

Soil Chemistry Analysis



Client: Soilsmart NSW
 Site: G4
 Soil Classification: Sandy Soil

Sample Rec'd: 18-Dec-20
 Plant/Crop: Turf
 Sample ref: XYZ081220G

Nb: Laboratory analysis conducted by the NATA accredited Environmental Analysis Laboratory at Southern Cross University Lismore NSW. Guidelines based on Albrecht and Reams methods

	Ideal level	Result	% of Optimal	Nutrient Status			Comments
				Low	Optimal	High	
pH 1:5 Water	6.3	5.35	84.9				Below the ideal level
CEC	3.3	2.41	73.1				Low
Organic matter	> 2.5	3.11	124.3				High
Conductivity dS/m	0.100	0.036	35.9				Low salt levels
Key Ratios							
Calcium:Magnesium	3.2 : 1	4.19	132.3				Calcium is high relative to Magnesium
Potassium:Magnesium	1:1	1.11	110.6				Potassium is high relative to Magnesium
Phosphorus:Sulphur	3:1	4.69	156.4				Phosphorus is high relative to Sulphur
Phosphorus:Zinc	10:1	3.71	37.1				Phosphorus is low relative to Zinc
Potassium:Sodium	3:1	3.82	127.5				Slightly high but OK
Iron:Manganese	1:1	16.08	1608.4				High will affect Manganese availability
Plant Available Nutrients							
Plant Available Calcium (ppm)	175	207.38	118.5				Above optimal
Plant Available Magnesium (ppm)	25	36.67	146.7				Above optimal
Plant Available Potassium (ppm)	50	26.15	52.3				Below optimal
Plant Available Phosphorus (ppm)	5	2.61	52.1				Below the minimum required
Nutrient levels							
Nitrate Nitrogen (ppm)	10	1.1	11.4				Low
Ammonium Nitrogen (ppm)	12	3.9	32.1				Low
Total Nitrogen	22	5.0	22.7				Total Nitrogen is low
Phosphorus (Bray 2) (ppm)	40	38.5	96.2				Total P is OK but only 7% is plant available
Sulphur (ppm)	7	8.2	117.1				Higher than optimal
Cation Volume							
Calcium (ppm)	375	312.2	83.2				Below optimal
Magnesium (ppm)	75	45.2	60.3				Below optimal
Potassium (ppm)	100	50.0	50.0				Below optimal
Sodium (ppm)	25.3	15.0	59.3				Below optimal
Aluminium (ppm)	13.5	15.1	111.7				Slightly elevated
Hydrogen (ppm)	1.5	1.9	125.7				High will be driving low pH.
Cation Balance							
Calcium (%)	57.40	64.61	112.6				High relative to other Cations
Magnesium (%)	18.10	15.43	85.2				Low relative to other Cations
Potassium (%)	9.10	4.12	45.3				Low relative to other Cations
Sodium (%)	3.30	1.08	32.6				Low relative to other Cations
Aluminium (%)	5	6.95	139.0				High relative to other Cations
Hydrogen (%)	4	7.82	195.4				High relative to other Cations
Trace Elements							
Zinc (ppm)	3	10.37	345.7				High - Review inputs
Manganese (ppm)	15	13.18	87.9				Low will affect plant function
Iron (ppm)	15	211.95	1413.0				High particularly in relation to Manganese
Copper (ppm)	1.2	1.88	156.7				High
Boron (ppm)	1	0.52	51.8				Low will affect plant function
Silicon (ppm)	35	7.78	22.2				Low
Chloride estimate (ppm)	65	22.99	35.4				Low - OK
Sundry							
Carbon:Nitrogen ratio	10 - 12	14.73	133.9				High

Comments and Recommendations

Key Issues and General

There are a few deficiencies and some issues with nutritional balance which will be impacting nutrient availability and plant health. The amendments suggested in the following are designed to correct and improve nutrient balance, availability and ultimately plant health. Dependent upon budget constraints, steps taken within the theme of these recommendations will gradually improve plant health.

The **pH level (5.35)** is lower than the ideal level and will have a negative impact on nutrient availability. **Soil Organic Matter (3.11%)** is also above the ideal for this soil type and will have a positive impact on nutrient retention and biological support.

Cations, Cation Exchange Capacity (CEC) and Cation Balance.

The level of nutrition in terms of **Cation Exchange (CEC 2.41)** is well below the optimal level reflecting the low level of most Cations. Cations are also unbalanced, with **Calcium** over represented at the expense of **Potassium, Magnesium** and other Cations. The low level of Cations is causing **Aluminium** and **Hydrogen** to be elevated. Hydrogen will promote low pH and the availability of Aluminium. Adjusting the volume of Cations will offset the issues with balance and improve both Cation availability and pH.

Major Nutrients Levels

Looking at the pool of major nutrients, the level of both **Nitrate** and **Ammonium** Nitrogen is low. The level of '**Total Phosphorus**' is slightly lower than optimal, whereas the level of **Sulphur** is above the ideal. As well as being low, **93% of 'Total Phosphorus'** is tied-up and not plant available. At this point, '**Plant available**' Phosphorus is also below the **minimum level required** and will need amending to ensure an ongoing supply of 'available' P to the plant.

Trace Element Levels

With the exception of **Iron, Copper** and **Zinc**, trace elements are below ideal levels. Of most concern are the low levels of **Boron** because of its role in carbohydrate mobilisation and strong influence on root growth and activity. **Manganese** is also a concern because of its critical importance in carbohydrate production and the potential for it to be **tied-up by high Iron levels**.

All Trace elements have significant roles to play in plant function (ATP production, carbohydrate production and transfer etc. Consequently we would suggest foliar applications will be required, at least in the short term, to ensure availability to the plant.

Biological Remediation

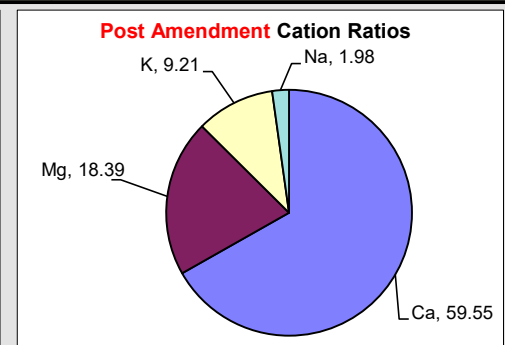
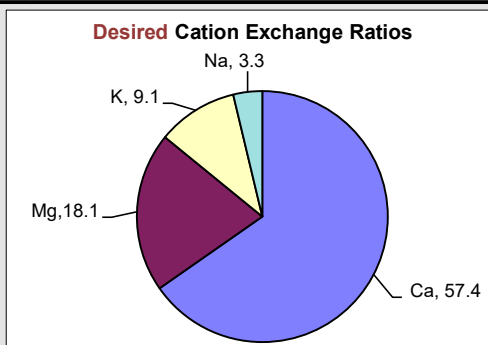
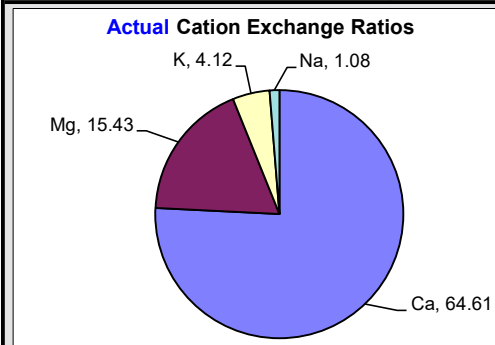
The regular addition of 'diverse' biological stimulant, such as **Soil and Plant Tonic (SPT)** will ensure optimal nutrient availability and strong resilient plants. **SPT** will also assist with the **breakdown and stabilisation of organic matter** and will also assist release of '**tied-up**' Phosphorous (as will periodic additions of a quality **FulVik Liquid**).

Whilst plants can tolerate a wide variation of management styles and nutrient regimes, a soil analysis essentially compares the existing nutrient status and program with optimal levels. As a result, the following attempts to correct as many of the deficiencies and imbalances as possible. In practice however, and depending on budgets and work loads, any and all steps taken along the lines outlined below will achieve some improvement in the current situation.

In terms of soil amendments, where possible we have selected mineral based products, which will be less prone to leaching in sandier profiles.

Soil Remediation (nutrient amendments) - estimate of rates and volume (based on known and familiar materials).

Product	kg/1000m ²	App Type	Frequency	Pack Size	Analysis
Granular Rock Phosphate	20	Soil	At renovation	25kg	N0.2, P11.2, K1, Ca21.5, Mg0.76, S1.6, Fe1.86, Si23
Dolomite	55	Soil	Max 800kg/app & 5t annually	25kg	Ca22.8, Mg10.9
Sulphate of Potash	20	Soil	Divided into 5 - 6 monthly apps	25kg	K41.5, S17.4
Boron Granules	3.5	Soil	Once only	25kg	B3.23, HA57.2
Potassium Nitrate	17.5	Soil	Divided into 4 - 5 monthly apps	25kg	N13, K38
Greens Bio Mineraliser	10	Soil	At renovation	25kg	16.N, 5.3P, 7.5K, 9Ca, 1.1Mg, 4.2S, 1.2Fe, 10Si, 0.019B, 0.08Zn, 0.03Cu, 0.51Mn, 0.005Mo, 0.042Co



Maintenance Program - Suggested nutrient inputs post renovation and during active growth.

Product	kg/1000m ²	App Type	Frequency	Pack Size	Analysis
Greens Bio Mineraliser	5	Soil	Bi-monthly during active growth	25kg	12.2N, 8.2P, 13.0K, 5.8 Ca, 1.6Mg, 5.7S, 0.05Zn, 0.5Fe, 0.04Mn, 0.08B, 0.002Cu, Mo 0.006%, 6.2Si
Maintain Foliar (Liquid)	1	Foliar	Monthly in growing season	20lt	3.3N, 2.3P, 1.2K, 4.7Ca, 0.9Mg, 1.1S, 0.5Fe, 0.5Fe, 0.05Si, 0.7B, 0.3Zn, 0.1Cu, 2Mn, 0.02Mo
Soil & Plant Tonic	10	Drench	Monthly	20lt	Biological Inoculant
BioGrow	1	Drench	Monthly	20lt	Biological stimulant
RootMax (Super Kelp)	0.8	Drench	Monthly	20lt	Biological stimulant
PhotoBor	2.0	Drench	Monthly	20lt	Biological and Plant stimulant

Remediation Program Summary

Soilsmart NSW		Sample Received: 18-Dec-20						Ongoing requirement
Remedial Apps	Soluble	kg/1000m ²	Apps Reqd	Initial app (kg)	Month 2 app (kg)	Month 3 app (kg)	Month 4 app (kg)	
	Granular							
Granular Rock Phosphate	G	20	1	20				
Dolomite	G	55	2	27.5	27.5		27.5	
Sulphate of Potash	G	20	6	3.3	3.3	3.3	3.3	6.6
Boron Granules	G	3.5	1	3.5				
Potassium Nitrate	S	17.5	5	3.5	3.5	3.5	3.5	3.5
Greens Bio Mineraliser	G	10	1	10				

NB: Application of Boron Granules & Manganese Sulphate could be encompassed in Maintain applications

Maintenance Program Summary

Soilsmart NSW		Sample Received: 18-Dec-20					
Maintenance Apps	Soluble	kg/1000m ²	Soil	Pack Size	Monthly Apps Reqd		
	Granular		Foliar				
	Liquid		Drench				
Greens Bio Mineraliser	G	5	S	25kg	4 - 5		
Maintain Foliar (Liquid)	L	1	F	20L	8 - 10		
Soil & Plant Tonic	L	10	L	20L	12		
BioGrow	L	1	L	20L	12		
RootMax (Super Kelp)	L	0.8	L	20L	12		
PhotoBor	L	2.0	L	20L	12		

Our aim is to provide an accurate picture of the current status of your soil, however it is a summary of soil status at a point in time, consideration should always be given to current soil management, soil amendments and fertilizer practice as well as that which has occurred over the recent past. The results will also reflect seasonal conditions and the rate of recent plant growth.

The information, data and recommendations set forth herein are believed by Soilsmart to be accurate. Soilsmart NSW however makes no warranties, either expressed or implied, with