Comparative Soil Characterisation – Meningie East

SOIL DESCRIPTION DATA SHEET – Menalpyn

General Description:
Saline Sandy clay loam over mottled sandy light clay and gleyed clayey sand

Site Details

Site Name	Cartledge	1:50,000 Sheet:	
Hundred:		Easting:	54H 372893
Section:		Northing:	6047592
Sampling date:	6/7/2020	Annual Rainfall:	475mm

Soil Description:

Depth (cm)	Description
0 – 10	Brown sandy clay loam with high lime reaction
10 - 40	Brown light sandy clay loam with very high lime reaction
40-75	Grey sandy light clay with orange/brown mottles
75-90	Brown/orange clayey sand with light grey mottles

Laboratory data

Depth cm	pH H_2O	pH $CaCl_2$	EC1:5 dS/m	ECe dS/m	Chloride mg/kg	Nitrate N mg/Kg	Org C %	Avail P mg/kg (PBI)	PBI	Avail K mg/kg	KCL Sulphur mg/kg	Trace elements mg/kg (DTPA)				Boron mg/kg	CEC cmol (+)/kg	**Pre-washed** Exchangeable Cations cmol(+)/kg				ESP
												Cu	Fe	Mn	Zn			Ca	Mg	K	Na	
0 – 10	8.6	8.6	4.8	46	7200	25	2	41	225	170	200	.28	5.6	1.3	.35	2.8	23	11	11	0.3	1.0	4.3
10 – 20	8.4	8.4	6.1	58	9700	37	1.4	9	239	160	200	.16	1.8	<0.3	0.13	2.1	22	12	8	0.2	0.8	3.6
20 - 40	8.5	8.4	4.3	41	6800	22	1.1	<5	180	99	140	<0.08	<1	<0.3	<0.08	1.3	17	10	7	0.1	0.4	2.5
40 – 75	9.0	8.5	1.7	11	2400	1	0.3	<5	234	110	96	.08	1.2	<0.3	<0.08	2.5	17	8	8	0.2	1.1	6.2
75 - 90	9.3	8.7	0.9	13	1400	<1	.07	<5	55	93	40	<0.08	5	<0.3	.09	1.9	8	3	5	0.2	0.3	4
Adequate Levels	6-8.5	5.5 - 7.7	<.2	<2	<120 -300	>5	1	25-30	20-40	100-120	10	.3-1	5-10	1-5	.3-1.0	0.5-15	>5	60 - 80 %	10 - 20 %	3-8 %	<6 %	<6 %

Note: CEC (cation exchange capacity) is a measure of the soil's capacity to store and release nutrients. ESP (exchangeable sodium percentage) is derived by dividing exchangeable sodium value by the CEC. Used pre-wash cation test for this site. Adequate levels from Hughes.

SOIL DESCRIPTION DATA SHEET - SOIL PIT Green Plains Flat

General Description:

Thick sand over sandy light clay

Site Details

Site Name	Crossman 1	1:50,000 Sheet:	
Hundred:		Easting:	54H 0363560
Section:		Northing:	6047908
Sampling Date:	6/7/2020	Annual Rainfall	375mm

Soil Description:

Depth (cm)	Description
0 – 15	Dark brown loamy sand, single grain structure
15 – 35	Light brown loamy sandy, single grain structure
35 – 60	Bleached light brown sand, single grain structure
60– 80	Brown sandy light clay, ?? structure, slight dispersion
80 - 95	Brown clayey sand, ?? structure, very high lime reaction

Laboratory data

Depth cm	pHCa trial site hole	Al (CaCl2) mg/kg	pH $CaCl_2$	EC1:5 dS/m	ECe est	Chloride mg/kg	Nitrate N mg/Kg	Org C %	Avail P mg/kg (PBI)	PBI	Avail K mg/kg	KCL Sulphur mg/kg	Trace elements mg/kg (DTPA)				Boron mg/kg	CEC cmol (+)/kg	Exchangeable Cations cmol(+)/kg				ESP
													Cu	Fe	Mn	Zn			Ca	Mg	K	Na	
PADDOCK			5.3	.06	0.9	27	5	1.2	14	7	47	10	1.4	23	11	3.9	.3	3.2	2.7	0.4	0.1	.05	1
0 – 10	5.1	0.3	5.6	.06	0.9	6	8	1.4	10	5	45	7	.7	25	5	2.8	.3	4.1	3.6	.45	.1	.05	1
10 – 20	4.7	0.4	5.6	.02	0.3	<5	2.2	.5	8	7	35	4	.2	16	1.6	1.2	.2	2.1	1.8	.24	.07	<.04	1
20 - 35	5.3	<0.1	6.4	.02		<5	1.5	.2	5	5	29	<2	.1	9	.3	.3	<0.1	1.1	.9	.14	.05	<.04	1.3
35 – 60			6.4	.02		<5	1.3	.1	<5	6	42	3	.1	7	.9	.1	.2	.7	.5	.12	.05	<.04	3.1
60-80			7.3	.2		48	1.7	.3	<5	41	310	8	.1	18	.4	.1	.9	20	16	2.1	.7	.9	4.3
80-95			7.3	.2		110	2	.3	<5	68	210	14	.1	14	1.1	.2	1.1	22	18	1.7	.5	1	4.7
Adequate Levels	6-8.5	2	5.5 - 7.7	<.2	<2	<120 -300	>5	1	25-30	20 - 40	100-120	10	.3	5-10	1	.3	0.5 - 15	>5	60 - 80 %	10 - 20 %	3-8 %	<6%	<6 %

Note: CEC (cation exchange capacity) is a measure of the soil's capacity to store and release nutrients. ESP (exchangeable sodium percentage) is derived by dividing exchangeable sodium value by the CEC.

SOIL DESCRIPTION DATA SHEET - SOIL PIT Green Plains Ridge

General Description:

Loamy sand over carbonate and limestone

Site Details

Site Name	Crossman 2	1:50,000 Sheet:	
Hundred:		Easting:	54H 0363593
Section:		Northing:	6047942
Sampling Date:	6/7/2020	Annual Rainfall	375mm

Soil Description:

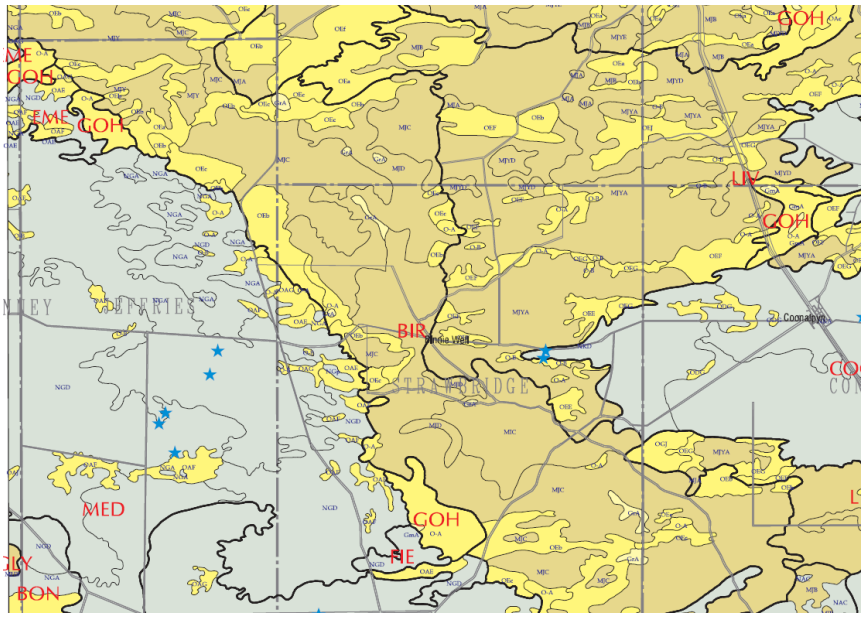
Depth (cm)	Description
0 – 12	Dark greyish brown loamy sand, single grain structure
12 – 30	Brown loamy sand, single grain structure
30 – 60	Calcareous brown rubbly calcareous layer with significant calcrete nodules
60 – 90	Calcareous light brown rubble with areas of non- calcareous clayey sand

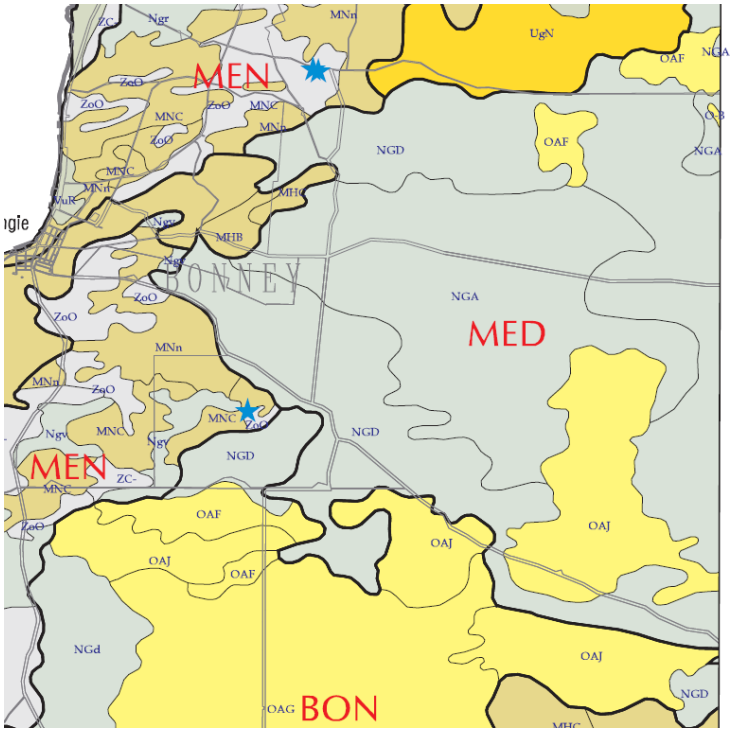
Laboratory data

Depth cm			pH H_2O	pH $CaCl_2$	EC1:5 dS/m	ECe dS/m	Chloride mg/kg	Nitrate N mg/Kg	Org C %	Avail P mg/kg (PBI)	PBI	Avail K mg/kg	KCL Sulphur mg/kg	Trace elements mg/kg (DTPA)				Boron mg/kg	CEC cmol (+)/kg	Exchangeable Cations cmol(+)/kg			
														Cu	Fe	Mn	Zn			Ca	Mg	K	Na
0 – 10			7.3	6.8	.2	2.9	88	6.9	2.1	32	13	200	12	1	24	3.7	4.4	0.7	7.4	5.6	1.0	0.5	0.3
10 – 20			7.2	6.5	.08	1.2	36	2.3	0.7	19	12	110	6.8	0.3	23	1.2	0.8	0.3	3.1	2.4	0.4	0.2	0.1
20 - 30			7.3	6.5	.05	0.7	22	1.7	0.4	17	9	90	4.6	0.2	16	0.6	0.6	0.2	2.9	2.4	0.3	0.2	0.1
30-60			8.6	7.8	.2	1.9	41	3.4	0.7	17	81	230	13	0.1	8.9	0.5	0.2	1	21.5	19	1.0	0.5	0.4
60 – 90 carb			8.7	7.9	.2	1.9	77	2.1	0.6	5	112	230	17	0.1	12	0.8	0.2	1.1	23.6	21	1.3	0.5	0.1
60-90 CS			8.1	7.5	.3	4.3	230	<1	0.2	9	23	150	20	0.1	15	<.3	0.1	0.6	9.4	7.0	0.9	0.3	1.2
Adequate Levels			6-8.5	5.5 - 7.7	<.2 -.3	<2	<120 -300	>5	1	25-30	20-40	100-120	10	.3-1	5-10	1-5	.3-1.0	0.5-15	>5	60 - 80 %	10 - 20 %	3-8 %	<6 %

Note: CEC (cation exchange capacity) is a measure of the soil's capacity to store and release nutrients.

Regional Soil Info





MED Meningie Downs Land System
(based on the description by A.K.McCord in "A Description of Land in the Southern Mallee of South Australia")

Gently undulating sandplain east of Meningie.

Area: 436.9 km^2

Annual rainfall: 450 - 500 mm.

Geology: The land is underlain by sandy limestones of the Coomandook Formation. These are covered by sandy lagoon sediments (Padthaway Formation) deposited in corridors between ancient coastal dunes. A discontinuous limestone layer caps the Padthaway Formation materials. Most of the land is covered by a veneer of aeolian Molineaux Sand. Minor Tertiary remnants with ironstone cappings protrude through the sedimentary cover.

Topography: The Meningie Downs Land System is a gently undulating sand plain with low to moderate irregular sand dunes and isolated low stony rises. Saline water tables underlie the System and are near the surface in some low lying depressions.

Elevation: 4-30 m.

Relief: Up to 10 m.

Soils: Sandy soils predominate. They range from deep sands to sand over sandy clays. Shallow stony soils are minor.

Main soils

G3a	Sand over sandy clay - Extensive (on flats and rises).
H3	Deep siliceous sand - Extensive (on sand dunes).
G3b	Thick sand over sandy clay - Common (on flats).

Minor soils

B3	Shallow stony loamy sand - stony rises
B7/N2	Sand over yellow and grey mottled clay - saline depressions

Main features: The Meningie Downs Land System comprises mainly sandy soils, with clayey subsoils on flats, but usually extending below a metre on sand dunes. Natural fertility is low, and water repellence and wind erosion are moderate to high limitations. Although some cropping is carried out, grazing of perennial pastures is the most extensive land use.

BIR Binnie Range Land System
(based on the description of the Binnie Range System by A.K.McCord in "A Description of Land in the Southern Mallee of South Australia")

Undulating range, parallel to and 10-20 km west of the Duke's Highway, between Tintinara and Coomandook.

Area: 422.7 km^2

Annual rainfall: 400 - 475 mm

Geology: The System is formed on calcreted calcarenites (Bridgewater Formation) of an ancient coastal dune. About 30% of the land surface is overlain by more recent windblown sands (Molineaux Sand) in the form of dunes or sand spreads. Locally derived alluvium has accumulated in larger depressions and corridors between the rises. Granitic intrusions underlie the System and outcrop sporadically.

Topography: Undulating to rolling rises with occasional low to moderate irregular sandhills superimposed over the main landscape. Depressions between the rising ground are usually closed.

Elevation: 20-170 m.

Relief: Up to 30 m.

Soils: All soils are underlain by calcreted calcarenite. Some are shallow, with sand to sandy loam surfaces and thin clayey subsoils. Others have a substantial thickness of sand, with or without a more clayey subsoil.

Main soils

B6 Sandy loam over red sandy clay on calcrete. Extensive on slopes and flats.
B7 Loamy sand over brown sandy clay on calcrete. Common on sandy flats and slopes.
H3 Deep bleached sand. Common on sand dunes and spreads.

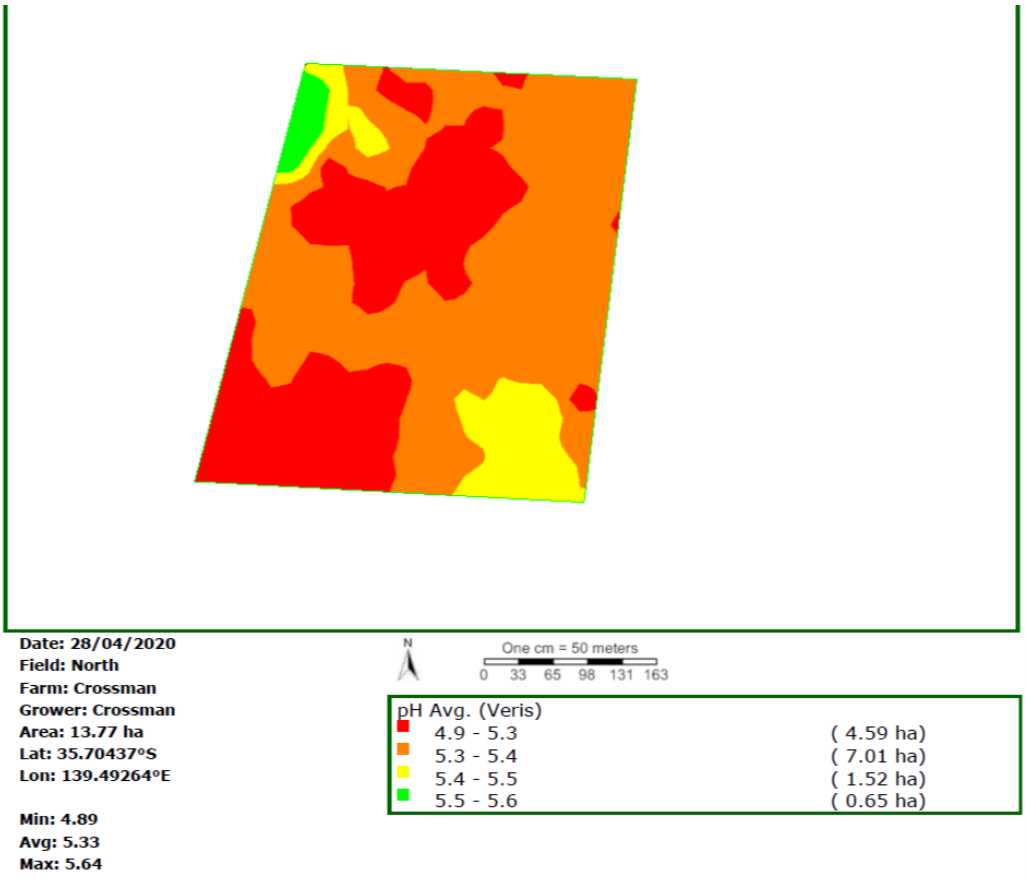
Minor soils

G2 Sand over sandy clay. Limited on sand dunes and spreads.
A6/D2 (Calcareous) sandy clay loam over red clay. Minor on lower slopes and swales.

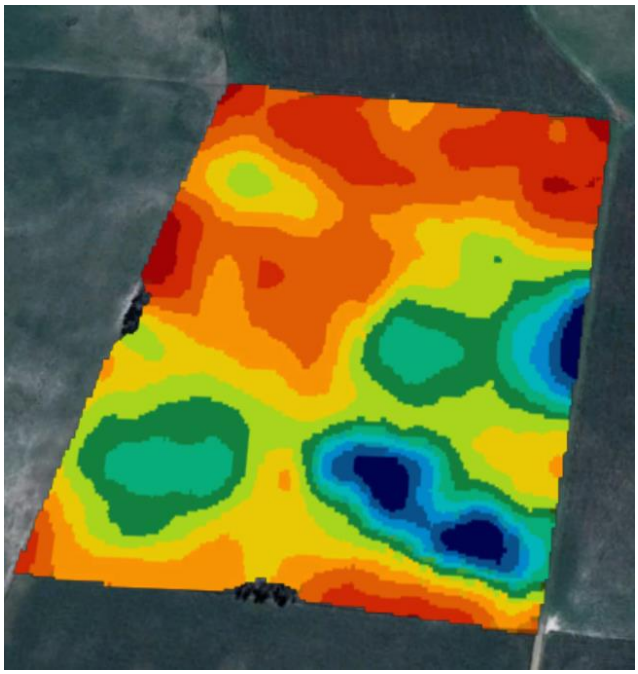
Main features: The Binnie Range Land System comprises mainly shallow stony soils on rising ground, associated with either deep sands or shallow sand over clay soils. Most of the land is arable, although water holding capacity is restricted, and some areas are sufficiently stony or characterized by sheet rock as to be non arable. The sandy soils have lower inherent fertility and are susceptible to wind erosion, making them less attractive for agriculture. There are minor heavy flats which have high productive potential.

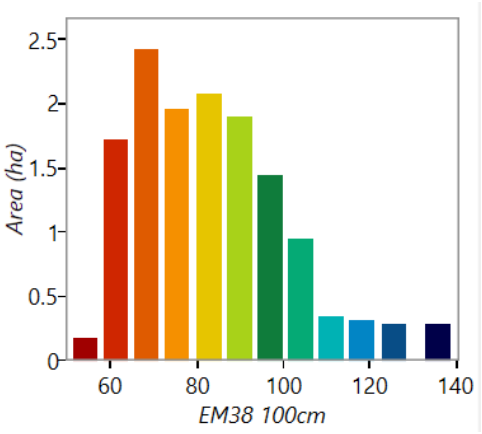
Veris and EM maps

Veris pH

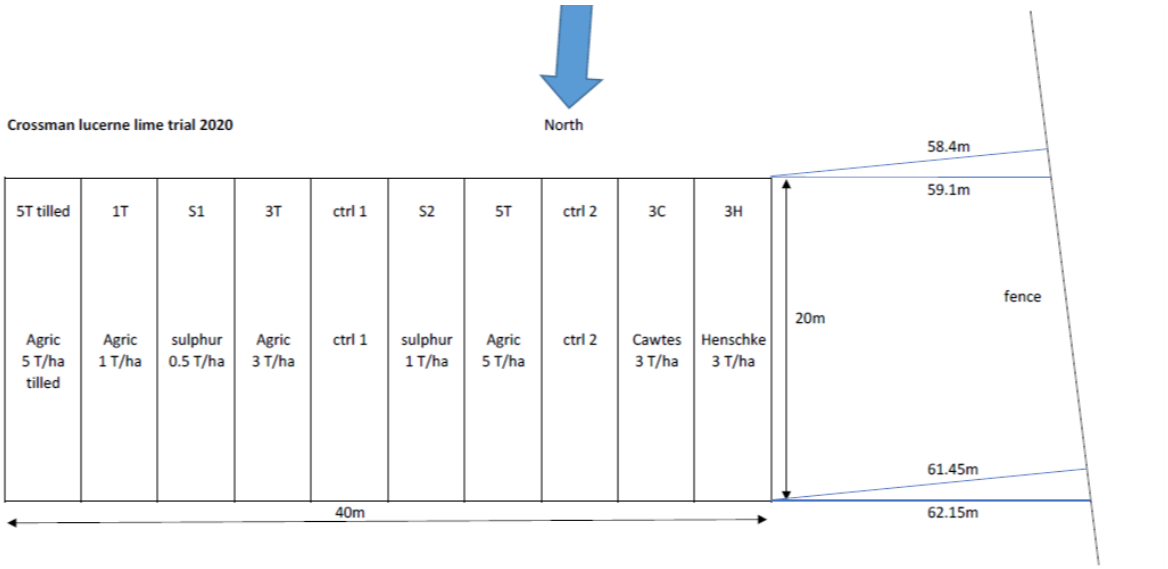


EM 38 100cm





Liming Demo site map



Soil Acidity basic rules

Why are soils acidifying

Acidifying fertilisers- most forms of N, elemental S

Product removal- hay, grain, livestock products

N leaching – shallow rooted plants worse

Legumes can increase in some situations

Impacts

Rhizobium cannot persist- linked to Mo/ N deficiency in plant

Toxic Al reduces root growth

Some nutrients lost or reduced availability/ tie-up- P, Ca, Mg. K, Cu, Zn, B, Mo

Critical pHCa (reads about 0.8 less than pHw)

<pHCa 5.5- need to start thinking about acidity as an issue, if surface pH drops below will see acidity creeping deeper into soils, particularly sandy soils

<pHCa 5.0- highly sensitive plants including lucerne, beans, lentils affected

< pHCa 4.8- toxic Al starts to accumulate- sensitive plants affected –phalaris, barley

< pHCa 4.5- slightly tolerant plants can be affected- sub-clover, wheat-var

<pHCa 4.0- Fe becomes released, tolerant plants affected – lupins, oats

Targets

Keep surface pH at 5.5 or better

Sub-surface at 4.8-5.0 or better

Avoid sub-surface acidification developing

Crossman Farm – estimate of acidification and alkaline inputs

Item	Possible acid/ alkalinity	Net/ farm 2000ha/yr
Applies 90kg/ha Sulphate of Ammonia last 10 years	102 kgs lime equiv acidification per year/ 10 years = 1 tonne lime- drop pH by 0.5 unit	204 tonnes acidification/yr from SofA -204t
Single super and KCl also applied	no direct impact, indirect due to increased pasture growth and release of N	nil
Deep N leaching	possibly lower under deep rooted lucerne and veldt- use 20 kg/ha lime equivalent	40,000 kgs lime (40t) per year -40t
Product Removal	milk lose 4 kgs lime eq/ tonne 6t/yr Meat – depend on stock removal- no data 17kgs per tonne meat	4kgsx6t milkx600 cows= 14 tonnes lime equiv -14t for milk only
Large hay and grain input 2500t hay, 1600t grain	can have alkaline impact- some possibly lost as effluent oats, some clover hay 30kgs lime eq/ton= 75 t lime eq grain 10kgs lime eq/ton= 16 t lime eq	+ 91t lime if all ends in the paddocks (lot possibly ends in effluent) +90t?
Calcareous subsoils	will roots pick up calcareous materials from subsoil and add to surface of acidic sandy soils	+???

Summary

Test and test for pHca– surface, sub-surface and precision mapping all useful

www.acidsoilssa.com.au soil acidity web site about to be launched!!