoils, or a combination of these test options.
4. Ensure a test code is clearly indicated using the current Nutrient Advantage Price List.
5. Double check that the barcode numbers on the completed Area Information Form match the barcode numbers on the sample bags (remember to keep one for your records).
6. Remember that you must supply accurate information so that correct interpretation and recommendation of test results can be made.
7. Place all Forms in the clear press seal plastic pocket provided. Place the submission forms and soil samples into a Freight satchel and seal and deliver to:

**Attn: Sample Preparation
Nutrient Advantage Laboratory
8 South Rd
Werribee Victoria
Australia 3030**

SUMMARY

Soil testing, results in better information about nutrients and soil ameliorants which leads to more effective farm management decisions being possible.

To optimise this outcome, it is important that the soil sampling strategy is carefully planned and the technique accurately implemented.

Remember, the soil analysis results and recommendations are only as good as the original sampling technique and the level of detailed information supplied for the interpretation by the laboratory.

For more information please contact Nutrient Advantage on Freecall 1800 803 453.

Submission forms, soil bags, freight bags and other materials required for sampling are available from the Nutrient Advantage Help Desk or from your local Incitec Pivot Agent. Submission Forms and current Nutrient Advantage product information are available on our website.

www.nutrientadvantage.com.au.

A shallow sample 'core' type sampling probe.



A deep sample 'auger' type sampling probe.

