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 and pasture production.
- 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](http://www.depi.vic.gov.au)
- To keep up to date with State Quarantine risks go to the Quarantine Domestic website [www.quarantinedomestic.gov.au](http://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** (0-20cm), 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 (say 15 or more hectares), 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** (20-60cm), 8-10 cores will usually suffice, as subsoils typically show less variability than surface soils.
A. SOIL SAMPLING STRATEGY FOR THE BLOCK

1. In Great Barrier Reef catchment areas, prior to initiating any soil testing or nutrient recommendation for sugarcane, refer to the details outlined at the website: www.reefwisefarming.qld.gov.au

   The soil sampling protocols outlined within this website is considered the minimum requirements to satisfy the legislation. IPL strongly advocate following the more thorough “sampling protocol” as outlined in ‘Section B’ below.

2. Categorise your plant cane blocks into soil type & management zones – e.g. ameliorant history, mill-by product application, fallow management, poor/good, black/red, sandy/clay.

3. Sample block/s & soil type/s that will provide the most useful interpretation (eg this could be the most dominant soil type or an area where crop production is currently below expectation).

4. **Fallow plant** – Sugarcane soils have traditionally been sampled at the end of a fallow, or just prior to one of the final cultivations before planting the block.

   However sampling at the start of the fallow or either just after harvesting the final ratoon is a valid option also. Sampling at this time is beneficial as it will allow for:

   - an earlier assessment of ameliorant requirements (e.g. lime, dolomite, gypsum or calcium silicate) requirements;
   - if a fallow crop is to be grown, a determination of nutrient &/or ameliorant requirements can be identified;
   - if a green cane trash blanket (GCTB) is to be incorporated into the soil, sampling should occur prior to the GCTB incorporation.

   This is to limit the ‘artificial’ & ‘short term’ increase in Organic Carbon (OC%) due to the recent GCTB soil incorporation. Because sugarcane nitrogen rates, under the Six-Easy-Steps guidelines, are primarily determined by ‘District Yield Potentials’ & the soil ‘Mineralisation Index’. This cultural practice may artificially alter the crop’s nitrogen requirement, due to the short-term increase in soil organic carbon levels by incorporating the GCTB and without sufficient time for decomposition.

   - Just as significantly, if soil samples are collected whilst the location of last ratoon crop’s rows are still known, a much more representative and valid fertility status of the soil (especially for phosphorus) will determined if the following equation is utilised.

   Sampling soils in fields under row-crops or permanent beds can give misleading results. 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


5. **Plough-out Replant (PORP)** - Soil samples taken in plough-out replant blocks and are best taken immediately the harvest is completed and before the soil is cultivated. This assists in getting a representative sample from an undisturbed soil profile, as per the details outlined immediately above.
B. SAMPLING PROTOCOL

**Surface Sample Depths.** 25-30 cores (minimum)

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<th>Vic</th>
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<tr>
<td>Depth</td>
<td>0-20 cm</td>
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**Subsoil Sample Depths** 8-10 cores (minimum)

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<tr>
<td>Depth</td>
<td>20-60 cm</td>
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Each sample should comprise a minimum of 500 grams of soil.

**Examples of various sampling strategies & their characteristics.**

- **Zone**
  
  ![Zone Diagram](image)
  
  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**
  
  ![Zigzag Diagram](image)
  
  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**
  
  ![Transect Diagram](image)
  
  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**
  
  ![Cluster Diagram](image)
  
  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**
  
  ![Grid Diagram](image)
  
  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)

1. Using the corer/auger, take soil sample cores and remove trash/grass and other debris.
2. Place the cores into a clean bucket and break soil into small crumbs.
3. Mix sample thoroughly by tipping sample back and forth between two buckets, or by mixing on a plastic sheet (avoid using hands unless gloved).
4. Use a separate, pre-labelled bag for each sample.
5. After filling with soil, securely seal the bag with the press seal.
6. 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.
7. 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.
8. 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 Submission 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 submission Forms in the clear press seal plastic pocket provided. Place the submission form and soil samples into a Freight satchel and seal 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 both the representativeness of the original sampling technique and the level of detail in relation to information provided about the sample to the laboratory.

For more information about Nutrient Advantage please contact the Nutrient Advantage Help Desk on 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.