Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal

ABN: 41 995 651 524

AGRICULTURAL SOIL ANALYSIS REPORT (Page 1 of 2)

1 sample supplied by XXXx on XX/XX/2021. Lab Job No.KXXX

Analysis requested by Accounts Payable. Your Job: XXXXXX

			Sample 1	*Desirable*	*Desirable*	*Desirable*	*Desirable*
		Sample ID:	**Native Pasture**	*Level*	*Level*	*Level*	*Level*
		Crop:	**Pasture**	*Heavy Soil*	*Medium Soil*	*Light Soil*	*Sandy Soil*
		Client:	**XXX**	*e.g Clay*	*e.g Clay Loam*	*e.g Loam*	*e.g Loamy Sand*
	Parameter	**Method reference**	**K4654/1**	*Indicative guidelines only- refer Note 17*			
	Soluble Calcium (mg/kg)	**Inhouse S10 - Morgan 1	298	*1150*	*750*	*375*	*175*
	Soluble Magnesium (mg/kg)	**Inhouse S10 - Morgan 1	64	*160*	*105*	*60*	*25*
	Soluble Potassium (mg/kg)	**Inhouse S10 - Morgan 1	<25	*113*	*75*	*60*	*50*
	Soluble Phosphorus (mg/kg)	**Inhouse S10 - Morgan 1	3.3	*15*	*12*	*10*	*5*
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9E2 (Bray 1)	6.3	*45 note 8*	*30 note 8*	*24 note 8*	*20 note 8*
	Phosphorus (mg/kg P)	**Rayment & Lyons 2011 - 9B2 (Colwell)	19	*80*	*50*	*45*	*35*
	Phosphorus (mg/kg P)	**Inhouse S3A (Bray 2)	14	*90 note 8*	*60 note 8*	*48 note 8*	*40 note 8*
	Nitrate Nitrogen (mg/kg N)	**Inhouse S37 (KCl)	9.3	*15*	*13*	*10*	*10*
	Ammonium Nitrogen (mg/kg N)	**Inhouse S37 (KCl)	1.3	*20*	*18*	*15*	*12*
	Sulfur (mg/kg S)	**Inhouse S37 (KCl)	1.8	*10*	*8*	*8*	*7*
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	5.81	*6.5*	*6.5*	*6.3*	*6.3*
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.045	*0.20*	*0.15*	*0.12*	*0.10*
	Estimated Organic Matter (% OM)	**Calculation: Total Carbon x 1.75	3.6	*>5.5*	*>4.5*	*>3.5*	*>2.5*
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	2.44	*16*	*11*	*5*	*2*
	Exchangeable Calcium (kg/ha)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	1095	*7000*	*4816*	*2240*	*840*
	Exchangeable Calcium (mg/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	489	*3125*	*2150*	*1000*	*375*
	Exchangeable Magnesium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	0.57	*2.4*	*1.7*	*1.2*	*0.6*
	Exchangeable Magnesium (kg/ha)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	155	*650*	*448*	*325*	*168*
	Exchangeable Magnesium (mg/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	69	*290*	*200*	*145*	*75*
	Exchangeable Potassium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	<0.12	*0.6*	*0.5*	*0.4*	*0.3*
	Exchangeable Potassium (kg/ha)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	<112	*526*	*426*	*336*	*224*
	Exchangeable Potassium (mg/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	<50	*235*	*190*	*150*	*100*
	Exchangeable Sodium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	0.13	*0.3*	*0.3*	*0.2*	*0.1*
	Exchangeable Sodium (kg/ha)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	69	*155*	*134*	*113*	*57*
	Exchangeable Sodium (mg/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	31	*69*	*60*	*51*	*25*
	Exchangeable Aluminium (cmol+/kg)	**Inhouse S37 (KCl)	0.05	*0.6*	*0.5*	*0.5*	*0.2*
	Exchangeable Aluminium (kg/ha)	**Inhouse S37 (KCl)	11	*108*	*90*	*81*	*27*
	Exchangeable Aluminium (mg/kg)	**Inhouse S37 (KCl)	5	*54*	*45*	*41*	*14*
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	3.26	***20***	***14***	***7***	***3.5***
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / TCE x 100	59.2	*77*	*76*	*69*	*60*
	Magnesium (%)	**Base Saturation Calculations - Cation cmol+/kg / TCE x 100	13.8	*12*	*12*	*16*	*20*
	Potassium (%)	**Base Saturation Calculations - Cation cmol+/kg / TCE x 100	1.4	*3*	*4*	*5*	*8*
	Sodium - ESP (%)	**Base Saturation Calculations - Cation cmol+/kg / TCE x 100	3.3	*2*	*2*	*3*	*3*
	Aluminium (%)	**Base Saturation Calculations - Cation cmol+/kg / TCE x 100	1.3	*7*	*7*	*7*	*9*
	Hydrogen	**Base Saturation Calculations - Cation cmol+/kg / TCE x 100	21.0				
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	4.3	*6.4*	*6.3*	*4.3*	*3.0*
	Zinc (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	2.5	*6*	*5*	*4*	*3*
	Manganese (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	1.5	*25*	*22*	*18*	*15*
	Iron (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	36	*25*	*22*	*18*	*15*
	Copper (mg/kg)	Rayment & Lyons 2011 - 12A1 (DTPA)	0.3	*2.4*	*2.0*	*1.6*	*1.2*
	Boron (mg/kg)	**Rayment & Lyons 2011 - 12C2 (Hot CaCl 2)	0.51	*2.0*	*1.7*	*1.4*	*1.0*
	Silicon (mg/kg Si)	**Inhouse S11 (Hot CaCl2)	7.2	*50*	*45*	*40*	*35*
	Total Carbon (%)	Inhouse S4a (LECO Trumac Analyser)	2.08	*>3.1*	*>2.6*	*>2*	*>1.4*
	Total Nitrogen (%)	Inhouse S4a (LECO Trumac Analyser)	0.12	*>0.3*	*>0.25*	*>0.2*	*>0.15*
	Carbon/Nitrogen Ratio	**Calculation: Total Carbon/Total Nitrogen	17.5	*10 to 12*	*10 to 12*	*10 to 12*	*10 to 12*
	Basic Texture	**Inhouse S65	Sandy Soil	..	..	..	..
	Basic Colour	**Inhouse S65	Grey	..	..	..	..
	Chloride Estimate (equiv. mg/kg)	**Calculation: Electrical Conductivity x 640	29	..	..	..	..

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AGRICULTURAL SOIL ANALYSIS REPORT (Page 2 of 2)

1 sample supplied by XXXx on XX/XX/2021. Lab Job No.KXXX

Analysis requested by Accounts Payable. Your Job: XXXXXX

	Parameter	Method reference	Sample 1 Native Pasture Pasture XXX	Desirable Level Heavy Soil e.g Clay	Desirable Level Medium Soil e.g Clay Loam	Desirable Level Light Soil e.g Loam	Desirable Level Sandy Soil e.g Loamy Sand
	Sample ID:		Native Pasture	Level	Level	Level	Level
	Crop:		Pasture	Heavy Soil	Medium Soil	Light Soil	Sandy Soil
	Client:		XXX	e.g Clay	e.g Clay Loam	e.g Loam	e.g Loamy Sand
	Parameter	**Method reference**	**K4654/1**	*Indicative guidelines only- refer Note 17*			
	Total Calcium (mg/kg)	Rayment & Lyons 2011 - 17C1 Aqua Regia	770	*range 1,000 - 10,000 Ca*			
	Total Magnesium (mg/kg)		141	*range 500 - 5,000 Mg*			
	Total Potassium (mg/kg)		102	*range 200 - 2,000 K*			
	Total Sodium (mg/kg)		<50	*range 100 - 500 Na*			
	Total Sulfur (mg/kg)		180	*range 100 - 1,000 S*			
	Total Phosphorus (mg/kg)		78	*range 400 - 1,500 P*			
	Total Zinc (mg/kg)		5.3	*range 20 - 50 Zn*			
	Total Manganese (mg/kg)		6.4	*range 200 - 2,000 Mn*			
	Total Iron (mg/kg)		585	*range 1,000 - 50,000 Fe*			
	Total Copper (mg/kg)		1.7	*range 20 - 50 Cu*			
	Total Boron (mg/kg)		2.7	*range 2 - 50 B*			
	Total Silicon (mg/kg)		473	*range 1,000 - 3,000 Si*			
	Total Aluminium (mg/kg)		386	*range 2,000 - 50,000 Al*			
	Total Molybdenum (mg/kg)		<0.2	*range 0.5 - 3 Mo*			
	Total Cobalt (mg/kg)		0.1	*range 5 - 50 Co*			
	Total Selenium (mg/kg)		0.6	*range 0.1 - 2.0 Se*			
	Total Cadmium (mg/kg)		<0.5	*< 1 Cd*			
	Total Lead (mg/kg)		<1	*< 10 Pb*			
	Total Arsenic (mg/kg)		<2	*< 5 As*			
	Total Chromium (mg/kg)		<2	*range 10 - 100 Cr*			
	Total Nickel (mg/kg)		<1	*range 1 - 50 Ni*			
	Total Mercury (mg/kg)		<0.1	*< 1 Hg*			
	Total Silver (mg/kg)		<1	*< 1 Ag*			
	Phosphorus Buffer Index	**Rayment & Lyons 2011 - 9I4b (PBI)	1	..			
	Phosphorus Buffer Index - Colwell adj.	**Rayment & Lyons 2011 - 9I2b (PBI $_{COLWELL}$)	4	..			

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results'.
10. Conversions for 1 cmol $_+$/kg = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimate
13. ** NATA accreditation does not cover the performance of this service.
14. Analysis conducted between sample arrival date and reporting date.
15. This report is not to be reproduced except in full.
16. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal).
17. Guidelines provided are suggestions only and based on 'Albrecht' and 'Reams' concepts.
18. This report was issued on 19/03/2021.

NATA
WORLD RECOGNISED ACCREDITATION
Accreditation No. 14960
Accredited for compliance with ISO/IEC 17025 - Testing

Quality Checked: Kris Saville
Agricultural Co-Ordinator KS

Southern Cross University
PO Box 157 Lismore NSW 2480
P: +61 2 6620 3678
E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

Understanding your EAL agricultural soil results

An EAL agricultural soil test report holds a wealth of information. To assist in its interpretation, please refer to the colour coded text below and within the report. For example, phosphorous results can be quickly located by looking for the yellow bar to the left of the data. The Parameter column of the report defines the test undertaken, while the Method reference indicates which technique was used. To the right of your data, indicative guidelines have been provided based on soil texture. In the phosphorous example, Bray I data would be used to assess plant available results, while Bray II would give exchangeable information.

Ammonium acetate	**Effective Cation Exchange Capacity** - The ECEC result can be related to the texture of the soil (heavy, medium, light or sandy). Comparing results to indicative values can give you an idea of the soil texture. Knowing the soil texture can guide your interpretation of other parameters against the guidelines. Exchangeable elements give you an idea of the available nutrients. In particular, compare exchangeable calcium and potassium (kg/ha) to the indicative guidelines.
pH	**Soil pH** - A water pH > 6.5 or $CaCl_2$ pH > 5.5 indicates no major problem. Soils with pH > 7 are considered alkaline. Soils with pH < 4.5 often have high exchangeable hydrogen and aluminium (kg/ha; with high % hydrogen and aluminium base saturation).
Conductivity, Chloride Estimate	**Soil Salinity** - An electrical conductivity (EC) greater than the texture guidelines (e.g. > 0.2 dS/m heavy soil) may indicate a salinity issue. If the Exchangeable Sodium Percentage (ESP) or % Exchangeable Sodium is > 5% you may have a salt issue. High EC soils can have elevated chloride concentrations.
Calcium/Magnesium Ratio	**Calcium/Magnesium Ratio** - A Ca/Mg ratio of 5 indicates good soil structure. The structure of a soil with a ratio of 1–5 may benefit from additional calcium. A ratio < 1 (significantly more Mg than Ca) often indicates high clay content soil and possibly a clay sub-soil. The cation imbalance may be due to compaction and poor water infiltration.
Estimated organic matter	**Organic Matter** - An organic matter content greater than the indicative guidelines for the appropriate soil type indicates good organic carbon levels. For example OM > 4.5% in a medium soil. The Carbon/Nitrogen ratio should be between 10 and 12. Higher values suggest a depletion in organic nitrogen.
Bray 1, Colwell	**Phosphorus** - Bray I phosphorous indicates plant available results. Bray II phosphorous provides exchangeable values. Phosphorous concentrations near or above the guidelines suggest phosphorous additions are not required.
Morgan 1 and KCl	**Solubles** - Nitrate, ammonium and sulfur are leachable nutrients and may accumulate down the soil profile. Indicative values are given relative to soil texture.
DTPA	**Micronutrients** - Plant available iron, manganese, copper and zinc should be compared to indicative guidelines to assess whether levels are low or high. Iron and manganese availability is significantly influenced by soil pH (acid soils often have very high soluble iron). Leaf testing is ideal for confirming potential issues with micronutrient concentrations.
$CaCl_2$	**Boron** - The $CaCl_2$ extracted boron is the plant available form of the micronutrient. Boron is very leachable and can accumulate down the soil profile.
PBI	**Phosphorus Buffer Index (PBI; no units)** - Soils with higher PBI values up to 1000 have a greater capacity to absorb phosphorous. Therefore, low PBI soils have limited ability to tie up phosphourous ammendments.
Total Acid Extractable	**Acid Extractable Nutrients** - Total available nutrient concentrations give an indication of the store of nutrients in the soil.