Capability Statement

AgVita Analytical has been providing analytical services to clients nationally since 1984. We are recognised within agricultural industries as one of Australia's leading laboratories providing innovative plant and soil nutrient analysis.

A key strength is our ability to provide next to 'real time' testing and analyses, which have a fit with todays advanced production systems, fertilisers and application technologies.

State of the art precision equipment run by dedicated staff guarantee rapid turnaround analyses, a service the Laboratory prides itself on.

As well as providing a fast turn-around innovative analysis we also pride ourselves on our excellent customer service.

All test results are emailed to clients in user friendly, easy to use reports which enable consultants to further value-add when advising to their growers.

We work closely with our clients to ensure they have the best information possible to assist them to understand the results issued.

AgVita is an accredited member of ASPAC, the Australian Soil and Plant Analysis Council

AgVita is also ISO-9001:2015 accredited.

Analytical Products:

NU-test® is a quick turnaround, accurate tool for the monitoring and management of crop nutrient uptake. Unlike tissue analysis, NU-test® allows detection and correction of nutritional problems early in a crops life. Results show nutrient levels and balances at the time of sampling as well as the effect of remedial nutrient applications.

The standard test includes the following components:

- Nitrogen (as NO3 and NH_4)
- phosphorus (P)
- potassium (K)
- calcium (Ca)
- magnesium (Mg)
- sodium (Na)
- sulphur (S)
- zinc (Zn)
- boron (B)
- copper (Cu)
- manganese (Mn)
- iron (Fe)
- molybdenum (Mo)
- chloride (Cl)

- Brix and pH can be tested on request.

Once the sample is received, the plant sap is extracted and prepared for analysis, using standardised procedures.

Results are reported in parts per million (ppm), which is the nutrient concentration in milligrams per litre (mg/L) of plant sap.

NU-test® samples of different plant parts (i.e. petioles, fruit, and storage organs) have to be taken according to the correct procedure at certain physiological growth stages, which are easily accessed on our website, to allow the best comparison to AgVita's *Desirable Levels* for that crop type.

All NU-test reports have analytical results benchmarked against NU-test *Desirable Levels* for particular crop types at various growth stages, giving advisors and growers a clear guide to status of current results. If sampled more than once in a season, these reports also graph the history of various analytes across multiple growth stages.

Samples are forwarded to AgVita Analytical by Express Post mail and are processed on the same day they arrive. Results are e-mailed back to clients throughout Australia on the day of analysis, giving a 24-36 hour interval between sampling and reporting. We do not batch samples.

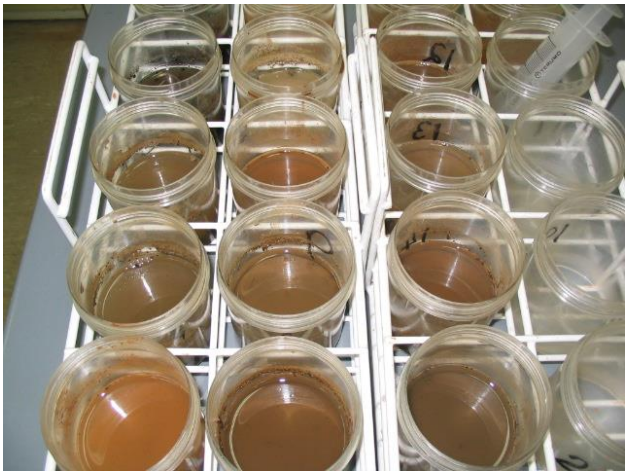
N-check® is a crop management tool that accurately and quickly evaluates available soil nitrogen levels in the rootzone. The information N-check® provides can improve crop performance and reduce fertiliser costs while managing the risk of nitrogen losses in the environment.

One of the key benefits of N-check® is that excess soil nitrogen (N) is measured accurately over the entire possible range in all soil types. Plant analyses cannot reflect excess nitrogen due to the plants' inability to take up unlimited amounts of N.

The methodology is adopted from Europe where it is the test of choice in agriculture, and also prescribed by regulatory bodies in some countries.

An N-check® test prior to planting can show how much, if any, nitrogen is required in the base dressing. In-crop, e.g. prior to rapid growth phases, an N-check® test will ensure crops will not suffer yield or quality loss from too little or excess nitrogen.

To ensure accuracy, N-check® samples must be collected according to the correct procedure. Cooled samples are forwarded to AgVita Analytical by Express Post mail. We process the field fresh soil on the day it arrives.



Results are e-mailed back to clients throughout Australia on the day of analysis, resulting in a 24-36 hour interval between sampling and reporting. We report N-Check results to our clients in simple to use graphical reports with space for advisors to add their interpretations and recommendations.

The N-check® analysis may be used as an alternative to deep soil N testing.

AQUA~SURE® measures the suitability of water for a range of agricultural uses. Applications include:

- hydroponics solution (drip, drain) and run-off or recycled solution analysis
- dam, bore and channel water for irrigation
- Spray water analysis
- recycled / waste water
- rivers, lakes and streams

We provide test specific sampling instructions. Succinct interpretation guides are included with reports on irrigation water results, and hydroponic solution reports contain elemental concentrations in both ppm and meq/l

All water is analysed and reported on the day of arrival in the lab.

Depending on the water source, a combination of the below listed properties are determined:

- Nutrient load (ppm);
  Nitrate (NO_3), ammonium (NH_4) phosphorus (P), potassium (K), calcium (Ca), chloride (Cl), magnesium (Mg), sulphur (S) zinc (Zn), boron (B), copper (Cu), manganese (Mn), iron (Fe), and molybdenum (Mo).

- Quality indicators;
  Acidity or alkalinity (pH), electrical conductivity (EC), sodium absorption ratio (SAR), chloride (Cl), sodium (Na), hardness (calcite), carbonate (CO3), bicarbonate (HCO3), total dissolved salts (TDS), total dissolved ions (TDI), and residual sodium carbonate (RSC).

The expressSoil® soil nutrient analysis is based on a multi-element extraction process, which was originally developed in 1984 by Dr Adolph Mehlich. This method is popular in the United States and some European countries. It is used to assess the potential availability of phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sodium (Na), sulphur (S), zinc (Zn), boron (B), copper (Cu), manganese (Mn), and iron (Fe).

All cations are determined as absolute levels (mg/kg) as well as CECe (meq/100g and % of CECe)

The soil nutrient test is complemented by measurements of the following fertility indictors:

- pH (H2O and CaCl2),
- Total carbon& total nitrogen (%)
- electrical conductivity (EC),
- Exchangeable acidity (Al+ & H+ Mehlich buffer method)
- Sodium (ppm) and exchangeable sodium (%=ESP and meq/100g)
- Lime requirement to neutralise acidic cations
- Chloride (mg/kg)
- M3-PSR, P Saturation Ratio (P Buffer Capacity)
- ESI, Electrochemical Stability Index (describes the relationship between sodicity and salinity)

In addition to expressSoil®, N-check® available soil nitrogen test can be conducted on the same sample, providing N-check® specific sampling and sample handling instructions have been observed.

The M-3 PSR has agronomic and environmental use eg. for waste water re-use and effluent use sites. PSR is a measure of the soils P fixing capacity. CECe is the 'effective cation exchange capacity', measured at the actual soil pH, rather than under alkaline conditions (pH 8.2).

The lime requirement is calculated based on 90% CaCO3 equivalent - the amount reported will neutralise the exchangeable acidity, resulting in pH 6.

ESI describes the relationship between sodicity and salinity, indicating the likelihood of crusting or hard setting.

Results will be available within five working days of samples arriving at the lab.

Simple to use interpretative reporting templates are standard, making interpretations and recommendations easy. These templates use suggested levels of nutrients and indicators specific to the Mehlich extraction method to provide guidelines for soil results.

AgVita Analytical works closely with a specialist lab that measures the level of soil microbial activity in the root zone. Soil microbes are important for the management, cycling and general plant availability of minerals and nutrients within the soil.

By managing microbial population ratios the general health of plants can be influenced, thereby increasing crop yield, quality and profitability.

It is possible to conduct the SMI test™ (Soil Microbial Indicator test) on N-check® or expressSoil® samples, as long as sufficient soil is sent and relevant sampling instructions have been observed.

SMI test™ measures and reports against target levels on the following indicators:

Nutrients held in the biomass

- Calcium
- Carbon
- Potassium
- Nitrogen
- Phosphorus
- Sulphur
- Magnesium

Microbial Activity in kg/ha

- Total microorganism count
- Total bacteria count
- Total Fungi count
- Prokaryotes
- Pseudomonas
- Antinomycetes
- Anaerobic bacteria
- Gram-positive bacteria
- Gram-negative bacteria
- Eukaryotes
- Protozoa
- Mycorrhizal fungi
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Two useful ratios are also included

- Fungi : Bacterial ratio
- Total Bacteria : Anaerobic Bacteria ratio

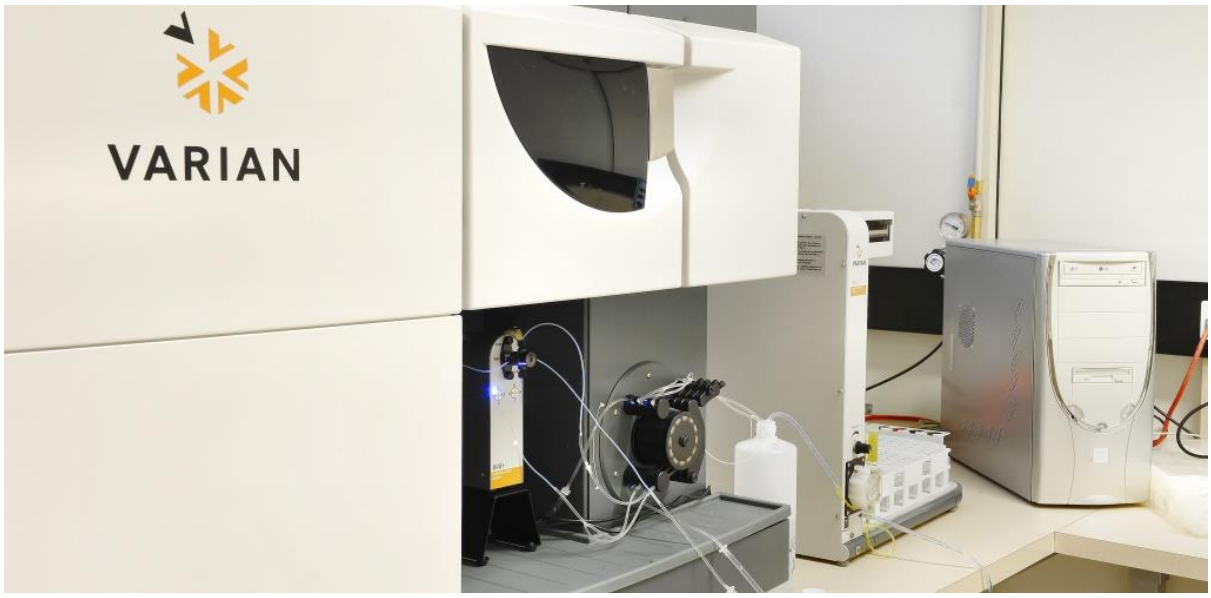
The report also includes a useful Microbial Diversity Indicator.

Sample Analysis

ICP (Inductively Coupled Plasma)

The VARIAN ICP (shown below) is used to determine inorganic nutrients in soil, plant and water samples. ICPs are used in applications where very precise detection of elements is required (e.g. mining, petrochemical & pharmaceutical industries, soil, plant and water analysis). AgVita currently operate two ICP's.

The ICP has stringent quality control systems built into the software, allowing for consistency and repeatability with all analyses. The simultaneous analysis of elements (up to 33 elements at one time) greatly reduces analytical time, allowing for fast turnaround of results.



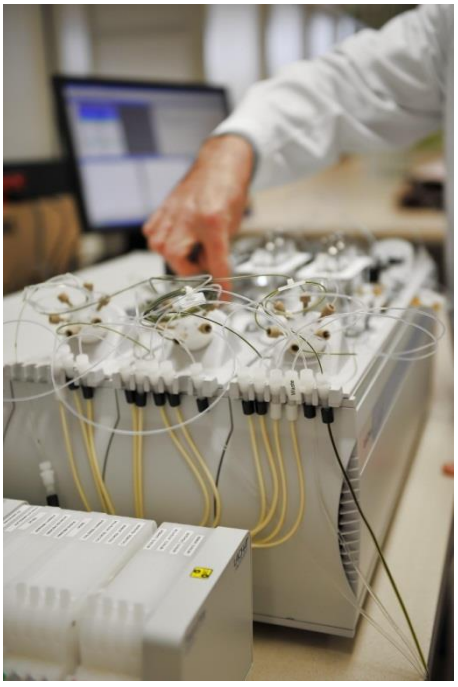
FIA (Flow Injection Analyser)

The FIA (pictured right) is used to measure NO_3, NH_4 and Cl on soil, plant and water samples, a task it performs simultaneously in around one minute per sample. There is rigorous QA and QC built in to the machine and each run, including a series of standard, check, blank and duplicate samples

Other methods of analysis requiring a colorimetric finish can also use the FIA for automated, calibrated accurate analysis (e.g organic carbon, Olsen-P).

The Flow injection analyser is used for the measurement of nitrogen, chloride and ammonium in plant sap (NU-test®), soil extracts (N-check®) and various water analyses (AQUA-SURE®). The FIA is a colorimetric method, measuring the colour change in samples after a chemical reaction has taken place.

FIA technology is used widely in many countries in the analysis of water and waste water.



ELEMENTAR (TC & TN analyser)

Our two VarioMax TC/TN analysers combusts small quantities of finely ground and homogenised soil at 900ºC - this liberates all forms of carbon and nitrogen from the soil. This machine can also analyse Total Carbon (TC) & Total N (TN) in plant and liquid samples. As with all modern analytical equipment, numerous QC and QA protocols such as blanks, check samples, and standards are built in to all runs on this machine.

Total Carbon (TC) measures **all** the carbon in the soil, or the carbon storage in soil, and can be used in carbon calculators and as part of carbon accounting.

Combustion of the soil involves heating the soil to 900 C, carbon from the soil then reacts with oxygen pumped into the furnace to form carbon dioxide. This evolved carbon dioxide is then measured by the instrument.

Total Organic Carbon (TOC), on the other hand, measures all the carbon in the soil that is not bound up as a mineral (typically carbonate).

Typically what we have observed is that unless lime/dolomite or gypsum have been placed on the soil prior to sampling the observed TC is very close to the observed TOC. Both methods are industry standards and are included in the ASPAC (Australasian Soil and Plant Analysis Council) proficiency testing.

Similarly, Total N % represents the total amount of all Nitrogen sources in the soil. This will include Nitrate (NO3-), Nitrite (NO2-), Ammonium (NH4+), and other nitrogenous compounds held in organic matter including the microbial biomass. These sources of N may or may not be plant-available because they are tied up in organic matter. Depending on mineralisation conditions, it is estimated that between 0.5 – 3% of the total N will become plant available over time.

Measurement of both TC & TN can then be used to calculate the C/N ratio of the sample.