



UNDERSTANDING SOIL TESTS



Reading soil samples can be complicated, especially with the extra numbers that come from extensive testing packages. Wouldn't it be nice to understand what all the numbers tell you about your soil?

This guide provides an overview of a sample soil report commonly seen in our region. Results are typically broken into four sections — chemical and physical, cation exchange capacity, macronutrients, and micronutrients.

Physical properties

Soil texture: Texture is based on mineral composition — broken down to parts of clay, silt, and sand.

Soil colour: A visual assessment of the mineral material colour.

Chemical properties

pH: Nutrient availability is optimised in the majority of pasture grasses and legumes at pH 5.5-6.5. pH influences nutrient availability and cation exchange.

Electrical conductivity: This is a measure of salts in the soil, which are extracted in a solution. A good level is less than 4 dS/m.

Organic matter: Soils in our region are known to be naturally low. Organic matter does not have specific critical levels for extensive grazing.

Cation Exchange Capacity (CEC)

CEC is a measure of cations present in the soil. Cations are positively charged ions. A CEC greater than 4 meq/100g, with sodium <1% and aluminum <5% of cations, in extensive grazing country is a good result. CEC can determine calcium, magnesium, and potassium deficiencies.

Macronutrients

Nitrogen is critical for plant energy production. In extensive grazing practices, there are no defined critical limits.

Phosphorus is known to be a limiting nutrient in Australia, and our region is no exception. Phosphorus levels in a Colwell P test below 10 mg/kg will indicate poor plant nutrition and productivity. A common result in our region is between 10 and 20 mg/kg, which may pose issues for legumes establishing root nodes.

Potassium is generally not a major limiting factor on pasture growth in northern Queensland. Critical limits for growth depend on soil type, sandy soils require higher levels to support growth, as potassium is easily leached from soil.

Sulphur levels required for pasture production are low when nitrogen and potassium are limiting. Legumes have a greater requirement for sulphur as this supports nitrogen fixation in root nodes.

Micronutrients

Micronutrients are at low levels in much of northern Queensland. Soil used for extensive grazing is often tested for iron, manganese, zinc, boron, copper, and silicon. Low levels will indicate a deficiency, but symptoms are often not pronounced in plants as micronutrients may not be the most limiting nutrient.

How to read a soil test

A good place to start when assessing your results is the soil texture; this will determine the critical limits of, and determine the inputs required for correcting, your soil.

These sample soil test results (opposite) show there is an acidity issue (pH), an imbalance of cations that could be causing a calcium

Analyte	Result	Units
Soil Colour	Yellow-Brown	
Soil Texture	Sandy Loam	
pH (1:5 CaCl ₂)	4.8	
pH (1:5 Water)	5.5	
Electrical Conductivity	1.9	dS/m
Chloride	12	mg/kg
Organic Matter	1.7	%
Organic Carbon	1	%
Nitrate Nitrogen	21	mg/kg
Ammonium Nitrate	10	mg/kg
Phosphorus (Colwell)	<5.0	mg/kg
PBI	28	
Available Potassium	220	mg/kg
Sulphur	4.7	mg/kg
Calcium	1.2	cmol(+)/kg
Magnesium	0.68	cmol(+)/kg
Potassium	0.55	cmol(+)/kg
Sodium	0.035	cmol(+)/kg
Aluminium	0.14	cmol(+)/kg
CEC	2.62	cmol(+)/kg
Calcium:Magnesium	1.8	
Zinc	0.85	mg/kg
Iron	92	mg/kg
Copper	0.34	mg/kg
Manganese	23	mg/kg
Boron	0.18	mg/kg
Silicon	68	mg/kg

deficiency, a low phosphorus level that would be impacting on plant growth and animal nutrition, and low micronutrient levels.

The sample shows a CEC of 2.62, which is a low cation activity for sandy loam soil. The results for calcium, magnesium, potassium, sodium, and aluminum are the percentages of each cation — and this sample shows an imbalance of cations. These results in turn can be used for the calcium:magnesium ratio, and anything under 4 may indicate a calcium deficiency.

At less than 20 mg/kg, phosphorus levels are low in this sample, but nitrogen and nitrate levels are good. Levels of micronutrients are low but the impact on pasture productivity will not be pronounced as low levels of potassium and calcium will have a greater limiting effect, as well as soil acidity inhibiting nutrient uptake.

All these issues would impact on pasture productivity and quality in extensive grazing practices. For advice on correcting low levels of nutrients and nutrient availability contact an agronomist or soil health consultant.