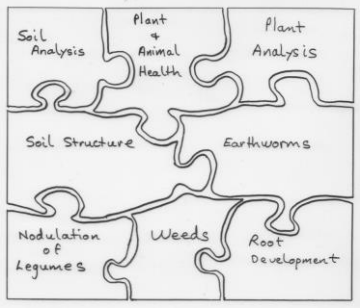
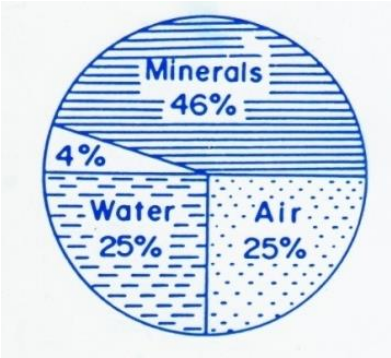
Demonstrating Sustainable FARM PRACTICES

Tissue/Plant and Soil Analysis - Chris Alenson Apr '15

Soil and tissue analysis are two of the analytical techniques along with other observations that provide information on which to base on-farm management decisions. No single observation or analytical technique can, on their own provide the breadth of information required. As the diagram on the left indicates it is a jig saw puzzle of information that must be obtained before action is taken.



This visual and analytical assessment assists in pinpointing weaknesses relating to the major components of the soil seen in the pie chart below.



Assessing minerals (chemistry) - techniques such as soil analysis, tissue analysis are widely used along with observations on plant/crop quality, production levels, animal health and pest and disease pressures.

Assessment of air and water in our soil (pore space) may utilise information on bulk density, observations on soil texture and structure, compaction and water infiltration.

Assessment of organic matter and biological soil life may be provided by analytical techniques including complex microbiological testing, field testing utilising a Solvita soil health test, observations of soil colour, plant root structures, legume nodules, worm numbers and other soil life forms.

Soil analysis
Soil tests are a valuable tool for identifying a soil's fertility status which can be related to crop needs. The analysis usually provides a recommendation of suggested amendments. Most laboratories provide a comprehensive analysis of the full range of plant nutrients including trace elements, conductivity and cation exchange properties. Soil analysis has been covered in previous discussion notes.

Plant analysis
The principle behind plant tissue testing is that for particular plant species there are optimum ranges at various stages of the plants growth where nutrients should fall for optimum production and quality to occur.
These results help growers to understand what nutrients are taken up by the plant, correct deficiencies before they reach a critical stage and to identify specific issues that may be adversely influencing production.

Uses of plant analysis

- Diagnosis of nutrient deficiencies
- Prediction of nutrient deficiencies
- Establishment of input recommendations
- Monitoring of effectiveness of fertiliser additions
- Estimation of nutrient levels in diets available to grazing animals

Shortcomings of plant analysis
Using tissue analysis as the sole source of information may lead to wrong conclusions as to what needs to be done to ensure optimum plant nutrition.

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This project is supported by Western Port Catchment Landcare Network through funding from the Australian Government's National Landcare Programme and PPWCMA

Australian Government National Landcare Programme

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Soil analysis is routinely used to identify and prevent nutrient problems **before** the cropping/growing season whereas plant tissue analysis generally can only detect nutrient problems **after** the plant has already suffered production problems.

Tissue testing on its own could lead to incorrect management strategies being implemented. It should be used in conjunction with a routine soil-testing program. For example it is not unusual to find low nutrient levels in plants growing on fertile soils.

Nutrient concentrations are affected by many factors and therefore vary with time through the growing season. Factors such as the nutrient composition of the plant tissue, soil moisture, soil texture/structure, inherited soil fertility/geochemistry and fertilizer practices, environmental conditions all may have effects on nutrient uptake.

The crop load, species, disease and insect challenges, environmental conditions, and cultural practices such as weed management and pruning can also alter tissue nutrient composition.
All these factors would need to be considered when interpreting the results.

Soil related factors that affect nutrient availability

- Soil mineralogy (geochemistry)
- Soil texture/soil structure
- pH
- soil biology
- Environmental conditions
- Fertiliser practices

Important information not available through plant analysis includes:

- How much fertiliser should be applied to correct a nutritional disorder?
- How did the disorder arise?
- Will nutrient elements at marginal levels become limiting later in the season?

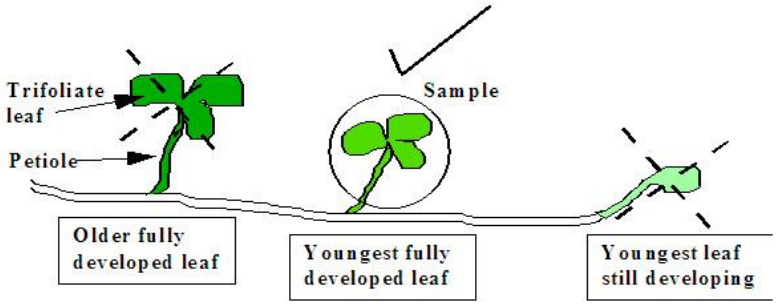
Sampling appropriate plant parts

It is important to know which part of plant tissue should be collected for the species being analysed. For example grape vines will sample the petioles (leaf stems) at flowering from opposite a bunch, for pasture species clover is considered appropriate although rye grass can be used. In deciduous fruit trees leaves would be sampled in mid-summer from a mid-shoot position. Plants sampled should be logged and position noted for future reference.

A form that indicates relevant details of the plant sample, site conditions, soil types and fertiliser history must be submitted with the plant sample.

Example of plant tissue analysis using a section of clover to sample. - Source: DEPI, Victoria

As when soil sampling care has to be taken to avoid contamination, as results can easily be influenced by careless sampling procedures. Samples should not be taken from diseased plants, from plants that may be growing in unusual conditions (boggy, rocky terrain) or plants that have been recently fertilised. Representative samples should be taken from the site to ensure statistically relevant results. Reference to plant analysis texts is recommended to ensure appropriate sampling.



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Sampling should be undertaken early in the week and dispatched within 24 hours to ensure that the laboratories receive the sample as soon as possible. Plant material should be free from dirt and clean. Storing in a car refrigerator is a good approach until they are sent to the laboratories.

Summary

Tissue analysis along with soil analysis provides the best information on current soil fertility and soil health. However other observations such as visual soil assessment, plant and animal production and health are important pieces of the information puzzle that should producers should access.

Chris Alenson
April 2015

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