SoilWealth
NURTURING CROPS

Integrated Crop Protection
PROTECTING CROPS

JANUARY 2020

TAKING SOIL SAMPLES

Soil sampling and testing is usually done prior to planting a crop; specific in-crop testing can be useful e.g. testing for available nitrate and ammonium.

A soil test report is only as good as the care taken in sampling. Tools and equipment should be cleaned prior to collecting each sample. Completing labels and writing on bags or containers before going out to the field can save some time and confusion.

TOOLS REQUIRED FOR SAMPLING

- Soil corer or spade
- Clean bucket(s)
- New plastic bags or sample containers (off the shelf or supplied by the lab)
- Labels and (felt) pens to identify the sample before or after it is collected and to make notes
- Record sheet or sample information label(s) to record sample details (site, depth etc.); the format and type of information to provide is often prescribed by the lab
- Notebook to record observations about the paddock, soil condition, weeds etc.
- Optional: GPS to mark the sampling path, camera to take photos of soil profile, structure, colour of the paddock, a helping hand

RANDOM, REPRESENTATIVE SAMPLING

Look at the soils in the paddock or block you intend to sample. Submit a separate soil sample from each distinct soil zone in a paddock or block, if they are to be treated differently (e.g. by soil type or texture: clay, loam or sand). Alternatively, only sample the predominant soil type or texture if you cannot treat areas differently. Two or more individual samples are needed from paddocks with large areas that have been managed differently in the past (e.g. if two or more paddocks have been combined), as this history may affect fertiliser and management requirements significantly. For very large paddocks, a representative sampling area of 1-2 ha may be selected for sampling.

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To obtain representative samples, do not sample from unusual sites such as:

- Gateways and headlands
- Close to dams
- Old fertiliser stockpiles
- Paddocks that have had fertiliser applied in the last 3 months
- If known: old stock camps, feed out areas or near water troughs.

Soil cores should be collected along a fixed diagonal transect or zig zag path (Figure 1). A map and plan of the soil sampling area is essential for interpreting results and any subsequent testing trends. Ideally keep waypoints via GPS or landscape markers of your sampling area and sampling points, the transect or zig zag pattern used for further reference.

Use the same path (not the same points) the next time you sample. Always sample at the same time of year. This allows for re-testing and better monitoring of fertility trends than random sampling.

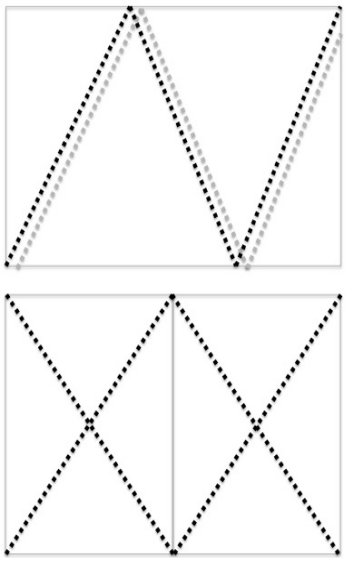

Figure 1 Soil subsample collection patterns

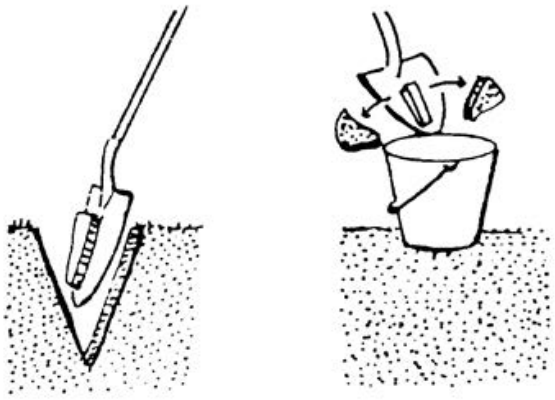

Figure 2 Taking a soil sample using a spade (Source: Bionutrient Food Association)

Never sample straight after an application of fertiliser or amendments, unless you want to check how they affect soil fertility and nutrient levels. Avoid collecting surface material such as leaf litter or coarse, un-decomposed organic matter.

The sampling depth should give information about the main rootzone

- Topsoil 0-15 cm, Subsoil 15-30 cm; this is advisable if the soil has not been tilled before sampling, or not tilled to 30 cm so that nutrient stratification can be detected
- Alternatively, if two separate samples are not taken: 0-30 cm depth usually covers the main rootzone for vegetables and provides a good summary of soil fertility and potentially available nutrients in that zone; 0-30 cm also is the required depth for the soil carbon methodology under the Emission Reduction Fund; if the soil has been tilled to 30 cm, 0-15 cm depths only may be used
- Deep soil N or N-check (available N) sampling can be done at either 0-30 cm, 0-30 and 30-60 cm or 0-60 cm

If trends are important, sampling depths used previously should be maintained unless these were not representative of the rootzone.

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For specific purposes, you may choose to sample to a different depth, e.g. the depth of the A horizon which is the darker layer containing most of the organic matter and roots, or to the depth of the anticipated rootzone. Deeper, subsoil samples (below the A-horizon or topsoil depth) may be needed to detect subsurface acidity or salinity, other rootzone restrictions or for deep rooting crops (please contact your advisor for guidance).

A soil sample for lab analysis is made up of a set of separate subsamples

For each sample to be sent to the lab, thoroughly mix a minimum of 20 soil cores (subsamples) in one bucket. The more cores taken, the more reliable the test result. You may use a spade instead of a core sampler, as demonstrated in Figure 2. However, a core sampler gives better results. Fill a container or bag with 500 g of the well-mixed sample from the 20 or so cores in sampling bucket. Make sure samples are clearly labelled and labels correspond with the record sheet accompanying them to the lab.

Once the samples have been collected they should be kept cold (fridge) and sent as soon as possible to the laboratory for analysis.

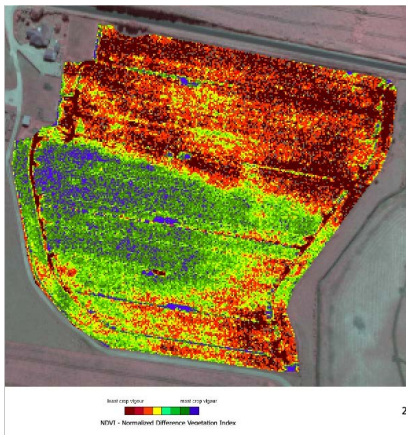

Figure 3 NDVI image of a crop

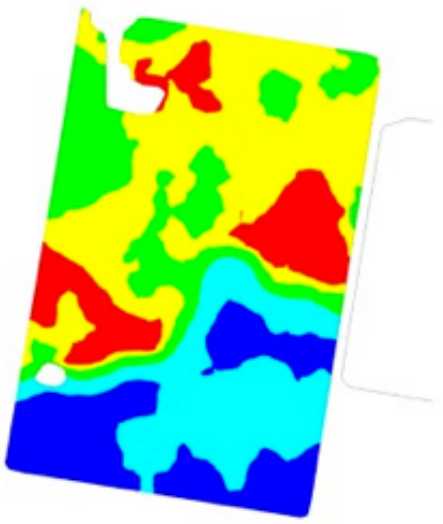

Figure 4 Example of an EM38 map (Source: GRDC publication accessed via the GRDC website: "Utilising spatial data for within-paddock soil and crop management.")

SPATIALLY INFORMED SAMPLING

Maps may be produced using a range of spatial information (see Table 1), including Normalised Difference Vegetation Index (NDVI, Figure 3), electromagnetic soil maps (e.g. EM38, Figure 4), yield or soil fertility maps. These maps can be used to delineate sampling zones. For example the paddock in Figure 3 has two distinct zones that should be sampled separately using the sampling approaches detailed in Figure 1 for each distinct zone.

SAMPLING FOR PRECISION MANAGEMENT

Sampling for precision farming, e.g. variable rate fertilser applications, is done in a grid pattern and usually with automated samplers. EM38 (or other) maps can be used to determine the sampling zones.

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Table 1 Options of using spatial information to delimit sampling zones

Type of image	Source of image	Considerations
Electromagnetic soil maps (e.g. EM38 maps, see Figure 4)	Electromagnetic induction (EMI) device that can be handheld or attached to a vehicle	Best done when the paddock is not planted, the device needs to be moved over the entire paddock surface May show differences in soil water and clay content and these do not necessarily correspond with soil fertility, elevation may have a major influence
Soil fertility map	Soil grid sampling	Maps are produced to delimit management zones for variable rate lime or fertiliser applications; delimiting sampling areas using fertility maps can be used to check on the effectiveness of the variable rate application
Aerial images of a crop	• Satellite image • image produced by an unmanned aerial vehicle (UAV) / drone	Easy to obtain via Google Earth The image may not show differences in the crop well enough if taken after row closure
Vegetation indices (VIs) e.g. • Normalised Difference Vegetation Index (**NDVI**) (see Figure 3) • Leaf area index (LAI = leaf area per unit ground area)	• Satellite image • Image produced by an unmanned aerial vehicle (UAV) / drone	Satellite based NDVI images can be obtained for free; it is important to use images taken on days with little or no cloud cover
Yield maps from a previous crop	Load cell on harvester	Only applicable for crops that are mechanically harvested, e.g. carrots Yield map of one crop may not be indictive of how the following crop is affected, especially if the yield variations are not due to differences in the soil that affect nutrient uptake

This factsheet was originally published in June 2016 as part of the Soil Wealth (phase 1) project. It has been updated to reflect changes in technology.