Ballance agri-nutrients

Hill Laboratories
BETTER TESTING BETTER RESULTS

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Web www.hill-labs.co.nz

ANALYSIS REPORT

Client:	St Peters School	**Lab No:**	1554736	s2chpv2
Address:	Private Bag 884 Cambridge 3450	**Date Registered:**	19-Mar-2016	
		Date Reported:	24-Mar-2016	
		Quote No:		
		Order No:		
		Client Reference:	4051959	
		Add. Client Ref:	Owl Farm	
Phone:	07 827 9899	**Submitted By:**	M Ter-Morshuizen	

Soil Analysis Results

Sample Name:	Soil Type*	pH pH Units	Olsen Phosphorus mg/L	Sulphate Sulphur mg/kg	Potassium MAF units	Calcium MAF units	Magnesium MAF units
1	Ash	5.6	35	35	22	8	24
2	Ash	5.6	51	17	8	6	31
3	Ash	5.9	62	16	14	10	26
4	Ash	5.4	55	48	9	7	16
5	Ash	5.5	41	44	16	7	26
6	Ash	5.9	35	31	15	9	30
7	Ash	5.6	36	35	11	8	20
A	Ash	5.7	24	22	9	8	15
B	Ash	5.4	45	45	13	6	16
C	Ash	5.7	35	36	4	7	10
D	Ash	5.6	30	46	5	6	14

Sample Name:	Sodium MAF units	Aluminium ($CaCl_2$ Extractable) mg/kg	Total Nitrogen* %	'Total' Cadmium* mg/kg	Soil Sample Depth* mm		
1	6	-	0.75	0.63	0-75	-	-
2	5	-	0.65	0.53	0-75	-	-
3	5	-	0.70	0.68	0-75	-	-
4	6	3.8	0.60	0.56	0-75	-	-
5	7	-	0.99	0.68	0-75	-	-
6	10	-	0.85	0.80	0-75	-	-
7	8	-	0.58	0.49	0-75	-	-
A	5	-	-	0.41	0-150	-	-
B	6	3.0	-	0.68	0-150	-	-
C	6	-	-	0.64	0-150	-	-
D	6	-	-	0.67	0-150	-	-

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Phone:	07 827 9899	**Submitted By:**	M Ter-Morshuizen

Soil Analysis Results

Sample Name: 1
Lab Number: 1554736.1
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.6	5.8 - 6.0		
Olsen Phosphorus	mg/L	35	20 - 30		
Potassium	MAF units	22	7 - 10		
Calcium	MAF units	8	4 - 10		
Magnesium	MAF units	24	8 - 10		
Sodium	MAF units	6			
Sulphate Sulphur	mg/kg	35	10 - 12		
Total Nitrogen*	%	0.75			
'Total' Cadmium*	mg/kg	0.63			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 5.4	Ca 33	Mg 5.4	Na 0.6
me/100g	K 1.37	Ca 8.3	Mg 1.38	Na 0.16
Additional Properties	Cation Exchange Capacity (me/100g)			26
	Total Base Saturation (%)			44
	Volume Weight (g/mL)			0.77
Soil Type*	Ash			

Sample Name: 2
Lab Number: 1554736.2
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.6	5.8 - 6.0		
Olsen Phosphorus	mg/L	51	20 - 30		
Potassium	MAF units	8	7 - 10		
Calcium	MAF units	6	4 - 10		
Magnesium	MAF units	31	8 - 10		
Sodium	MAF units	5			
Sulphate Sulphur	mg/kg	17	10 - 12		
Total Nitrogen*	%	0.65			
'Total' Cadmium*	mg/kg	0.53			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 2.5	Ca 29	Mg 8.5	Na 0.7
me/100g	K 0.68	Ca 8.0	Mg 2.33	Na 0.19
Additional Properties	Cation Exchange Capacity (me/100g)			28
	Total Base Saturation (%)			41
	Volume Weight (g/mL)			0.58
Soil Type*	Ash			

Sample Name: 3
Lab Number: 1554736.3
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.9	5.8 - 6.0		
Olsen Phosphorus	mg/L	62	20 - 30		
Potassium	MAF units	14	7 - 10		
Calcium	MAF units	10	4 - 10		
Magnesium	MAF units	26	8 - 10		
Sodium	MAF units	5			
Sulphate Sulphur	mg/kg	16	10 - 12		
Total Nitrogen*	%	0.70			
'Total' Cadmium*	mg/kg	0.68			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 4.0	Ca 46	Mg 6.6	Na 0.7
me/100g	K 0.97	Ca 11.2	Mg 1.61	Na 0.16
Additional Properties	Cation Exchange Capacity (me/100g)			24
	Total Base Saturation (%)			57
	Volume Weight (g/mL)			0.73
Soil Type*	Ash			

Sample Name: 4
Lab Number: 1554736.4
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.4	5.8 - 6.0		
Olsen Phosphorus	mg/L	55	20 - 30		
Potassium	MAF units	9	7 - 10		
Calcium	MAF units	7	4 - 10		
Magnesium	MAF units	16	8 - 10		
Sodium	MAF units	6			
Sulphate Sulphur	mg/kg	48	10 - 12		
Aluminium ($CaCl_2$ Extractable)	mg/kg	3.8	0.0 - 3.0		
Total Nitrogen*	%	0.60			
'Total' Cadmium*	mg/kg	0.56			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 2.7	Ca 33	Mg 4.3	Na 0.8
me/100g	K 0.83	Ca 10.1	Mg 1.30	Na 0.23
Additional Properties	Cation Exchange Capacity (me/100g)			31
	Total Base Saturation (%)			41
	Volume Weight (g/mL)			0.55
Soil Type*	Ash			

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		Add. Client Ref:	Owl Farm
Phone:	07 827 9899	**Submitted By:**	M Ter-Morshuizen

Soil Analysis Results

Sample Name: 5
Lab Number: 1554736.5
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.5	5.8 - 6.0		
Olsen Phosphorus	mg/L	41	20 - 30		
Potassium	MAF units	16	7 - 10		
Calcium	MAF units	7	4 - 10		
Magnesium	MAF units	26	8 - 10		
Sodium	MAF units	7			
Sulphate Sulphur	mg/kg	44	10 - 12		
Total Nitrogen*	%	0.99			
'Total' Cadmium*	mg/kg	0.68			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 4.1	Ca 30	Mg 6.2	Na 0.8
me/100g	K 0.96	Ca 7.2	Mg 1.47	Na 0.19
Additional Properties	Cation Exchange Capacity (me/100g)			24
	Total Base Saturation (%)			41
	Volume Weight (g/mL)			0.79
Soil Type*	Ash			

Sample Name: 6
Lab Number: 1554736.6
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.9	5.8 - 6.0		
Olsen Phosphorus	mg/L	35	20 - 30		
Potassium	MAF units	15	7 - 10		
Calcium	MAF units	9	4 - 10		
Magnesium	MAF units	30	8 - 10		
Sodium	MAF units	10			
Sulphate Sulphur	mg/kg	31	10 - 12		
Total Nitrogen*	%	0.85			
'Total' Cadmium*	mg/kg	0.80			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 3.6	Ca 36	Mg 6.6	Na 1.1
me/100g	K 0.93	Ca 9.3	Mg 1.73	Na 0.29
Additional Properties	Cation Exchange Capacity (me/100g)			26
	Total Base Saturation (%)			47
	Volume Weight (g/mL)			0.77
Soil Type*	Ash			

Sample Name: 7
Lab Number: 1554736.7
Sample Type: SOIL Mixed Pasture, Dairy (Ash) (S180)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.6	5.8 - 6.0		
Olsen Phosphorus	mg/L	36	20 - 30		
Potassium	MAF units	11	7 - 10		
Calcium	MAF units	8	4 - 10		
Magnesium	MAF units	20	8 - 10		
Sodium	MAF units	8			
Sulphate Sulphur	mg/kg	35	10 - 12		
Total Nitrogen*	%	0.58			
'Total' Cadmium*	mg/kg	0.49			
Soil Sample Depth*	mm	0-75			

Base Saturation %	K 3.3	Ca 38	Mg 5.6	Na 1.0
me/100g	K 0.75	Ca 8.6	Mg 1.27	Na 0.24
Additional Properties	Cation Exchange Capacity (me/100g)			23
	Total Base Saturation (%)			48
	Volume Weight (g/mL)			0.71
Soil Type*	Ash			

Sample Name: A
Lab Number: 1554736.8
Sample Type: SOIL Chicory (150mm) (S283)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.7	5.7 - 6.4		
Olsen Phosphorus	mg/L	24	20 - 30		
Potassium	MAF units	9	7 - 14		
Calcium	MAF units	8	6 - 14		
Magnesium	MAF units	15	12 - 25		
Sodium	MAF units	5	0 - 14		
Sulphate Sulphur	mg/kg	22	10 - 20		
'Total' Cadmium*	mg/kg	0.41			
Soil Sample Depth*	mm	0-150			

Base Saturation %	K 2.9	Ca 42	Mg 4.4	Na 0.7
me/100g	K 0.45	Ca 6.6	Mg 0.70	Na 0.11
Additional Properties	Cation Exchange Capacity (me/100g)			16
	Total Base Saturation (%)			50
	Volume Weight (g/mL)			0.94
Soil Type*	Ash			

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		Add. Client Ref:	Owl Farm	
Phone:	07 827 9899	**Submitted By:**	M Ter-Morshuizen	

Soil Analysis Results

Sample Name: B
Lab Number: 1554736.9
Sample Type: SOIL Chicory (150mm) (S283)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.4	5.7 - 6.4		
Olsen Phosphorus	mg/L	45	20 - 30		
Potassium	MAF units	13	7 - 14		
Calcium	MAF units	6	6 - 14		
Magnesium	MAF units	16	12 - 25		
Sodium	MAF units	6	0 - 14		
Sulphate Sulphur	mg/kg	45	10 - 20		
Aluminium ($CaCl_2$ Extractable)	mg/kg	3.0	0.0 - 3.0		
'Total' Cadmium*	mg/kg	0.68			
Soil Sample Depth*	mm	0-150			

Base Saturation %	K 3.6	Ca 28	Mg 4.0	Na 0.7	
me/100g	K 0.79	Ca 6.2	Mg 0.89	Na 0.16	
Additional Properties	Cation Exchange Capacity (me/100g)				22
	Total Base Saturation (%)				37
	Volume Weight (g/mL)				0.79
Soil Type*	Ash				

Sample Name: C
Lab Number: 1554736.10
Sample Type: SOIL Chicory (150mm) (S283)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.7	5.7 - 6.4		
Olsen Phosphorus	mg/L	35	20 - 30		
Potassium	MAF units	4	7 - 14		
Calcium	MAF units	7	6 - 14		
Magnesium	MAF units	10	12 - 25		
Sodium	MAF units	6	0 - 14		
Sulphate Sulphur	mg/kg	36	10 - 20		
'Total' Cadmium*	mg/kg	0.64			
Soil Sample Depth*	mm	0-150			

Base Saturation %	K 1.3	Ca 36	Mg 3.0	Na 0.9	
me/100g	K 0.37	Ca 10.4	Mg 0.88	Na 0.27	
Additional Properties	Cation Exchange Capacity (me/100g)				29
	Total Base Saturation (%)				41
	Volume Weight (g/mL)				0.53
Soil Type*	Ash				

Sample Name: D
Lab Number: 1554736.11
Sample Type: SOIL Chicory (150mm) (S283)

Analysis		Level	Optimum	Below Optimum	Above
pH	pH Units	5.6	5.7 - 6.4		
Olsen Phosphorus	mg/L	30	20 - 30		
Potassium	MAF units	5	7 - 14		
Calcium	MAF units	6	6 - 14		
Magnesium	MAF units	14	12 - 25		
Sodium	MAF units	6	0 - 14		
Sulphate Sulphur	mg/kg	46	10 - 20		
'Total' Cadmium*	mg/kg	0.67			
Soil Sample Depth*	mm	0-150			

Base Saturation %	K 1.7	Ca 35	Mg 4.2	Na 0.9	
me/100g	K 0.38	Ca 7.7	Mg 0.91	Na 0.20	
Additional Properties	Cation Exchange Capacity (me/100g)				22
	Total Base Saturation (%)				42
	Volume Weight (g/mL)				0.67
Soil Type*	Ash				

The above nutrient graph compares the levels found with reference interpretation levels. NOTE: It is important that the correct sample type be assigned, and that the recommended sampling procedure has been followed. R J Hill Laboratories Limited does not accept any responsibility for the resulting use of this information. IANZ Accreditation does not apply to comments and interpretations, i.e. the 'Range Levels' and subsequent graphs.

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Analyst's Comments

Samples 1-7 Comment:
While soil Mg MAF levels of 8-10 are sufficient for pasture production, soil levels of 25-30 are required to ensure adequate Mg content in pasture for animal health (greater than 0.22%).

Samples 4, 9 Comment:
The guidelines for interpretation of 0.02M CaCl2 Extractable Aluminium are: Less than 3 mg/kg unlikely to be toxic to plants; 3-10 mg/kg may be toxic to plants in soils with low Organic Matter; greater than 10 mg/kg toxic to plants. Interpretive levels for raw peat soils are not well known so other observations should be taken into consideration.

Samples 8-11 Comment:
The medium range guidelines shown in the histogram report relate to sampling protocols as per Hill Laboratories' crop guides and are based on reference values where these are published. Results for samples collected to different depths than those described in the crop guide should be interpreted with caution.
For pastoral soils, the medium ranges are specific for a 75mm sample depth, but if a 150mm sampling depth is used the nutrient levels measured may appear low against these ranges, as nutrients are typically more concentrated in the top of the soil profile. These soil profile differences are altered upon cultivation or contouring.

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SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Sample Registration*	Samples were registered according to instructions received.	-	1-11
Soil Prep (Dry & Grind)*	Air dried at 35 - 40°C overnight (residual moisture typically 4%) and crushed to pass through a 2mm screen.	-	1-11
pH	1:2 (v/v) soil:water slurry followed by potentiometric determination of pH.	0.1 pH Units	1-11
Olsen Phosphorus	Olsen extraction followed by Molybdenum Blue colorimetry.	1 mg/L	1-11
Sulphate Sulphur	0.02M Potassium phosphate extraction followed by Ion Chromatography.	1 mg/kg	1-11
Potassium (MAF)	1M Neutral ammonium acetate extraction followed by ICP-OES.	1 MAF units	1-11
Calcium (MAF)	1M Neutral ammonium acetate extraction followed by ICP-OES.	1 MAF units	1-11
Magnesium (MAF)	1M Neutral ammonium acetate extraction followed by ICP-OES.	1 MAF units	1-11
Sodium (MAF)	1M Neutral ammonium acetate extraction followed by ICP-OES.	2 MAF units	1-11
Aluminium ($CaCl_2$ Extractable)	0.02M Calcium Chloride extraction followed by ICP-OES.	0.2 mg/kg	4, 9
Total Nitrogen*	Determined by NIR, calibration based on Total N by Dumas combustion.	0.04 %	1-7
'Total' Cadmium*	Nitric/hydrochloric digestion (based on US EPA 200.2) followed by ICP-MS. (Total recoverable nutrients reported on a dry weight basis) The levels from this method are referred to as 'Totals' in quotation marks, as they will be a slight under-estimation of the true Totals for some elements.	0.02 mg/kg	1-11
Potassium	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.01 me/100g	1-11
Calcium	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.5 me/100g	1-11
Magnesium	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.04 me/100g	1-11
Sodium	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.05 me/100g	1-11
Potassium (Sat)	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.1 %BS	1-11
Calcium (Sat)	1M Neutral ammonium acetate extraction followed by ICP-OES.	1 %BS	1-11
Magnesium (Sat)	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.2 %BS	1-11
Sodium (Sat)	1M Neutral ammonium acetate extraction followed by ICP-OES.	0.1 %BS	1-11
CEC	Summation of extractable cations (K, Ca, Mg, Na) and extractable acidity. May be overestimated if soil contains high levels of soluble salts or carbonates.	2 me/100g	1-11
Total Base Saturation	Calculated from Extractable Cations and Cation Exchange Capacity.	5 %	1-11
Volume Weight	The weight/volume ratio of dried, ground soil.	0.01 g/mL	1-11

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Shelley Edhouse
Quality Assurance Coordinator - Agriculture Division