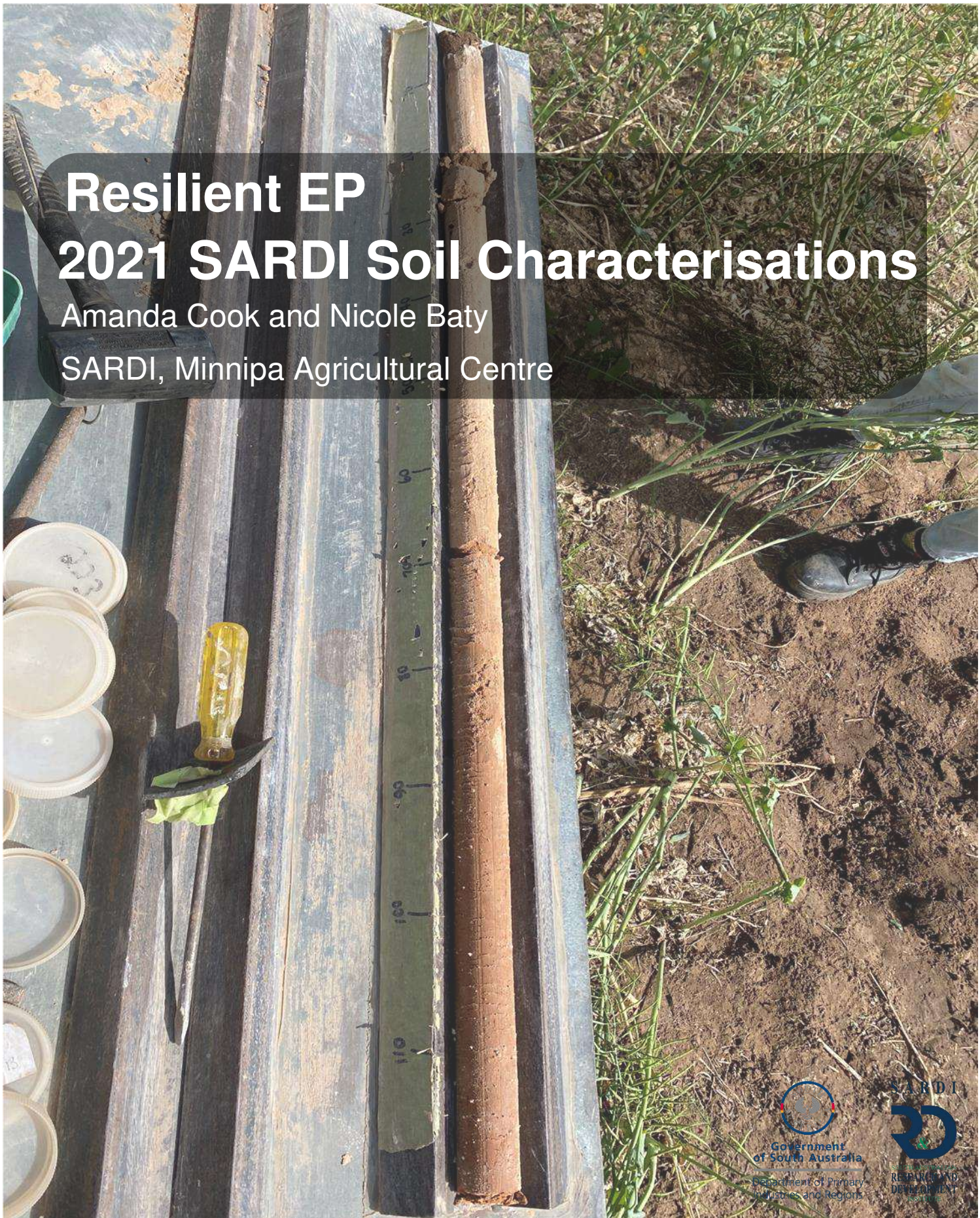


Resilient EP 2021 SARDI Soil Characterisations

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Resilient EP

2021 SARDI Soil Characterisations

Information current as of 1 October 2024
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This project is funded by the Australian Government's NLP2 Smart Farming Partnerships program



Delivery Partners



Background

Soil characterisations were undertaken by SARDI Minnipa Agricultural Centre staff in 2021 at thirteen Eyre Peninsula soil moisture probe sites as contracted through the National Landcare Program Project, Resilient EP, “Creating a new paradigm for resilient and profitable farming on the Eyre Peninsula”.

Project Aims

This project aims to ground truth new and emerging technologies including use of data from soil moisture probe and automatic weather station networks, GIS systems (satellite drone and imagery), decision tools being developed by the CSIRO (Grain Cast, C-Crop), and more sophisticated seasonal weather forecasting tools being developed by the BOM, Ag Victoria and SARDI. The project will evaluate a range of on-ground practices based on real time soil moisture and climate data to optimise productivity and reduce financial and soil erosion risk. The project will ensure there are effective linkages between the science and on-ground application through the formation of a regional drivers group (RIG) made up leading farmers and farm advisers.

Soil Characterisations

The full soil characterisations were undertaken by SARDI, Minnipa Agricultural Centre Agronomy team between August to October 2021 at thirteen grower soil moisture probe sites. Amanda Cook was responsible for undertaking the soil characterisations along with Ian Richter, Craig Stanley, Katrina Brands, Sue Budarick, Marina Mudge, Brianna Guidera and Rhaquelle Meiklejohn. The soil characterisations were undertaken following the ‘Estimating plant available water capacity’, Burk and Dalgliesh protocols, 2013, and ‘Field protocols to APSoil characterisations’, CSIRO October 2016.

Soil measurements taken included:

- Soil chemistry
- Bulk density (BD)
- Drained Upper Limit (DUL) – maximum soil water holding capacity (in-field)
- Crop Lower Limit (CLL) – amount water a cereal crop can remove from the soil profile
- Soil texture and colour
- Rock content
- Photos of soil to depth.

2021 sites which were soil characterised were:

- Cockaleeche, Adams
- Kimba, Baldock
- Cleve, Bammann
- Chandada, Carey
- Minnipa, Heddle 1, Minnipa South
- Mangalo, James
- Cowell, Kaden
- Solomon (Kimba), Mayfield
- Minnipa, Minnipa Agricultural Centre, N1
- Mt Damper, Michael
- Goldmine Hill, Glover
- Lock, Polkinghorne, Good Zone
- Brimpton Lake, Moroney





2021 Soil characterisation team, Amanda Cook, Marina Mudge, Katrina Brands, Ian Richter, Sue Budarick, Brianna Guidera, Craig Stanley, and Rhaquelle Meiklejohn.

The sites were wet up and sampled according to the Burk and Dalgliesh protocols. The 1000 L shuttles were filled with EP mains water weekly and allowed to drain according to soil type. See field logs for individual site details on timing and the amount of water applied.

Soil chemistry samples were collected (away from the wet site) from 3 soil cores to depth which was dried at 40°C for 96 hours then bulked to form a composite sample. The chemistry analysis was undertaken by CSBP, Western Australia. Calcium carbonate content to depth, and Phosphorus Buffering Index and DGT P level to 30 cm depth were also analysed.

Soil Test Methodology

Extracted from APAL Soil Laboratory Methods, valid to 31 December 2022.

Amm. acetate exchangeable cations (Ca, Mg, K, Na)

Rayment and Lyons Method 15D3

Units of measurement mg/kg

Soils are shaken end-over-end for 1 hour in 1M ammonium acetate solution pH 7.0 at a ratio of 1:10. Automated emission spectrometry analysis of soil extracts is performed by ICP-OES. This is APAL's default method for measuring exchangeable cations. Alternative methods are available depending on your soil type, or the nature of the investigation. Perkin Elmer Avio 500 ICP-OES Spectrometer; PerkinElmer Inc.

Ammonium-N

Units of measurement mg/kg

Soils are shaken end-over-end for 1 hour in 2M KCl at a ratio of 1:10. Automated colorimetric analysis of soil extracts is performed on a Continuous Flow Analyser.

Instrument: Skalar San ++ Continuous Flow Analyser (Skalar Analytical B.V., Breda, Netherlands)

Boron (Hot CaCl₂)

Rayment and Lyons Method 12C2

Units of measurement mg/kg

Soils in 0.01M calcium chloride solution at a ratio of 1:2 are heated in a microwave oven to boiling (without shaking). Automated emission spectrometry analysis of soil extracts is performed by ICP-OES.

Instrument: Perkin Elmer Optima 8300 ICP-OES Spectrometer; PerkinElmer Inc.

Colwell Extractable Phosphorus

Rayment and Lyons Method 9B2

Units of measurement mg/kg

Soils are shaken end-over-end for 16 hours in 0.5M sodium bicarbonate pH 8.5 solution at a ratio of 1:100. Automated colorimetric analysis of soil extracts is performed on Continuous Flow Analyser.

Instrument: Skalar San ++ Continuous Flow Analyser (Skalar Analytical B.V., Breda, Netherlands)

Colwell Extractable Potassium

Rayment and Lyons Method 18A1

Units of measurement mg/kg

Soils are shaken end-over-end for 16 hours in 0.5M sodium bicarbonate pH 8.5 solution at a ratio of 1:100. Automated emission spectrometry analysis of soil extracts is performed by ICP-OES. This method is favoured by some agronomists for assessing soil K status. Due to the very high dilution factor imposed by a 1:100 soil:solution ratio, the method is not recommended for soils with low CEC and low K status.

Instrument: Perkin Elmer Optima 8300 ICP-OES Spectrometer; PerkinElmer Inc.

Diffusive Gradient Thin Film Phosphorus (DGT-P)

Rayment and Lyons Method – Not applicable

Mason S (2012). DGT Commercial Protocol (2) – Deployment and analysis. The University of Adelaide

Units of measurement µg/L

DGT has been developed for the assessment of available P in a wide range of Australian soils. The mode of measurement is by diffusion of available P in the soil toward a P sink (an iron oxide gel) via a membrane which controls movement of P to the sink. Colorimetric analysis of soil extracts is performed on a UV-VIS spectrophotometer. DGT measurement incorporates the initial soil solution P concentration and also the ability of the soil to resupply the soil solution pool in response to the removal of P, mimicking plant phosphorus uptake better in many soils than traditional phosphorus soil test methods.

Instrument: Thermo Spectronic Unicam Helios Delta UV-Vis Spectrophotometer (Thermo Fisher Scientific, Massachusetts, USA).

DTPA Trace Elements (Extractable Cu, Fe, Mn, Zn)

Rayment and Lyons Method 12A1

Units of measurement mg/kg

Soils are shaken end-over-end for 2 hours in 0.005M DTPA, 0.01M CaCl₂, 0.10M triethanolamine (TEA) solution at a ratio of 1:2. Automated emission spectrometry analysis of soil extracts is performed by ICP-OES.

Instrument: Perkin Elmer Optima 8300 ICP-OES Spectrometer; PerkinElmer Inc.

EC (1:5 Soil / Water Extract), pH Water, pH CaCl₂ following pHw

Rayment & Lyons Method 3A1, 4A1, 4B4

Units of measurement pH, dS/m

Soils are shaken end-over-end for 1 hour in deionised water at a ratio of 1:5. Fully automated analysis of soil extracts is performed on a roboticised Skalar pH/EC system. Electrical conductivity is measured with a conductivity cell and multi-mode meter. pH is measured with a pH electrode and the same meter. EC is measured initially, and then pH water. The instrument subsequently adds calcium chloride to achieve 0.01M calcium chloride, stirs and allows an equilibration period before returning to read pH CaCl₂.

Instrument: OrionStar A215 meter (Thermo Fisher Scientific, Massachusetts, USA) and Orion 013005MD Conductivity cell (Thermo Fisher Scientific, Massachusetts, USA).

Exchangeable acidity (Al + H)

Rayment and Lyons Method 15G1

Units of measurement cmol/kg

Soils are shaken end-over-end for 1 hour in 1M KCl solution at a ratio of 1:10. Extracts are analysed by automated acid/base titrimetry, in a 2-step titration. Total exchangeable acidity is initially measured by titration of an aliquot with 0.008M sodium hydroxide solution to pH 8.0. An aliquot is simultaneously removed and filtered through a 0.45 µm membrane with glass fibre pre-filter, and then analysed for aluminium by ICP-OES. Analysis by ICP-OES instead of titration removes concerns about the assumption in the cmol/kg result derived from titration that all aluminium present is trivalent. ICP-OES measures and reports aluminium regardless of form or valency. The solution mg/L is converted to cmol/kg. This method is the best available method for assessing the total potential toxic Al in acidic soils. pH alone is not a sufficient indicator, or in many cases not an indicator at all of Al toxicity.

Instrument: Perkin Elmer Optima 8300 ICP-OES Spectrometer; PerkinElmer Inc.

Instrument: Metrohm 855 Robotic Titrosampler (Metrohm AG, Herisau, Switzerland)

Extractable Sulfur (KCl)

Rayment and Lyons Method 10D1

Units of measurement mg/kg

Soils are equilibrated (without shaking) for 3 hours at 40°C in 0.25M potassium chloride solution at a ratio of 4.5:30. Automated emission spectrometry analysis of soil extracts is performed by ICP-OES.

Instrument: Perkin Elmer Optima 8300 ICP-OES Spectrometer; PerkinElmer Inc.

Micro-Pipette Australian Particle Size Analysis

Rayment and Lyons Method - Not applicable

In-house methodology

Units of measurement % and texture class

Soil samples are shaken overnight in a dispersing solution of hexametaphosphate. Once removed, and after a final shake just prior to commencing timing, a fixed aliquot of solution is withdrawn at a set depth from the vessel based on settling velocity of clay particles. This aliquot is dried at 105°C, and weight corrected for the weight of hexametaphosphate salt. This yields the clay fraction. The remaining test solution is filtered through a 20 µm mesh sieve, transferred to a drying vessel and dried at 105°C. This yields the sand fraction. The silt fraction is calculated as 100% - (sand + clay%). R code is used to generate a textural classification from the Australian soil textural triangle. This version of the method reports % sand, silt and clay.

Nitrate-N

Rayment and Lyons Method 7C2a

Units of measurement mg/kg

Soils are shaken end-over-end for 1 hour in 2M KCl at a ratio of 1:10. Automated colorimetric analysis is performed on a Continuous Flow Analyser. The chemistry module utilises vanadium (III) reduction of nitrate to nitrite, and subsequent measurement as nitrite.

Instrument: Skalar San ++ Continuous Flow Analyser (Skalar Analytical B.V., Breda, Netherlands)

Organic Carbon (Walkley and Black)

Rayment and Lyons Method 6A1

Units of measurement %

The Walkley-Black method utilises the reaction of concentrated sulfuric acid and dichromate solution to achieve a temperature catalysed oxidation of organic matter in soils. The chromic ions produced are proportional to the oxidised organic carbon and measured colorimetrically on a UV-VIS spectrophotometer.

Instrument: Thermo Spectronic Unicam Helios Delta UV-Vis Spectrophotometer (Thermo Fisher Scientific, Massachusetts, USA).

Phosphorus Buffering Index - PBI + Col P

Rayment and Lyons Method 9I2b

Units of measurement None

Soils are shaken end-over-end for 17 hours in 100 mg P/L/0.01M calcium chloride equilibrating solution at a ratio of 1:10. Automated emission spectrometry analysis of soil extracts is performed by ICP-OES. The calculation is based on the amount of P sorption by the soil from the 100 mg/L solution, plus the measured Colwell P representing total P sorption.

Instrument: Perkin Elmer Optima 7300 ICP-OES Spectrometer, Perkin Elmer Optima 8300 ICP-OES Spectrometer, Perkin Elmer Avio 500 ICP-OES Spectrometer; PerkinElmer Inc.

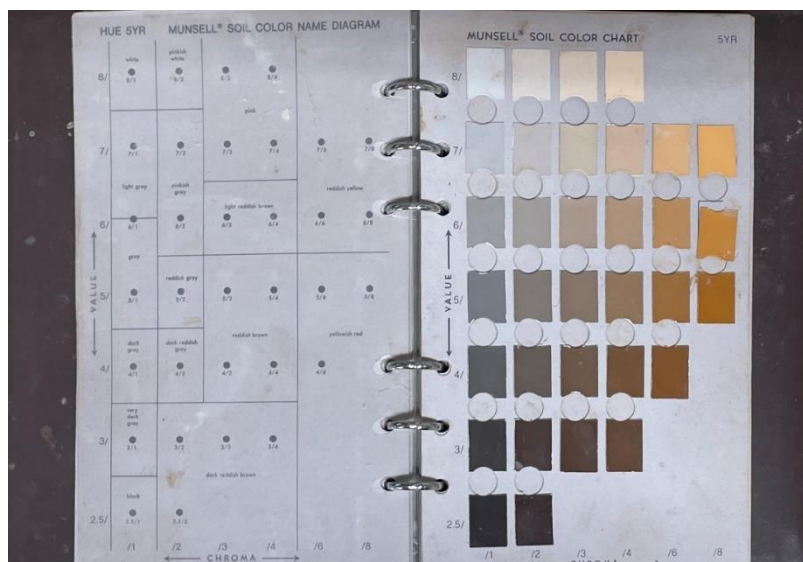
PHYSICAL CLASSIFICATION OF SOILS

Relative Texture Gradings of soil

CATEGORY	GENERAL DESCRIPTION OF DRY STATE	BEHAVIOURS OF MOIST BOLUS
1.0 SAND	Consists almost exclusively of sand grains. Flows easily through the fingers.	Coherence nil to very slight. Cannot be moulded; single grains adhere to fingers.
1.5 SAND/LOAM	Sand particles predominate. Ill-defined crumbs from surface, off which sand is easily rubbed.	Only slightly coherent but very sandy to touch. Will roll out or form a ribbon of about 10-15 mm. Larger sand grains visible to the naked eye.
2.0 LOAM	Heterogeneous. Loam alternates with sand. Not uniform in compactness.	Rather spongy and coherent. Smooth feel with no obvious sandiness. The presence of much organic matter makes the soil feel rather greasy. Sample will form a ribbon of approximately 20-25 mm.
2.5 LOAM/CLAY	Not quite homogeneous powder. Compact-crumblly but not so hard.	Coherent and plastic. Smooth to manipulate, forming a ribbon 45-50 mm.
3.5 VERY HEAVY CLAY	Fine homogeneous powder. Very compact. Forms very hard crumbs.	Very smooth and plastic. Handles like plasticine. Can be moulded and rolled out in a ribbon of 80 mm or more.

MUNSELL SOIL COLOR CHART

The Munsell Soil Color Chart is the most widely used method used for determining soil colours. Soil colour is determined via a visual comparison between the colour chips and air-dried bulk soil samples. In this system, colour is expressed in terms of hue (dominate base colour), value (lightness or darkness) and chroma (intensity of basic hue).



Crop Lower Limit (field)

Crop Lower Limit (CLL) soil samples were collected as crops ripened and before the early November rains. Larger rain out shelters were used to cover a larger crop area in 2021. CLL will be resampled at the sites in 2022 in cereal as having an accurate CLL (especially in 2020 season) prevents an accurate calculation of overall Plant Available Water (PAWC) content of the soil profile. Thank you to Therese McBeath CSIRO, for reviewing the data and PAWC graphs.



SARDI drill rig used to collect soil chemistry samples and paring back soil samples to collect bulk density and DUL at Andrew Baldock's at Kimba.



1. Cockaleeche, Adams

Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Adams 2021	Cockaleeche	-34.198783	135.909650	Clay	120	6000 L	9 days	10 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth- Wheat (cm)	Description
29 Sept	29 Sept 1000 L 1 Oct 1000 L 5 Oct 1000 L 6 Oct 1000 L 7 Oct 1000 L 8 Oct 1000 L	18 Oct	120	80-90	Brown gravelly clay 0-20 cm, light brown clay with calcrete nodules 20-30 cm, light clay loam 30-50 cm, heavy clay 50-100 cm, yellow clay with iron stone gravel 100-120 cm.



Site photo with slope, 18 October 2021.



Soil profile, 18 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark reddish brown	5 YR 3/4	Clay	35.2	53.6	11.3
10-20	Yellowish red	5 YR 4/6	Clay	35.7	51.9	12.4
20-30	Yellowish red	5 YR 5/6	Clay	38.6	45.5	15.9
30-40	Reddish yellow	7.5 YR 6/8	Clay	38.2	42.1	19.7
40-50	Reddish yellow	7.5 YR 6/6	Clay loam	36.5	43.4	20.1
50-60	Reddish yellow	7.5 YR 6/6	Clay loam	33.4	43.1	23.5
60-80	Reddish yellow	7.5 YR 6/6	Clay loam	35.3	40	24.7
80-100	Yellowish brown	10 YR 5/6	Clay loam	28.3	49.3	22.4
100-120	Yellowish brown	10 YR 5/8	Clay	42.2	43.7	14.1

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	2.6	15	26	380	5.5	2.32	0.17
10-20	1.1	2.8	11	170	6.1	1.39	0.14
20-30	<1	3.4	<5	120	11	0.94	0.15
30-40	<1	4.8	<5	95	18	0.78	0.16
40-50	1.2	9	<5	96	23	0.71	0.18
50-60	4.1	12	<5	75	18	0.58	0.19
60-80	4.2	11	<5	79	20	0.45	0.19
80-100	<1	8.6	<5	77	17	0.18	0.17
100-120	1.3	11	<5	180	15	0.15	0.21

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.53	8.05	145	8.1	47	0.232	1.3
10-20	7.69	8.31	180	21	11	0.258	1.1
20-30	7.71	8.42	nd	40	nd	0.251	1.3
30-40	7.73	8.46	nd	54	nd	0.224	1.1
40-50	7.74	8.49	nd	62	nd	0.319	1
50-60	7.8	8.55	nd	65	nd	0.482	0.95
60-80	7.89	8.76	nd	65	nd	0.767	0.75
80-100	8.01	9.05	nd	69	nd	0.958	0.59
100-120	8.05	8.91	nd	34	nd	1.29	0.97

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.33	17	1.4	2.7	<0.02	34.4	1.97	1.24
10-20	1.9	19	0.8	1.4	<0.02	32.7	1.98	0.627
20-30	0.22	17	0.6	0.31	<0.02	32	2.16	0.449
30-40	0.22	13	0.4	0.21	<0.02	28.1	2.16	0.338
40-50	0.22	11	0.4	0.18	<0.02	29.5	2.72	0.329
50-60	0.22	8.9	0.5	0.2	<0.02	27.1	3.23	0.29
60-80	0.22	6.5	0.6	0.17	<0.02	25.8	3.86	0.275
80-100	0.16	3.9	0.5	0.14	<0.02	24.2	4.49	0.262
100-120	0.23	5.1	0.9	0.24	<0.02	24.9	8.02	0.582

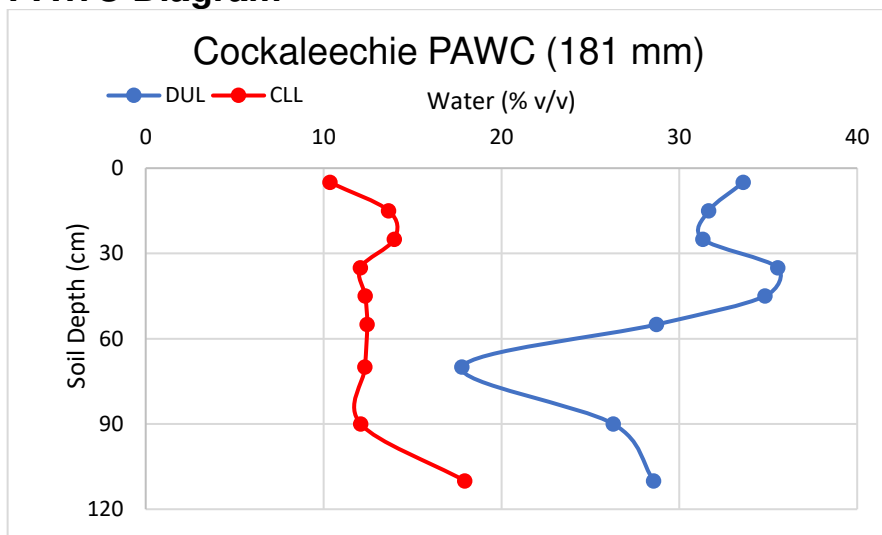


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Adams, D	Cockaleeche	0-10	1.29	33.60	10.35	23.24	181	5.00
Adams, D	Cockaleeche	10-20	1.24	31.66	13.66	18.00		15.00
Adams, D	Cockaleeche	20-30	1.38	31.32	13.98	17.35		25.00
Adams, D	Cockaleeche	30 - 40	1.20	35.54	12.07	23.47		35.00
Adams, D	Cockaleeche	40-50	1.33	34.81	12.35	22.47		45.00
Adams, D	Cockaleeche	50 - 60	1.39	28.72	12.45	16.27		55.00
Adams, D	Cockaleeche	60-80	1.59	17.78	12.33	10.90		70.00
Adams, D	Cockaleeche	80-100	1.46	26.29	12.09	28.40		90.00
Adams, D	Cockaleeche	100-120	1.55	28.56	17.94	21.24		110.00

PAWC Diagram



2. Kimba, Baldock Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Baldock 2021	Kimba	-33.138177	136.332072	Clay loam	95	5000 L	18 days	3 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
23 Sept	23 Sept 1000 L 30 Sept 1000 L 5 Oct 1000 L 7 Oct 1000 L 11 Oct 1000 L	14 Oct	110	90	Sandy loam 0-20 cm, loam with increasing amounts of gravel calcrete nodules 20-80cm, calcrete layer around 90cm with a white/pink/yellow clay loam below.



Site photo with slope, 14 October 2021.



Soil profile, 14 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Very dark brown	10 YR 2/2	Sand	5.9	90.3	3.8
10-20	Dark reddish brown	2.5 YR 3/3	Clay loam	23.6	66.1	10.3
20-30	Dark reddish brown	5 YR 3/4	Clay loam	26.7	59.9	13.4
30-40	Reddish brown	5 YR 4/4	Clay loam	28.1	58.3	13.6
40-50	Reddish brown	5 YR 5/4	Clay loam	28.6	57.3	14.1
50-60	Reddish brown	5 YR 5/4	Clay loam	29.7	56	14.3
60-80	Reddish brown	5 YR 5/4	Clay loam	33.5	52.9	13.6
80-100	Reddish brown	5 YR 5/4	Clay loam	27.1	56.3	16.6
100-120	Reddish brown	5 YR 5/4	Loam	17.9	63.1	19

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	4.4	6	26	400	8.5	1.11	0.15
10-20	1.5	1.9	12	400	7	0.97	0.14
20-30	1.5	<1	8	250	8.2	0.75	0.15
30-40	1.6	<1	5	210	11	0.64	0.18
40-50	1.6	1	10	170	13	0.55	0.24
50-60	1.5	2.2	13	140	16	0.5	0.35
60-80	1.4	4.8	<5	170	19	0.37	0.62
80-100	1	2.2	<5	170	67	0.23	0.92
100-120	1	1.7	<5	140	100	0.17	1.1

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.74	8.38	32	1.2	237	0.105	1.1
10-20	7.99	8.63	120	7.3	18	0.283	2
20-30	8.07	8.79	nd	12	nd	0.597	2.2
30-40	8.15	9.01	nd	16	nd	1.26	2.6
40-50	8.24	9.26	nd	21	nd	2.07	3.6
50-60	8.37	9.5	nd	25	nd	3.52	6.5
60-80	8.54	9.69	nd	25	nd	7.07	15
80-100	8.69	9.72	nd	12	nd	8.79	23
100-120	8.52	9.51	nd	6	nd	9.07	21

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.22	2.9	3.7	1.3	<0.02	12	1.86	1.21
10-20	0.41	5.4	1.5	0.39	<0.02	26.5	5.1	1.22
20-30	0.54	5.4	1.3	0.3	<0.02	27.4	6.7	0.863
30-40	0.66	5.7	1.2	0.37	<0.02	25.9	7.86	0.687
40-50	0.73	5.6	1.3	0.57	<0.02	23.8	8.48	0.557
50-60	0.83	5.8	1.1	0.23	<0.02	22.9	9.67	0.514
60-80	0.86	6	0.9	0.17	<0.02	22.1	10.3	0.621
80-100	0.58	3.9	0.6	0.24	<0.02	19.5	6.4	0.524
100-120	0.4	2.1	0.6	0.16	<0.02	18.5	4.96	0.416



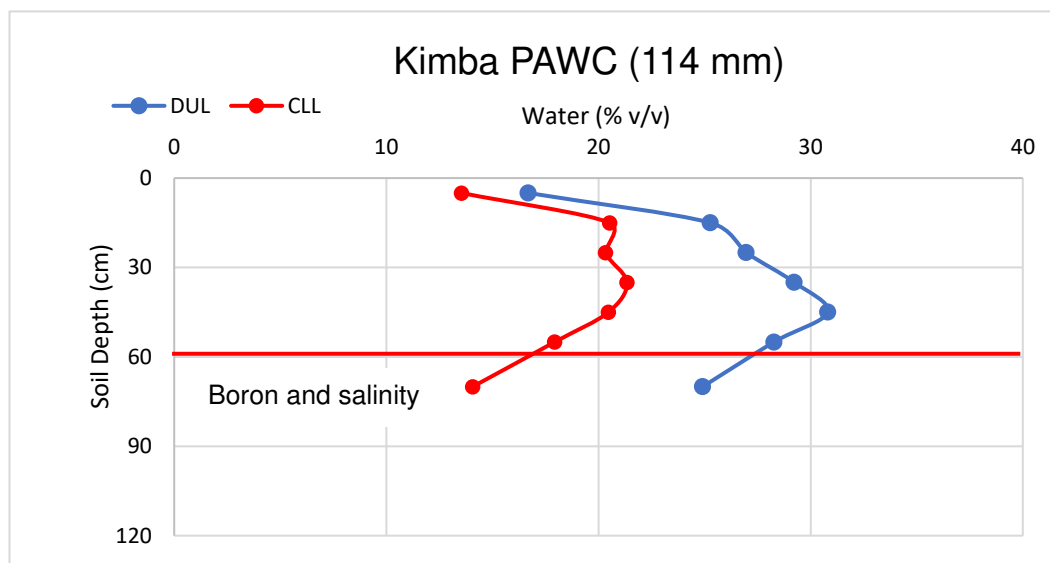
Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Baldock, A	Kimba	0-10	1.36	16.69	3.14	13.54	114 to 60cm 128.24	5.00
Baldock, A	Kimba	10-20	1.39	25.28	4.75	20.53		15.00
Baldock, A	Kimba	20-30	1.22	26.96	6.62	20.34		25.00
Baldock, A	Kimba	30-40	1.26	29.24	7.89	21.35		35.00
Baldock, A	Kimba	40-50	1.39	30.81	10.34	20.47		45.00
Baldock, A	Kimba	50-60	1.27	28.27	10.33	17.94		55.00
Baldock, A	Kimba	60-80	1.43	24.91	10.84	14.07		70.00
Baldock, A	Kimba	80-100	nd	nd	nd	nd		nd
Baldock, A	Kimba	100-120	nd	nd	nd	nd		nd

nd- no data

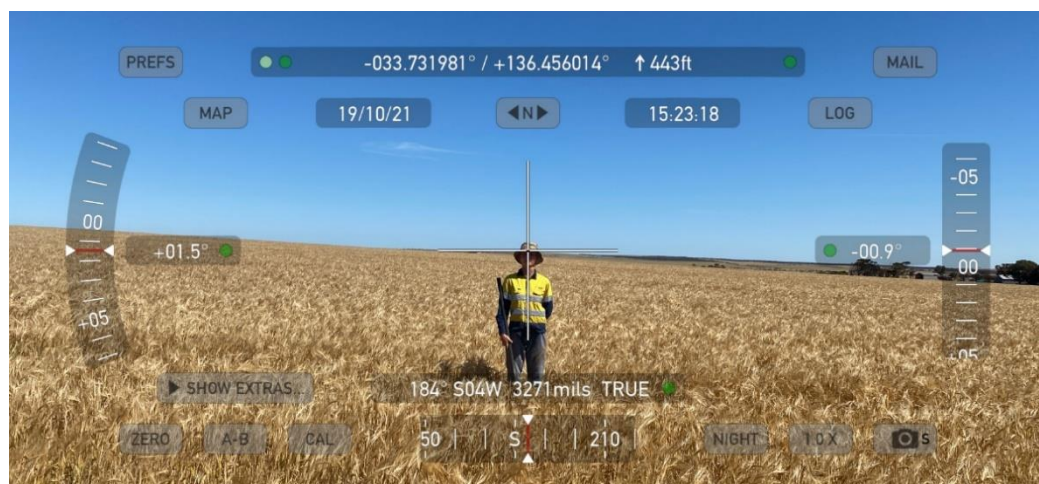
PAWC Diagram



3. Cleve, Bammann Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Bammann 2021	Cleve	-33.731981	136.456014	Sandy loam	120	5000 L	15 days	7 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
27 Sept	27 Sept 1000 L 1 Oct 1000 L 6 Oct 1000 L 8 Oct 1000 L 12 Oct 1000	19 Oct L	75	70	Brown sandy loam 0-10 cm, red brown sandy loam 10-20cm, red brown clay loam 20-30cm, brown clay loam with calcrete nodules at 50cm 30-75.



Site photo with slope, 19 October 2021.



Soil profile, 19 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark brown	7.5 YR 3/3	Sand	6.1	90.4	3.5
10-20	Dark brown	7.5 YR 3/3	Sandy loam	9.1	85.7	5.2
20-30	Dark brown	7.5 YR 4/4	Sandy loam	11	81.9	7.1
30-40	Strong brown	7.5 YR 4/6	Loam	18.5	64.3	17.2
40-50	Yellowish red	5 YR 5/6	Loam	21	62.7	16.3
50-60	Yellowish red	5 YR 5/5	Loam	19.7	69.7	10.6
60-80	Reddish yellow	5 YR 6/6	Loam	19.9	66.5	13.6
80-100	Yellowish red	5 YR 5/6	Loam	18.1	70.2	11.7
100-120	Reddish yellow	5 YR 6/8	Loam	18.9	65.3	15.9

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	1.2	2.5	20	380	4.1	0.68	0.11
10-20	1.1	1.6	11	450	3.8	0.61	0.11
20-30	1.3	<1	9	430	5.2	0.58	0.12
30-40	1.3	1.5	<5	250	12	0.76	0.14
40-50	1.6	1.7	<5	140	18	0.67	0.15
50-60	2.6	1.2	6	130	12	0.44	0.18
60-80	1.6	3	<5	210	19	0.31	0.3
80-100	1.6	4.4	<5	350	48	0.32	0.58
100-120	1.3	4.4	<5	280	78	0.19	0.77

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.94	8.57	35	1.8	126	0.115	1.2
10-20	7.96	8.62	51	1.2	34	0.146	1.1
20-30	8.02	8.72	nd	3	nd	0.168	1.2
30-40	7.97	8.63	nd	15	nd	0.301	2
40-50	8.02	8.68	nd	19	nd	0.382	2
50-60	8.08	8.96	nd	31	nd	0.739	2.6
60-80	8.16	9.34	nd	51	nd	1.97	6.2
80-100	8.27	9.58	nd	53	nd	4.19	13
100-120	8.61	9.79	nd	71	nd	5.26	18

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.3	2.1	4	1.3	<0.02	8.77	2.12	1.05
10-20	0.41	2.9	3	0.48	<0.02	17.9	2.3	1.21
20-30	0.56	3.8	2.9	0.44	<0.02	21.7	2.55	1.33
30-40	1	7.1	2.5	0.25	<0.02	28	4.24	0.889
40-50	1.3	6.7	2.2	0.16	<0.02	27.7	5.18	0.529
50-60	1.4	9	1.5	0.28	<0.02	22.8	6.49	0.483
60-80	1.4	6	1.4	0.16	<0.02	22.1	6.67	0.746
80-100	1.2	6.9	1.7	0.36	<0.02	21.4	6.47	1.05
100-120	0.56	3.5	0.6	0.35	<0.02	10.3	7.88	0.822

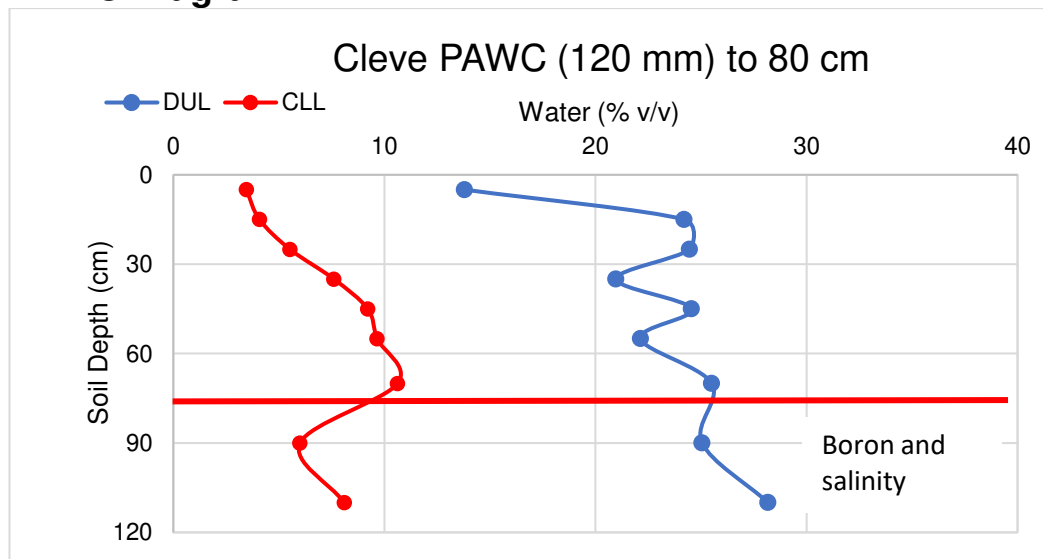


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Bammann, P	Cleve	0-10	1.30	13.81	3.46	10.35	120.40	5.00
Bammann, P	Cleve	10-20	1.27	24.20	4.08	20.12		15.00
Bammann, P	Cleve	20-30	1.34	24.46	5.53	18.93		25.00
Bammann, P	Cleve	30-40	1.50	20.98	7.61	13.37		35.00
Bammann, P	Cleve	40-50	1.63	24.56	9.21	15.35		45.00
Bammann, P	Cleve	50-60	1.51	22.14	9.66	12.48		55.00
Bammann, P	Cleve	60-80	1.58	25.51	10.63	29.76		70.00
Bammann, P	Cleve	80-100	1.51	25.06	6.00	38.11		90.00
Bammann, P	Cleve	100-120	1.67	28.19	8.11	20.08		110.00

PAWC Diagram



4. Chandada, Carey Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Carey 2021	Chandada	-32.790214	134.705754	Loam	120	5000L	20 days	4 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
21 Sept	21 Sept 1000 L 30 Sept 1000 L 5 Oct 1000 L 7 Oct 1000 L 11 Oct 1000 L	15 Oct	120	95	Brown sandy loam 0-20 cm, brown sandy loam with calcrete nodules 20-40 cm, clay loam with calcrete nodules 40-50 cm, sandy clay loam with calcrete nodules 50-120 cm.



Site photo with slope, 15 October 2021.



Soil profile, 15 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark brown	7.5 YR 4/2	Loam	13.1	73.8	13.1
10-20	Dark brown	7.5 YR 3/3	Loam	16.7	70.1	13.2
20-30	Dark brown	7.5 YR 3/3	Loam	16.4	69.5	14.1
30-40	Reddish brown	5 YR 4/4	Loam	16.1	68.6	15.3
40-50	Reddish brown	5 YR 5/4	Loam	16.6	69.9	13.5
50-60	Brown	7.5 YR 5/4	Loam	15.2	69.8	15
60-80	Reddish brown	5 YR 5/4	Loam	15.7	69.3	15
80-100	Reddish brown	5 YR 5/4	Loam	15.8	67.3	16.9
100-120	Reddish yellow	5 YR 6/6	Loam	16.3	66.7	17

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	3.6	4.6	51	830	6.8	1.51	0.18
10-20	2	1.8	13	780	8.2	1.11	0.16
20-30	2.1	<1	<5	700	12	1	0.15
30-40	2.4	1.5	<5	520	18	1.01	0.16
40-50	2.2	2.6	<5	380	21	0.83	0.17
50-60	2.3	3	<5	200	25	0.85	0.21
60-80	2.2	2.9	<5	160	34	0.69	0.23
80-100	2.1	2.9	<5	180	31	0.64	0.23
100-120	1.9	3.6	<5	210	23	0.56	0.18

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.88	8.56	162	43	23	0.258	1.9
10-20	7.92	8.64	196	45	7	0.235	1.8
20-30	7.94	8.75	nd	47	nd	0.267	2
30-40	7.92	8.72	nd	51	nd	0.305	1.9
40-50	7.98	8.75	nd	45	nd	0.416	2.1
50-60	7.96	8.72	nd	54	nd	0.599	2.5
60-80	7.98	8.8	nd	62	nd	0.73	2.5
80-100	8.02	8.88	nd	63	nd	0.769	2.6
100-120	8.02	9.02	nd	69	nd	0.687	2.7

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.34	2.7	6	0.85	<0.02	24	2.07	2.49
10-20	0.3	2.3	3.7	0.49	<0.02	24.2	2.11	2.54
20-30	0.3	2.5	2.6	0.18	<0.02	24.3	2.39	2.28
30-40	0.32	3.1	2.1	0.32	<0.02	24	2.7	1.79
40-50	0.32	3.3	1.8	0.26	<0.02	24.5	3.42	1.24
50-60	0.32	3.1	1.8	0.19	<0.02	23.3	3.99	0.737
60-80	0.31	2.9	1.2	0.16	<0.02	22.3	4.31	0.581
80-100	0.32	3	1.6	0.19	<0.02	22.3	4.9	0.645
100-120	0.27	2.9	0.6	0.1	<0.02	20.6	5.55	0.724

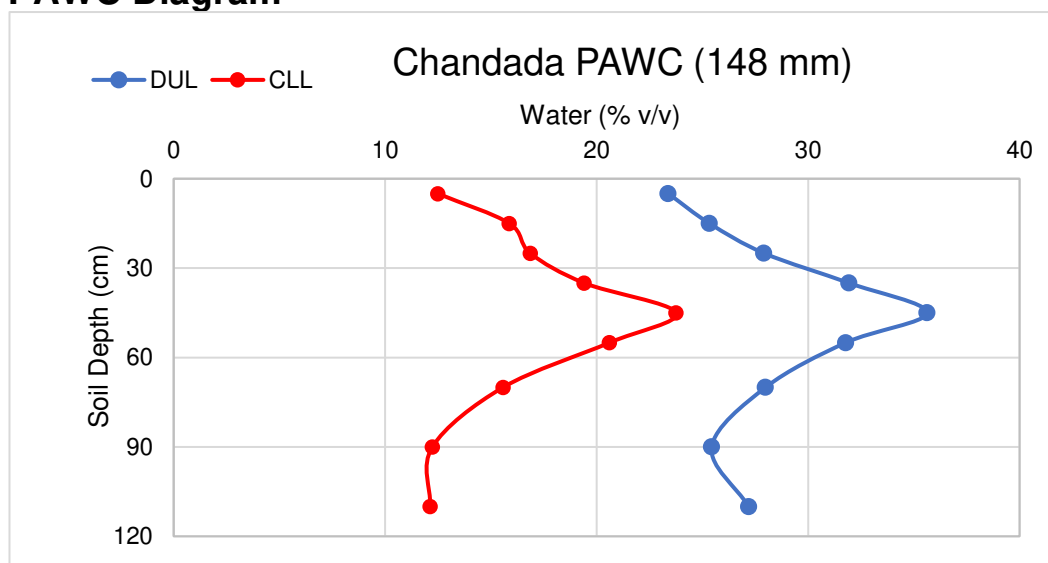


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Carey, S	Chandada	0-10	1.30	23.39	10.90	12.49	148	5.00
Carey, S	Chandada	10-20	1.20	25.34	9.46	15.87		15.00
Carey, S	Chandada	20-30	1.24	27.92	11.06	16.86		25.00
Carey, S	Chandada	30-40	1.34	31.93	12.52	19.41		35.00
Carey, S	Chandada	40-50	1.39	35.63	11.87	23.76		45.00
Carey, S	Chandada	50-60	1.35	31.78	11.17	20.61		55.00
Carey, S	Chandada	60-80	1.49	27.99	12.41	15.58		70.00
Carey, S	Chandada	80-100	1.52	25.44	13.21	12.23		90.00
Carey, S	Chandada	100-120	1.51	27.19	15.06	12.13		110.00

PAWC Diagram



5. Minnipa South, Heddle Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Heddle 2021	Minnipa	-32.863111	135.146006	Sandy Loam	95	5000 L	16 days	5 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
21 Sept	21 Sept 1000 L 30 Sept 1000 L 1 Oct 1000 L 5 Oct 1000 L 7 Oct 1000 L	12 Oct	120	100	Brown to red sandy loam 0-20 cm, light red sandy loam 20-40 cm, light red sandy loam with calcrete nodules increasing in size with depth 40-100 cm, light red loamy clay with 5 mm calcrete nodules 100-120 cm.



Site photo with slope, 12 October 2021.



Soil profile, 12 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark brown	7.5 YR 3/2	Sand	7.9	88.4	3.7
10-20	Red	2.5 YR 4/8	Sandy loam	8.7	88.5	2.8
20-30	Red	2.5 YR 4/6	Sandy loam	12.2	84.5	3.3
30-40	Red	2.5 YR 4/6	Sandy loam	13.1	82.9	4
40-50	Red	2.5 YR 5/8	Sandy loam	14.2	82	3.8
50-60	Red	2.5 YR 5/8	Sandy loam	16.5	78.6	4.9
60-80	Red	2.5 YR 5/8	Sandy loam	14.4	78.3	7.3
80-100	Reddish yellow	5 YR 6/6	Sandy loam	14	77.5	8.5
100-120	Reddish yellow	5 YR 7/6	Sandy loam	16.6	73.2	10.2

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	2.1	<1	12	210	8.3	0.72	0.12
10-20	1.2	<1	<5	170	3.6	0.43	0.1
20-30	1.3	<1	<5	170	3.9	0.41	0.1
30-40	1.3	<1	<5	130	3.9	0.33	0.11
40-50	1.3	<1	<5	110	4.5	0.25	0.11
50-60	1	<1	<5	120	12	0.23	0.17
60-80	1.2	2.9	<5	220	15	0.25	0.26
80-100	1	16	<5	250	23	0.26	0.55
100-120	<1	13	48	320	50	0.23	0.91

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.98	8.59	48	1.4	36	0.178	1.4
10-20	8.06	8.69	47	1.3	15	0.111	1.2
20-30	8.1	8.75	nd	1.9	nd	0.139	1.3
30-40	8.17	8.87	nd	3.3	nd	0.228	1.7
40-50	8.15	8.87	nd	3.9	nd	0.343	1.8
50-60	8.22	9.03	nd	9.6	nd	0.707	2.7
60-80	8.36	9.5	nd	21	nd	1.67	7.2
80-100	8.5	9.87	nd	33	nd	3.25	9.1
100-120	8.62	9.94	nd	36	nd	6.26	11

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.24	4.3	1.9	0.77	<0.02	17.8	1.53	0.55
10-20	0.19	4.7	1.1	0.34	<0.02	19.1	1.25	0.494
20-30	0.22	5.5	0.8	0.31	<0.02	20.5	1.57	0.474
30-40	0.25	4.6	0.4	0.22	<0.02	21.4	2.03	0.385
40-50	0.29	4.3	0.4	0.12	<0.02	21.2	2.77	0.299
50-60	0.4	3.9	0.7	0.17	<0.02	21.2	3.67	0.366
60-80	0.54	3.6	0.6	0.19	<0.02	21.1	4.89	0.657
80-100	0.61	2.9	0.6	0.2	<0.02	18.7	4.68	0.732
100-120	0.67	2.6	0.4	0.22	<0.02	19.7	4.84	0.946

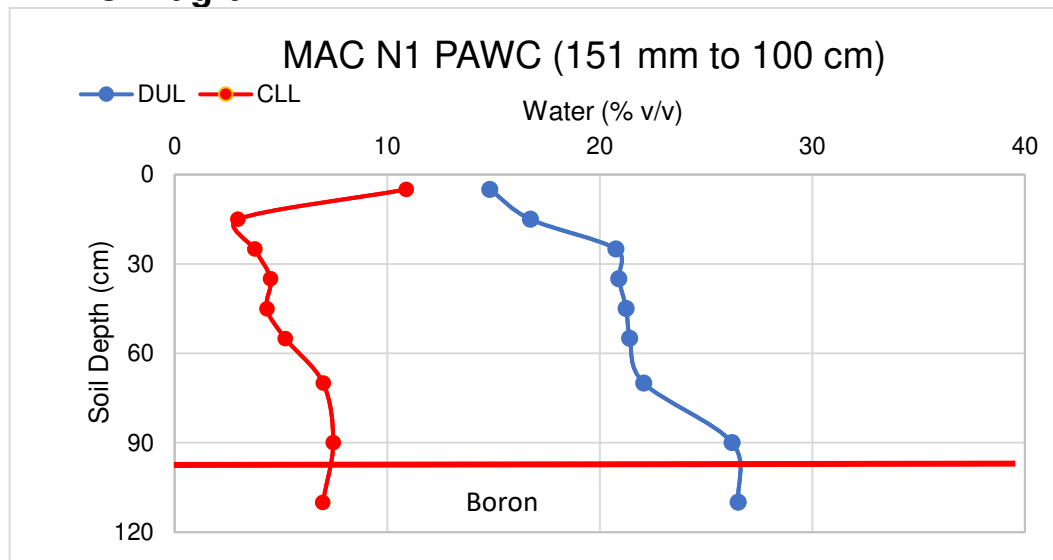


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Heddle, B	Minnipa South	0-10	1.55	15.03	3.89	11.14	160.34	5.00
Heddle, B	Minnipa South	10-20	1.64	13.89	5.54	8.35		15.00
Heddle, B	Minnipa South	20-30	1.61	16.18	5.03	11.14		25.00
Heddle, B	Minnipa South	30 - 40	1.60	18.16	6.30	11.86		35.00
Heddle, B	Minnipa South	40-50	1.56	18.64	5.00	13.65		45.00
Heddle, B	Minnipa South	50 - 60	1.51	20.98	6.97	14.01		55.00
Heddle, B	Minnipa South	60-80	1.45	21.67	7.26	28.82		70.00
Heddle, B	Minnipa South	80-100	1.53	26.07	8.59	34.94		90.00
Heddle, B	Minnipa South	100-120	1.55	26.20	12.98	26.42		110.00

PAWC Diagram



6. Mangalo, James Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
James 2021	Mangalo	-33.646975	136.624287	Clay	65	5000 L	15 days	7 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
27 Sept	27 Sept 1000 L 1 Oct 1000 L 6 Oct 1000 L 8 Oct 1000 L 12 Oct 1000 L	19 Oct	80	70	Sandy clay loam 0-10 cm, red clay 10-40 cm, red clay with mica gravel 40-100 cm.



Site photo with slope, 19 October 2021.



Soil profile, 19 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark reddish brown	2.5 YR 3/4	Loam	18.7	68.2	13.1
10-20	Dark red	2.5 YR 3/6	Clay	48.2	41.4	10.4
20-30	Dark red	2.5 YR 3/6	Clay	48.1	42.1	9.8
30-40	Dark red	2.5 YR 3/6	Clay	41	50	9
40-50	Dark yellowish brown	10 YR 3/6	Clay	33.2	58.3	8.5
50-60	Dark yellowish brown	10 YR 3/4	Sandy clay loam	21.3	70.6	8.1
60-80	Dark yellowish brown	10 YR 3/4	Clay loam	26.9	62.8	10.3
80-100	Dark yellowish brown	10 YR 3/4	Loamy sand	8.3	84.2	7.5

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	26	68	6	240	49	1.38	0.27
10-20	2.3	48	6	270	29	0.85	0.21
20-30	1.6	35	<5	220	30	0.55	0.19
30-40	1	29	<5	230	31	0.39	0.21
40-50	<1	18	<5	300	28	0.36	0.17
50-60	<1	17	<5	240	18	0.29	0.16
60-80	<1	16	<5	360	14	0.33	0.15
80-100	1.3	1.9	<5	380	11	0.13	0.18

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	6.05	7.18	67	<0.4	51	0.487	0.81
10-20	5.13	5.67	149	<0.4	7	0.705	1.5
20-30	6.17	7.05	nd	<0.4	nd	0.97	1.7
30-40	6.85	7.65	nd	<0.4	nd	1.32	1.8
40-50	6.19	7.15	nd	<0.4	nd	1.6	1.5
50-60	6.44	7.4	nd	<0.4	nd	1.58	1.2
60-80	6.48	7.53	nd	<0.4	nd	1.96	1.5
80-100	7.79	8.54	nd	<0.4	nd	0.569	0.32

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.3	42	70	1.8	<0.02	3.63	2.42	0.607
10-20	0.19	15	22	0.3	0.2	5.49	5.88	0.771
20-30	0.18	9.7	2.1	0.19	<0.02	6.14	7.9	0.635
30-40	0.15	10	1.2	0.11	<0.02	5.12	7.93	0.529
40-50	0.24	11	0.9	0.12	<0.02	4.72	8.02	0.522
50-60	0.21	11	1.1	0.1	<0.02	4.09	7.45	0.48
60-80	0.25	9.8	2.1	0.11	<0.02	4.36	8.22	0.486
80-100	0.19	38	8.5	0.36	<0.02	4.67	3.97	0.264

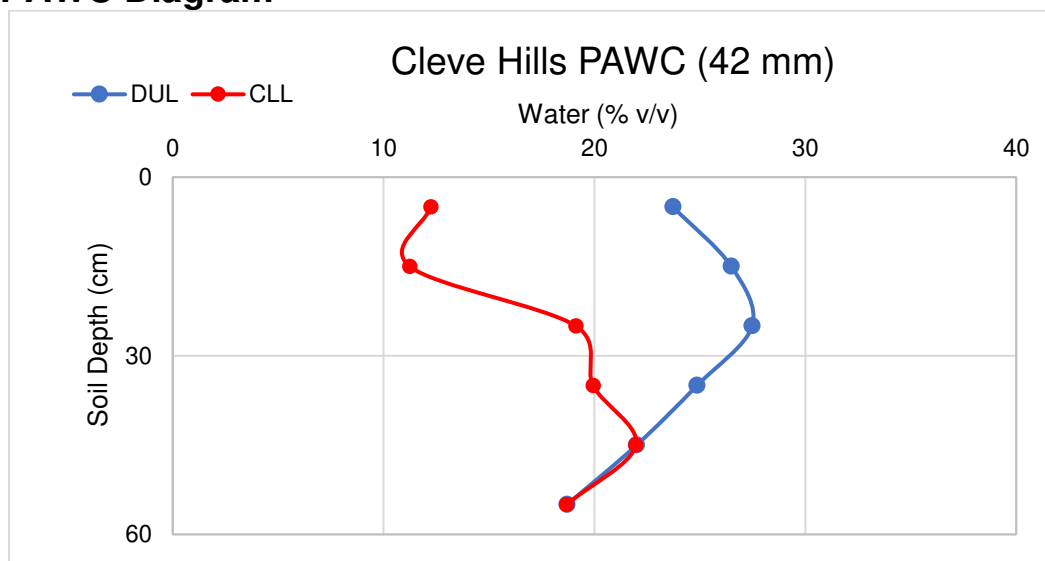


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
James, C	Mangalo	0-10	1.52	23.72	12.24	11.49	37	5.00
James, C	Mangalo	10-20	1.58	26.49	11.24	15.25		15.00
James, C	Mangalo	20-30	1.67	27.48	19.12	8.36		25.00
James, C	Mangalo	30-40	1.67	24.86	19.93	4.93		35.00
James, C	Mangalo	40-50	1.69	22.00	21.96	0.00		45.00
James, C	Mangalo	50-60	1.55	18.70	18.67	2.00		55.00

PAWC Diagram



7. Cowell, Kaden Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Kaden 2021	Cowell	-33.632822	137.166188	Sandy loam	110	5000 L	13 days	9 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
27 Sept	27 Sept 1000 L 1 Oct 1000 L 6 Oct 1000 L 8 Oct 1000 L 10 Oct 1000 L	19 Oct	120	85	Brown sandy loam 0-20 cm, darker brown sandy loam 20-30 cm, red sandy loam 30-40 cm, sandy clay with white particles 40-70 cm, hard sandy clay loam 70-120 cm.



Site photo with slope, 19 October 2021.



Soil profile, 19 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark brown	7.5 YR 3/3	Sand	5	92.9	2.2
10-20	Dark reddish brown	2.5 YR 2/5	Sand	5.8	90.9	3.3
20-30	Red	2.5 YR 4/6	Sand	6.9	89.1	4
30-40	Red	2.5 YR 4/6	Sandy loam	8.9	86.9	4.2
40-50	Red	2.5 YR 4/6	Sandy loam	12.7	83.2	4.1
50-60	Red	2.5 YR 4/6	Sandy clay loam	19.8	74.7	5.5
60-80	Red	2.5 YR 5/6	Sandy clay loam	22.8	70.7	6.5
80-100	Reddish yellow	5 YR 6/6	Sandy clay loam	21.4	71.6	7
100-120	Reddish yellow	5 YR 6/6	nd	nd	nd	nd

nd- no data

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	1.3	12	18	330	6.5	0.63	0.097
10-20	1.2	9.8	23	440	5.4	0.59	0.11
20-30	<1	5.7	14	390	4.5	0.52	0.099
30-40	<1	7.5	<5	330	5.3	0.33	0.12
40-50	<1	7.5	<5	300	6.3	0.22	0.16
50-60	<1	9.5	<5	390	10	0.29	0.24
60-80	<1	16	<5	350	18	0.27	0.36
80-100	<1	23	<5	380	26	0.21	0.49

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	6.89	7.43	18	<0.4	179	0.118	0.58
10-20	6.89	7.46	24	<0.4	139	0.156	0.74
20-30	7.13	7.8	nd	<0.4	nd	0.163	0.71
30-40	7.84	8.53	nd	<0.4	nd	0.293	0.87
40-50	8.18	8.96	nd	1	nd	0.812	1.6
50-60	8.33	9.22	nd	3	nd	1.71	3.2
60-80	8.46	9.44	nd	6.1	nd	3.39	4.7
80-100	8.47	9.4	nd	8.3	nd	3.15	5.9

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.3	5.8	5.7	0.87	<0.02	2.72	0.794	0.759
10-20	0.29	5.1	4.5	0.57	<0.02	3.87	1.09	0.92
20-30	0.31	4.3	3.4	0.29	<0.02	3.68	0.957	0.689
30-40	0.38	3.8	1.7	0.14	<0.02	5.72	1.6	0.838
40-50	0.52	6.3	1.2	0.17	<0.02	11.8	2.88	0.734
50-60	1	8	1.7	0.18	<0.02	20.6	5.46	1.02
60-80	1.4	8.3	2.2	0.14	<0.02	20.1	7.38	1.1
80-100	1.4	6.7	2.1	0.14	<0.02	19.6	6.6	0.961

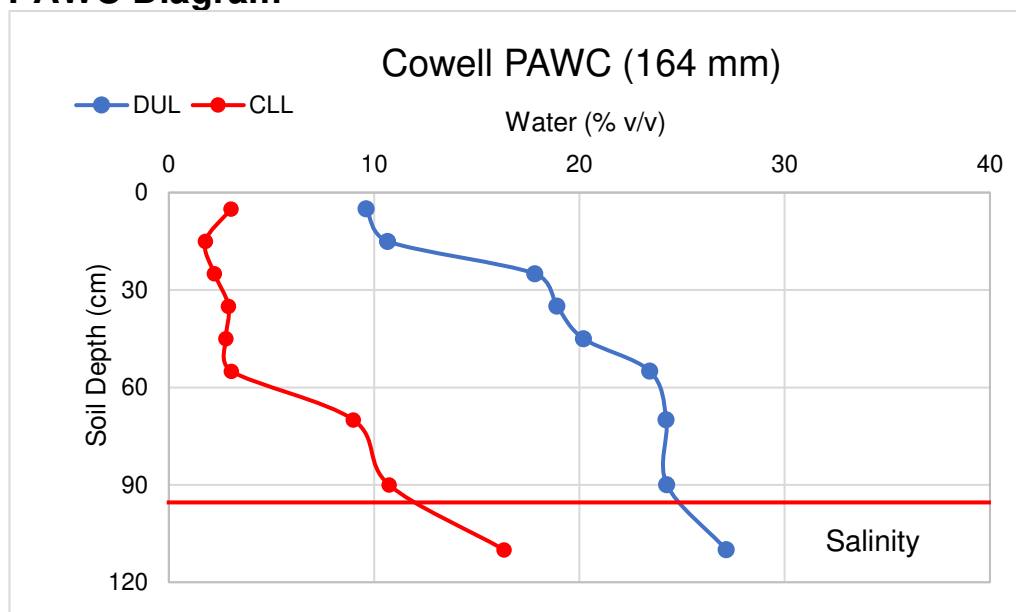


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Kaden, P	Cowell	0-10	1.51	9.63	3.04	6.59	164	5.00
Kaden, P	Cowell	10-20	1.69	10.67	1.78	8.89		15.00
Kaden, P	Cowell	20-30	1.62	17.84	2.22	15.61		25.00
Kaden, P	Cowell	30 - 40	1.56	18.91	2.91	16.00		35.00
Kaden, P	Cowell	40-50	1.57	20.21	2.78	17.42		45.00
Kaden, P	Cowell	50 - 60	1.53	23.44	3.06	20.38		55.00
Kaden, P	Cowell	60-80	1.52	24.23	8.99	30.49		70.00
Kaden, P	Cowell	80-100	1.56	24.27	10.73	27.07		90.00
Kaden, P	Cowell	100-120	1.59	27.16	16.34	21.65		110.00

PAWC Diagram



8. Kimba, Mayfield Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous samplng depth (cm)	Amount water applied	Time of watering	Drainage time
Mayfield 2021	Kimba	-33.181952	136.382657	Sandy loam over clay	120	5000 L	18 days	12 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
23 Sept	23 Sept 1000 L 30 Sept 1000 L 5 Oct 1000 L 7 Oct 1000 L 11 Oct 1000 L	27 Oct	120	80	Brown sandy loam 0-10 cm, red sandy loam 10-20 cm, red sandy loam with some clay 20-30 cm, red clay 30-40 cm, light red clay with carbonate 40-50 cm, very heavy red clay with carbonate 50-60 cm, red clay 60-70 cm, red clay with small calcrete nodules 80-100 cm, heavy red clay 100-120 cm.



Site photo with slope, 27 October 2021.



Soil profile, 27 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark reddish brown	2.5 YR 2.5/3	Sandy loam	11	80.9	8.1
10-20	Dark red	2.5 YR 3/6	Loamy sand	8	86.1	6
20-30	Dark red	2.5 YR 3/6	Sand	6.8	89.8	3.4
30-40	Red	2.5 YR 4/6	Sandy loam	16.2	79.1	4.8
40-50	Red	2.5 YR 4/6	Sandy clay loam	27	67.9	5.1
50-60	Red	2.5 YR 4/6	Clay	37.7	56.3	6.1
60-80	Red	2.5 YR 4/6	Sandy clay	35.4	60.1	4.5
80-100	Red	2.5 YR 4/6	Clay	38.8	53.2	8
100-120	Red	2.5 YR 4/6	Clay	37.8	56.2	6

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	<1	2.5	55	380	4.3	0.8	0.095
10-20	<1	1.3	39	200	2.5	0.44	0.073
20-30	<1	<1	17	150	<2.5	0.2	0.062
30-40	<1	<1	10	260	3.4	0.21	0.12
40-50	<1	<1	5	380	3.5	0.17	0.17
50-60	<1	<1	5	600	4.4	0.16	0.29
60-80	<1	1.5	<5	650	6.7	0.11	0.39
80-100	<1	4.8	<5	730	11	0.15	0.61
100-120	<1	10	<5	690	31	0.08	0.81

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.36	8.23	46	<0.4	255	0.144	1.2
10-20	7.41	8.29	37	<0.4	243	0.077	0.87
20-30	7.53	8.54	nd	<0.4	nd	0.161	0.79
30-40	7.85	8.64	nd	<0.4	nd	0.525	2.2
40-50	8.02	8.77	nd	1.1	nd	1.03	4.3
50-60	8.36	9.34	nd	2.5	nd	3.19	13
60-80	8.51	9.51	nd	2.9	nd	4.51	18
80-100	8.59	9.71	nd	19	nd	7.54	20
100-120	8.85	9.73	nd	2.9	nd	10.2	20

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.41	20	11	1.3	<0.02	7.79	1.68	0.971
10-20	0.23	13	5.4	0.72	<0.02	4.66	1.04	0.465
20-30	0.14	6.7	1.8	0.24	<0.02	3.29	0.976	0.329
30-40	0.31	10	2.3	0.19	<0.02	6.71	2.92	0.637
40-50	0.57	13	2.9	0.17	<0.02	13	5.64	1
50-60	0.86	9.1	2.2	0.2	<0.02	15.3	9.67	1.77
60-80	0.72	7.9	1.3	0.22	<0.02	12.5	9.33	1.79
80-100	0.58	7.3	0.9	0.39	<0.02	15.8	9.88	1.87
100-120	0.67	9.1	0.7	0.77	<0.02	8.91	8.9	1.63

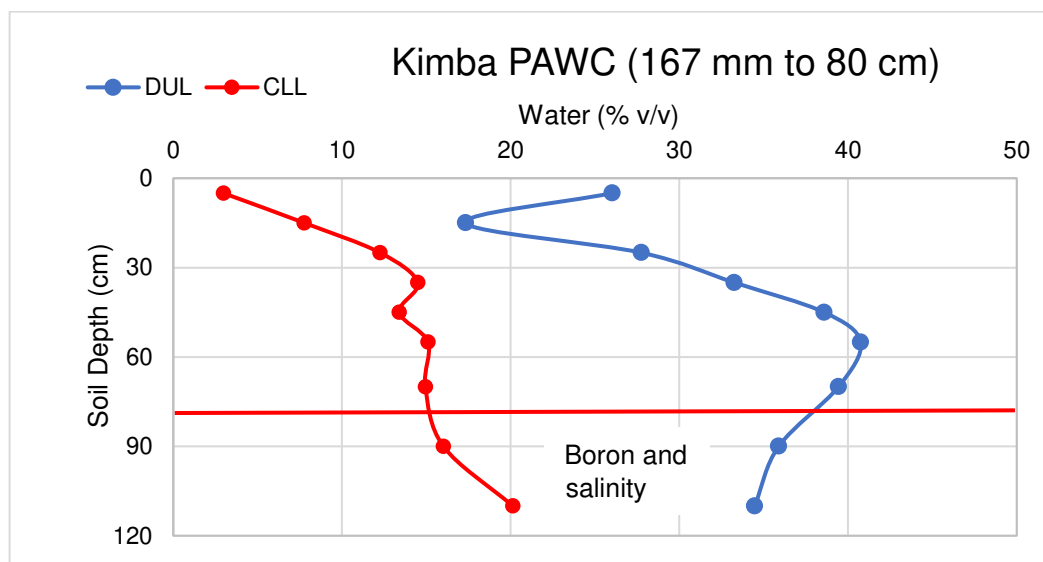


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Mayfield, S	Kimba	0-10	1.54	26.02	2.96	23.05	167 to 80cm	5.00
Mayfield, S	Kimba	10-20	1.77	17.32	7.76	9.56		15.00
Mayfield, S	Kimba	20-30	1.65	27.75	12.26	15.49		25.00
Mayfield, S	Kimba	30-40	1.55	33.24	14.49	18.75		35.00
Mayfield, S	Kimba	40-50	1.43	38.58	13.39	25.19		45.00
Mayfield, S	Kimba	50-60	1.34	40.74	15.09	25.65		55.00
Mayfield, S	Kimba	60-80	1.38	39.44	14.94	48.99		70.00
Mayfield, S	Kimba	80-100	1.46	35.89	16.01	39.75		90.00
Mayfield, S	Kimba	100-120	1.56	34.46	20.12	28.69		110.00

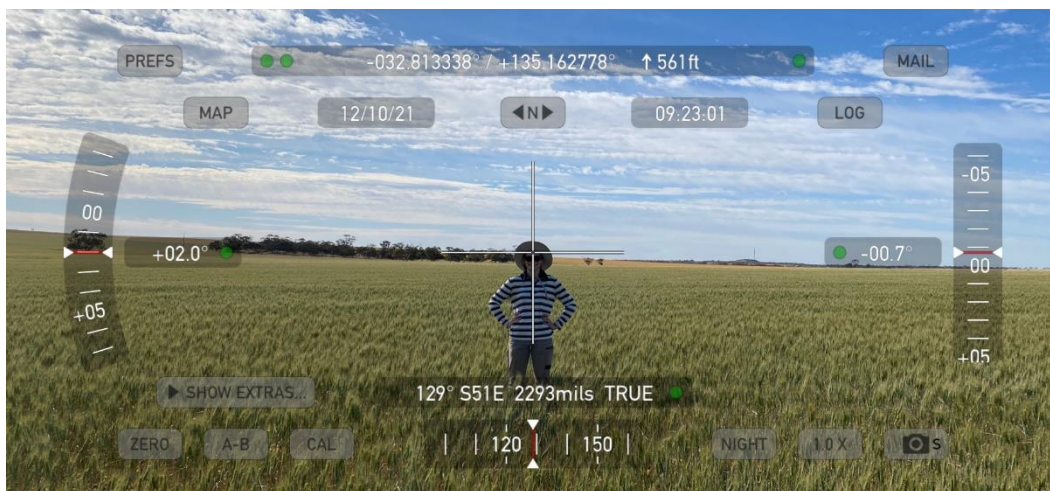
PAWC Diagram



9. Minnipa, Minnipa Ag Centre N1 Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
MAC 2021	Minnipa	-32.813338	135.162778	Red sandy loam over loam	120	5000 L	15 days	5 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
22 Sept	22 Sept 1000 L 30 Sept 1000 L 1 Oct 1000 L 5 Oct 1000 L 7 Oct 1000 L	12 Oct	110	85	Brown sandy loam 0-10 cm, lighter brown sandy loam with 10 mm calcrete nodules 10-45 cm, lighter brown sandy loam with 20 mm calcrete nodules 45-60 cm, light brown sandy loam with 10 mm calcrete nodules 60-120 cm.



Site photo with slope, 12 October 2021.



Soil profile, 12 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Very dusky red	2.5 YR 2.5/2	Sandy loam	9.5	83.4	7.2
10-20	Very dusky red	2.5 YR 2.5/2	Sandy loam	13.2	77.8	9.1
20-30	Dusky red	2.5 YR 3/2	Sandy loam	15	74.4	10.6
30-40	Reddish brown	5 YR 4/3	Sandy loam	15.8	73.2	11
40-50	Dark reddish brown	5 YR 3/4	Loam	16.8	70.9	12.3
50-60	Dark reddish brown	5 YR 3/4	Loam	16.5	69.8	13.7
60-80	Reddish brown	5 YR 4/4	Loam	17.8	67.8	14.4
80-100	Yellowish red	5 YR 6/6	Loam	20.2	65	14.9
100-120	Yellowish red	5 YR 5/6	Loam	21.9	64.3	13.8

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	<1	1.3	27	550	4.6	0.85	0.12
10-20	<1	<1	7	470	3.4	0.58	0.11
20-30	<1	<1	5	350	4.2	0.5	0.11
30-40	<1	1	7	260	6.3	0.51	0.11
40-50	<1	1	5	130	8.1	0.52	0.12
50-60	<1	3.3	<5	110	7.8	0.55	0.14
60-80	<1	12	<5	150	13	0.38	0.25
80-100	<1	17	<5	240	31	0.27	0.45
100-120	<1	16	<5	290	39	0.22	0.53

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.94	8.65	75	5.4	36	0.085	1.4
10-20	7.99	8.78	103	11	<4	0.086	1.2
20-30	7.95	8.78	nd	14	nd	0.144	1.4
30-40	7.93	8.76	nd	18	nd	0.176	1.3
40-50	7.89	8.59	nd	26	nd	0.314	1.9
50-60	7.98	8.77	nd	31	nd	0.546	2.3
60-80	8.13	9.16	nd	34	nd	1.73	5.3
80-100	8.25	9.48	nd	33	nd	3.53	9.6
100-120	8.32	9.57	nd	31	nd	4.12	15

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.28	1.8	4.5	0.95	<0.02	21.2	1.35	1.52
10-20	0.35	2	2.2	0.21	<0.02	22	1.36	1.28
20-30	0.39	2.3	1.4	0.13	<0.02	21.3	1.63	0.955
30-40	0.38	2.5	1.3	0.28	<0.02	22.4	2.24	0.665
40-50	0.41	2.8	0.8	0.14	<0.02	21.2	3.3	0.393
50-60	0.34	2.6	0.5	0.13	<0.02	21.5	4.62	0.315
60-80	0.24	2.4	0.5	0.09	<0.02	21.2	6.63	0.451
80-100	0.22	2.7	0.5	0.14	<0.02	19.2	7.34	0.718
100-120	0.22	2.6	0.5	0.1	<0.02	19.2	7.2	0.805

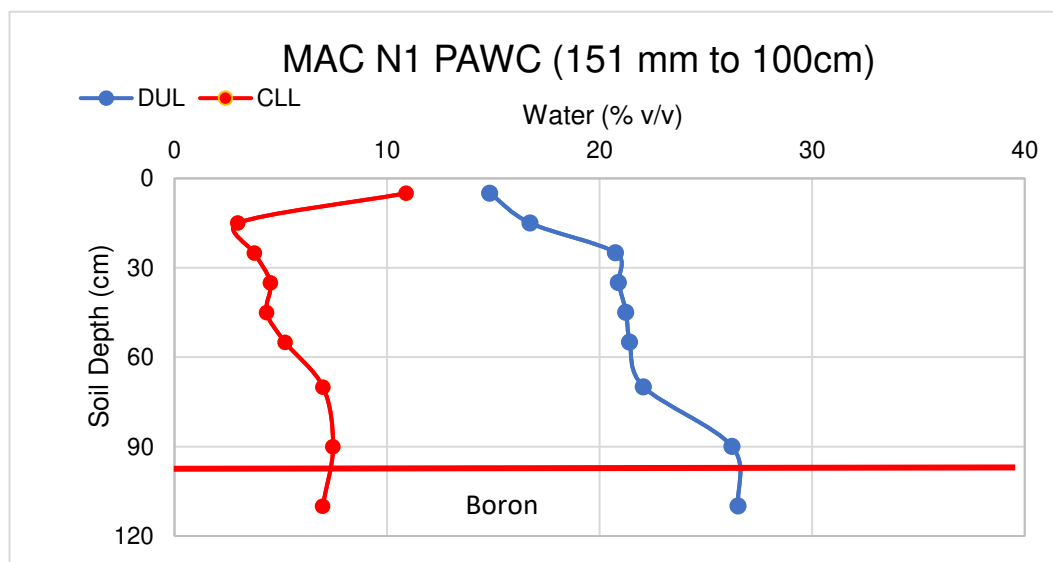


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
MAC	Minnipa	0-10	1.40	14.84	10.89	3.94	151	5.00
MAC	Minnipa	10-20	1.44	16.74	2.97	13.77		15.00
MAC	Minnipa	20-30	1.39	20.76	3.76	17.00		25.00
MAC	Minnipa	30-40	1.37	20.90	4.51	16.38		35.00
MAC	Minnipa	40-50	1.40	21.24	4.34	16.91		45.00
MAC	Minnipa	50-60	1.41	21.42	5.21	16.21		55.00
MAC	Minnipa	60-80	1.44	22.07	6.99	30.17		70.00
MAC	Minnipa	80-100	1.42	26.23	7.46	37.55		90.00
MAC	Minnipa	100-120	1.43	26.52	6.97	39.10		110.00

PAWC Diagram



10. Mt Damper, Michael Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Michael 2021	Mt Damper	-33.070980	135.068347	Sandy loam over clay loam	90	5000 L	19 days	4 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
22 Sept	22 Sept 1000 L 30 Sept 1000 L 5 Oct 1000 L 7 Oct 1000 L 11 Oct 1000 L	15 Oct	110	70	Brown sandy loam 0-10 cm, brown red sandy loam 10-30 cm, red sandy loam with 5mm calcrete nodules 30-40 cm, red sandy loam with 10 mm calcrete nodules 40-50 cm, lighter red sandy loam with 15 mm calcrete nodules 50-60 cm, light red sandy loam with 15-20 mm calcrete nodules 60-80 cm.



Site photo with slope, 15 October 2021.



Soil profile, 15 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark reddish brown	5 YR 3/2	Sandy loam	15.1	77.3	7.6
10-20	Reddish brown	5 YR 4/4	Sandy clay loam	20.4	71.4	8.2
20-30	Yellowish red	5 YR 4/6	Sandy clay loam	22	69.4	8.7
30-40	Yellowish red	5 YR 4/6	Clay loam	22.2	67.9	9.9
40-50	Yellowish red	5 YR 5/6	Clay loam	22.5	66.9	10.6
50-60	Yellowish red	5 YR 5/6	Sandy loam	19.6	70.9	9.5
60-80	Yellowish red	5 YR 5/6	Loam	19.1	70.4	10.6
80-100	Yellowish red	5 YR 5/6	Sandy loam	16.8	72.4	10.8

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	3	8.1	35	540	4.5	0.97	0.15
10-20	<1	2	15	370	5.4	0.78	0.13
20-30	<1	1.3	7	260	8.7	0.66	0.13
30-40	<1	1.9	5	180	16	0.45	0.14
40-50	<1	10	<5	150	14	0.35	0.15
50-60	<1	21	<5	150	7.7	0.35	0.17
60-80	<1	11	<5	180	6.5	0.29	0.18
80-100	<1	1.6	<5	170	7.3	0.27	0.15

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.95	8.53	91	4.3	40	0.144	1.9
10-20	8.01	8.68	144	8.6	5	0.186	1.9
20-30	8.04	8.74	nd	17	nd	0.272	2
30-40	8.08	8.8	nd	15	nd	0.29	2.1
40-50	8.09	8.82	nd	18	nd	0.291	2.2
50-60	8.14	8.85	nd	19	nd	0.352	2.6
60-80	8.24	9.18	nd	31	nd	0.731	3.8
80-100	8.31	9.23	nd	34	nd	0.478	3.2

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.24	4.5	3.7	1.1	<0.02	23.7	1.56	1.19
10-20	0.28	5.5	1.7	0.41	<0.02	25.6	1.79	0.909
20-30	0.35	5.9	1	0.24	<0.02	26.2	2.15	0.693
30-40	0.39	6	0.6	0.08	<0.02	24.2	2.69	0.46
40-50	0.48	5	0.6	0.11	<0.02	23.3	3.56	0.373
50-60	0.54	4.4	0.6	0.11	<0.02	23.5	4.75	0.353
60-80	0.57	3.7	0.4	0.11	<0.02	20.8	6.58	0.455
80-100	0.54	3.1	0.5	0.13	<0.02	19.7	7.39	0.456

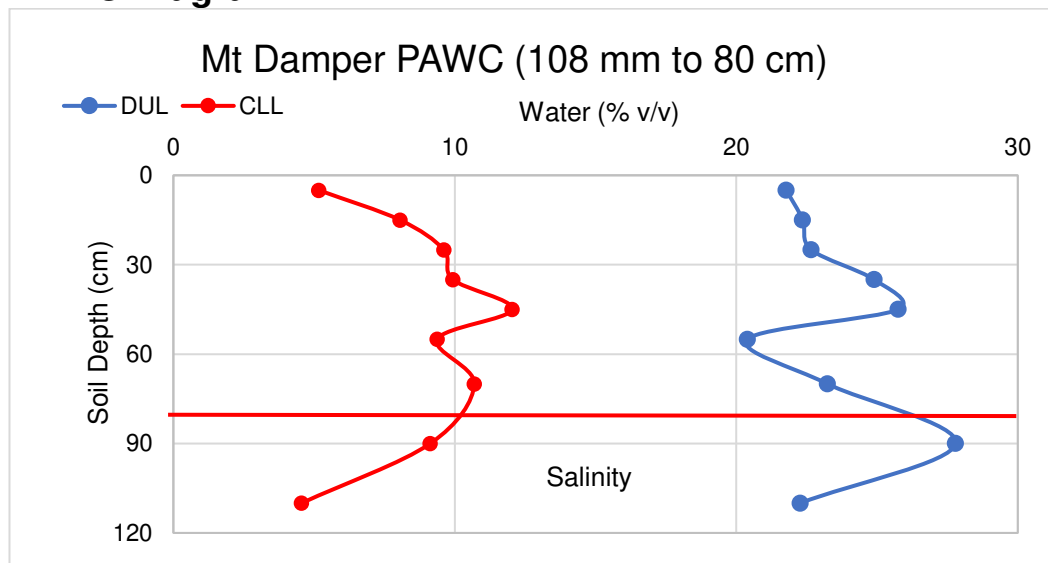


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Michael, A	Mt Damper	0-10	1.31	21.78	5.17	16.61	164	5.00
Michael, A	Mt Damper	10-20	1.39	22.36	8.05	14.31		15.00
Michael, A	Mt Damper	20-30	1.33	22.67	9.61	13.06		25.00
Michael, A	Mt Damper	30-40	1.45	24.90	9.93	14.97		35.00
Michael, A	Mt Damper	40-50	1.56	25.75	12.04	13.71		45.00
Michael, A	Mt Damper	50-60	1.41	20.39	9.38	11.02		55.00
Michael, A	Mt Damper	60-80	1.42	23.24	10.69	25.10		70.00
Michael, A	Mt Damper	80-100	1.38	27.80	9.13	37.34		90.00
Michael, A	Mt Damper	100-120	1.55	22.27	4.56	17.71		110.00

PAWC Diagram



11. Goldmine Hill, Glover Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Glover 2021	Goldmine Hill	-33.555204	135.836090	Brown sandy loam over clay	120	5000 L	10 days	5 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
28 Sept	28 Sept 1000 L 30 Sept 1000 L 5 Oct 1000 L 6 Oct 1000 L 8 Oct 1000 L	13 Oct	60	120	Brown sandy loam 0-10cm, light brown sandy loam 10-20cm, lighter brown/white sandy loam 20-35cm, lighter brown/white sandy loam with calcrete nodules 35-50cm, white/ red loam 50-70cm, red clay loam 70-80cm, heavy red clay loam 80-120cm.



Site photo with slope, 13 October 2021.



Soil profile, 13 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark brown	7.5 YR 3/2	Sandy loam	10.6	85.1	4.3
10-20	Yellowish red	5 YR 4/6	Sandy loam	19.6	73.4	7
20-30	Yellowish red	5 YR 4/6	Clay loam	22.7	67	10.3
30-40	Yellowish red	5 YR 5/6	Clay loam	22.5	63.1	14.4
40-50	Yellowish red	5 YR 5/6	Clay loam	30.4	51.4	18.2
50-60	Reddish yellow	7.5 YR 6/6	Clay loam	32.7	49	18.3
60-80	Pink	7.5 YR 7/4	Clay	36.1	49.3	14.6
80-100	Pink	7.5 YR 7/4	Clay	42.5	47.7	9.8
100-120	Pink	7.5 YR 7/4	Clay	46.4	47.8	5.8

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	3.5	1.7	23	440	22	1.18	0.17
10-20	2.7	<1	10	440	7.6	0.71	0.14
20-30	2	<1	<5	290	19	0.6	0.15
30-40	2.3	<1	<5	160	32	0.42	0.2
40-50	2.1	<1	5	180	21	0.34	0.39
50-60	2	2.2	5	290	31	0.29	0.55
60-80	1.7	1.8	<5	450	37	0.22	0.7
80-100	1.5	2.8	<5	660	65	0.21	0.95
100-120	1.5	4.3	<5	790	97	0.11	1.1

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.77	8.37	53	1.6	149	0.098	1.5
10-20	8.02	8.67	113	9	11	0.124	2
20-30	8.16	8.82	nd	16	nd	0.267	2.6
30-40	8.29	9.14	nd	36	nd	1.02	3.7
40-50	8.49	9.54	nd	45	nd	3.08	9.2
50-60	8.59	9.68	nd	45	nd	4.37	15
60-80	8.65	9.75	nd	33	nd	6.41	22
80-100	8.8	9.77	nd	23	nd	10.5	30
100-120	8.93	9.68	nd	9.1	nd	12.7	36

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.24	5.8	2.8	1.2	<0.02	20.4	2.08	1.19
10-20	0.35	7.6	1.3	0.32	<0.02	25.4	3.03	1.35
20-30	0.55	7	1.1	0.11	<0.02	25.3	4.68	1.03
30-40	0.54	4.7	0.8	0.16	<0.02	23.2	8.26	0.53
40-50	0.66	5.1	0.6	0.18	<0.02	18.8	11.2	0.544
50-60	0.64	5.3	0.5	0.13	<0.02	18	11.3	0.829
60-80	0.65	6.5	0.7	0.14	<0.02	16.8	10.8	1.28
80-100	0.79	8.1	0.8	0.18	<0.02	16.3	11.2	1.99
100-120	0.93	8.8	0.7	0.2	<0.02	8.28	13.4	2.28

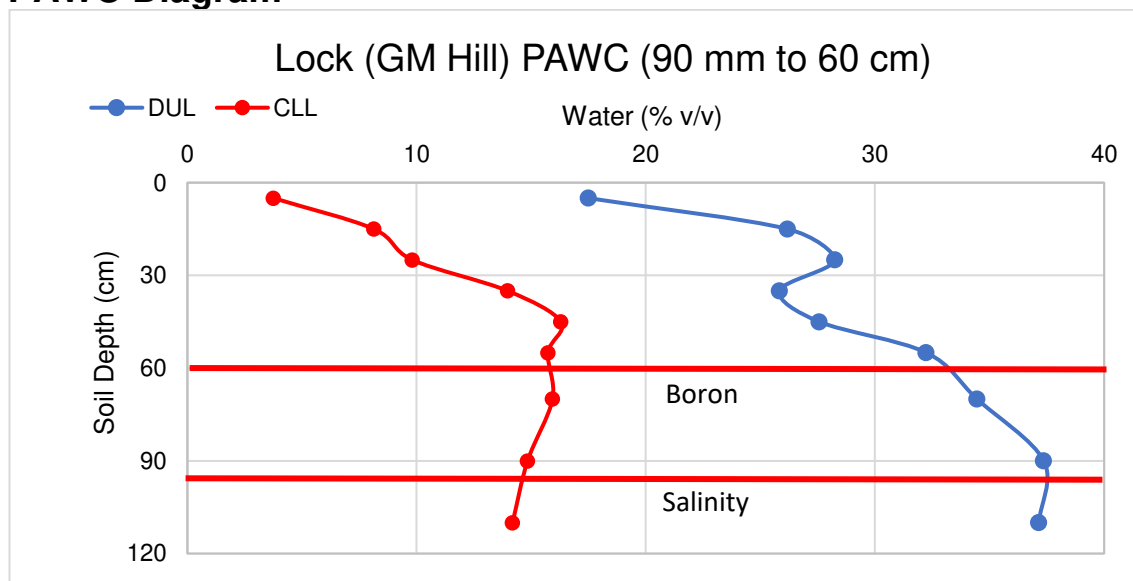


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Glover, G	Lock - Goldmine Hill	0-10	1.39	17.50	3.75	13.74	217.87	5.00
Glover, G	Lock - Goldmine Hill	10-20	1.42	26.18	8.13	18.05		15.00
Glover, G	Lock - Goldmine Hill	20-30	1.29	28.25	9.82	18.43		25.00
Glover, G	Lock - Goldmine Hill	30 - 40	1.37	25.83	13.97	11.86		35.00
Glover, G	Lock - Goldmine Hill	40-50	1.35	27.57	16.29	11.27		45.00
Glover, G	Lock - Goldmine Hill	50 - 60	1.33	32.24	15.73	16.51		55.00
Glover, G	Lock - Goldmine Hill	60-80	1.36	34.45	15.93	37.04		70.00
Glover, G	Lock - Goldmine Hill	80-100	1.40	37.36	14.84	45.04		90.00
Glover, G	Lock - Goldmine Hill	100-120	1.38	37.15	14.19	45.93		110.00

PAWC Diagram



12. Lock, Polkinghorne Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Polkinghorne 2021	Lock (good zone)	-33.588663	135.666583	Sandy Loam with calcrete nodules	30	5000 L	11 days	4 days

Set up date	Water date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
28 Sept	28 Sept 1000 L 30 Sept 1000 L 5 Oct 1000 L 6 Oct 1000 L 9 Oct 1000 L	13 Oct	120	80	Brown sandy loam 0-10 cm, lighter brown sandy loam with small calcrete nodules at 10-15 cm and larger at 40-50 cm 10-50 cm, sandy loam 50-60 cm, sandy clay loam with calcrete nodules 60-80 cm, red clay loam with calcrete nodules 80-100 cm, white/ yellow clay 100-120 cm.



Site photo with slope, 13 October 2021.



Soil profile, 13 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dark brown	7.5 YR 3/2	Sandy loam	11.8	79.8	8.4
10-20	Dark brown	7.5 YR 4/4	Loam	18.3	69.7	12
20-30	Dark brown	7.5 YR 4/4	Loam	20.3	64.7	15.1
30-40	Strong brown	7.5 YR 5/6	Loam	21.1	64	14.9
40-50	Strong brown	7.5 YR 5/6	Loam	19.5	65.2	15.3
50-60	Strong brown	7.5 YR 5/8	Loam	16.8	69.9	13.3
60-80	Strong brown	7.5 YR 5/8	Loam	14	73.4	12.6
80-100	Reddish yellow	7.5 RY 6/6	Loam	14.8	70.6	14.6
100-120	Reddish yellow	7.5 RY 6/6	Loam	18.7	67.9	13.4

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	<1	3.9	37	460	4.4	1.28	0.13
10-20	<1	<1	<5	460	4.7	1.35	0.15
20-30	<1	<1	<5	350	7	0.65	0.15
30-40	<1	<1	<5	210	7.8	0.58	0.16
40-50	<1	<1	8	210	8.9	0.43	0.16
50-60	<1	3	<5	290	11	0.42	0.19
60-80	<1	9.3	<5	400	11	0.27	0.26
80-100	<1	15	<5	430	13	0.25	0.31
100-120	<1	13	<5	520	8.7	0.22	0.36

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.86	8.47	83	1.6	73	0.115	1.8
10-20	7.94	8.51	150	9	12	0.143	2.7
20-30	8.1	8.69	nd	16	nd	0.251	2.8
30-40	8.19	8.8	nd	36	nd	0.354	3.5
40-50	8.27	8.91	nd	45	nd	0.455	4.2
50-60	8.34	9.03	nd	45	nd	0.729	6.7
60-80	8.45	9.32	nd	33	nd	1.17	10
80-100	8.46	9.43	nd	23	nd	1.54	12
100-120	8.44	9.6	nd	9.1	nd	2.04	13

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.29	4.6	4.2	4.1	<0.02	23.3	2.22	1.37
10-20	0.27	7.7	1.8	0.51	<0.02	26.8	3.32	1.31
20-30	0.34	6.5	1.1	0.09	<0.02	24.6	5.2	1.15
30-40	0.39	6.3	1.1	0.09	<0.02	22.9	7.48	0.727
40-50	0.49	6.3	1.2	0.29	<0.02	21.5	8.96	0.659
50-60	0.58	5.5	1	0.43	<0.02	19.7	10.8	0.887
60-80	0.72	5.1	0.4	0.33	<0.02	17.1	13	1.11
80-100	0.49	4.7	<0.3	0.43	<0.02	16.8	12.1	1.16
100-120	0.74	4.7	<0.3	0.19	<0.02	16.4	11.1	1.35

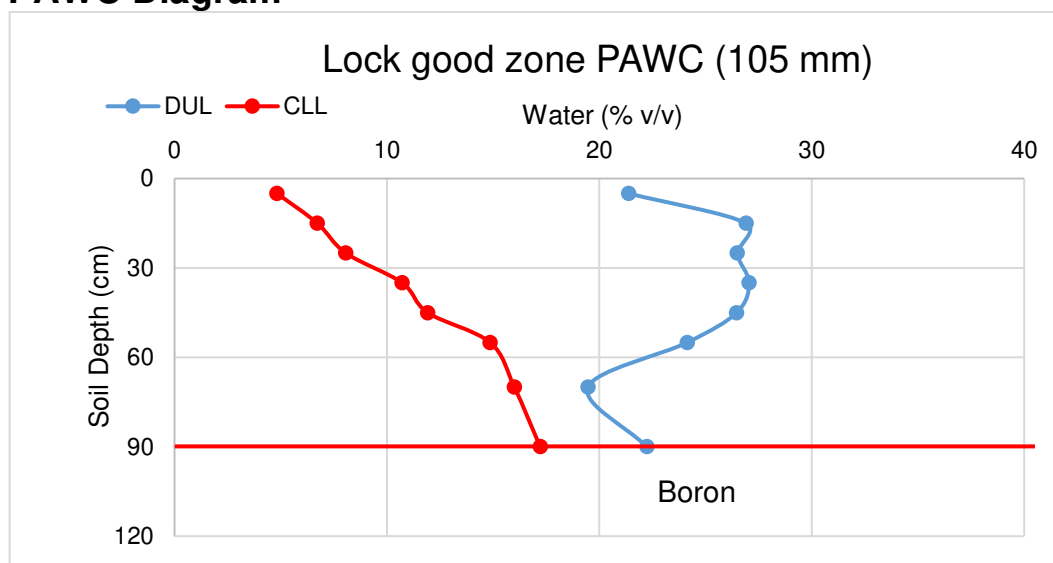


Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Polkinghorne, A	Lock	0-10	1.37	21.39	4.83	16.56	105.07 121.00	5.00
Polkinghorne, A	Lock	10-20	1.28	26.90	6.72	20.18		15.00
Polkinghorne, A	Lock	20-30	1.24	26.49	8.07	18.43		25.00
Polkinghorne, A	Lock	30-40	1.30	27.05	10.72	16.33		35.00
Polkinghorne, A	Lock	40-50	1.34	26.46	11.92	14.54		45.00
Polkinghorne, A	Lock	50-60	1.42	24.14	14.86	8.61		55.00
Polkinghorne, A	Lock	60-80	1.39	19.46	16.00	16.00		70.00
Polkinghorne, A	Lock	80-100	1.51	22.24	17.21	10.82		90.00

PAWC Diagram



13. Brimpton Lake, Moroney Field Log

Site/ Farmer	Location	GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Moroney 2021	Brimpton Lake	-34.042393	135.524644	Sandy loam over clay loam	30	6000 L	11 days	16 days

Set up date	Water Date	Sampling date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth - Wheat (cm)	Description
29 Sept	29 Sept 1000 L 1 Oct 1000 L 5 Oct 1000 L 6 Oct 1000 L 7 Oct 1000 L 10 Oct 1000 L	26 Oct	50	85	Brown sandy loam 0-10 cm, red clay loam with large calcrete rocks 10-30 cm, soft carbonate shale over clay with calcrete rock at 60 cm 30-120 cm.



Site photo with slope, 26 October 2021.



Soil profile, 26 October 2021.

Soil Chemistry

Depth (cm)	Colour	Colour Code	Texture	Clay (%)	Sand (%)	Silt (%)
0-10	Dusky red	2.5 YR 3/2	Sandy loam	10.6	82.1	7.3
10-20	Yellowish brown	10 YR 5/6	Sandy clay loam	20	73.4	6.6
20-30	Reddish yellow	5 YR 6/6	Sandy loam	12.7	76.5	10.8
30-40	Pink	7.5 YR 7/4	Loamy sand	8	80.2	11.8
40-50	Reddish yellow	7.5 YR 6/6	Clay loam	26.9	61.1	12
50-60	Reddish yellow	7.5 YR 7/6	Loam	21.3	65.5	13.2
60-80	Pink	7.5 YR 7/4	Loam	20.3	64	15.7
80-100	Brownish yellow	10 YR 6/6	Clay loam	28.5	51.4	20.1
100-120	Brownish yellow	10 YR 6/6	Clay	38.1	43.5	18.4

Depth (cm)	Ammonium Nitrogen (mg/kg)	Nitrate Nitrogen (mg/kg)	Phosphorus Colwell (mg/kg)	Potassium Colwell (mg/kg)	Sulphur (mg/kg)	Organic Carbon (%)	Conductivity (dS/m)
0-10	10	15	80	330	24	1.79	0.21
10-20	3.1	7.6	50	230	29	1.16	0.25
20-30	2.1	20	41	200	41	1.07	0.4
30-40	<1	42	19	120	50	0.56	0.63
40-50	1.6	6.3	12	120	120	0.94	0.99
50-60	1	11	9	140	100	0.85	0.93
60-80	<1	19	<5	300	54	0.34	0.66
80-100	<1	18	<5	430	51	0.21	0.67
100-120	<1	16	<5	530	56	0.16	0.72

Depth (cm)	pH Level (CaCl ₂)	pH Level (H ₂ O)	PBI	Calcium Carbonate (%)	DGTP (ug/L)	Exc. Sodium (meq/100g)	Boron Hot CaCl ₂ (mg/kg)
0-10	7.76	8.3	64	6.2	276	0.238	1.2
10-20	7.73	8.26	112	7.4	36	0.572	1.6
20-30	7.92	8.51	nd	43	nd	1.35	1.2
30-40	7.95	8.5	nd	72	nd	1.65	0.56
40-50	7.91	8.38	nd	38	nd	3.7	2.1
50-60	8.02	8.64	nd	57	nd	4.06	2.2
60-80	8.02	8.97	nd	58	nd	3.62	2
80-100	8.12	9.16	nd	50	nd	4.25	2.2
100-120	8.22	9.28	nd	42	nd	4.96	2.9

nd- no data

Depth (cm)	DTPA Copper (mg/kg)	DTPA Iron (mg/kg)	DTPA Manganese (mg/kg)	DTPA Zinc (mg/kg)	Exc. Aluminium (meq/100g)	Exc. Calcium (meq/100g)	Exc. Magnesium (meq/100g)	Exc. Potassium (meq/100g)
0-10	0.33	7	3.6	1.3	<0.02	22.9	1.17	0.908
10-20	0.26	13	2.1	0.56	<0.02	24.6	1.45	0.57
20-30	0.16	6.5	1	0.3	<0.02	22.4	1.94	0.51
30-40	0.08	3.1	<0.3	0.11	<0.02	22.2	1.63	0.319
40-50	0.12	21	1.7	0.29	<0.02	25.9	2.61	0.363
50-60	0.09	8.3	1.1	0.1	<0.02	23.9	3.06	0.396
60-80	<0.08	2.4	0.3	<0.08	<0.02	22.1	3.95	0.812
80-100	0.12	1.9	0.3	<0.08	<0.02	20.7	6.36	1.26
100-120	0.15	1.7	0.4	<0.08	<0.02	20.1	7.78	1.57



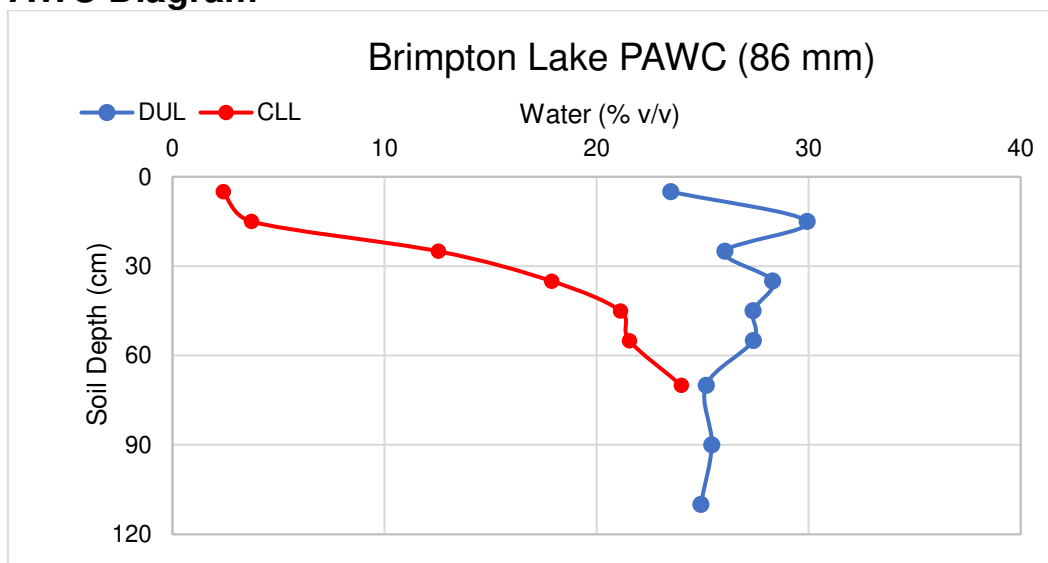
Photo: LHS (bottom tray) 0-10 cm, middle 10-20 cm, top 20-30 cm.
 Middle (bottom tray) 30-40 cm, middle 40-50 cm, top 50-60 cm.
 RHS (bottom tray) 60-80 cm, middle 80-100 cm, top 100-120 cm.

Bulk Density, DUL, CLL and PAWC

Farmer	Location	Sample Depth (cm)	Ave. Bulk Density (g/cc)	Ave. DUL Vol. (%)	Ave. CLL Vol. (%)	Ave. PAWC per Layer (mm)	Ave. PAWC Profile (mm)	Midpoint (cm)
Moroney, L	Brimpton Lake	0-10	1.19	23.50	2.39	21.10	86	5.00
Moroney, L	Brimpton Lake	10-20	1.43	29.92	3.72	26.20		15.00
Moroney, L	Brimpton Lake	20-30	1.27	26.05	12.54	13.52		25.00
Moroney, L	Brimpton Lake	30-40	1.17	28.30	17.87	10.43		35.00
Moroney, L	Brimpton Lake	40-50	1.24	27.39	21.12	6.27		45.00
Moroney, L	Brimpton Lake	50-60	1.17	27.39	21.55	5.84		55.00
Moroney, L	Brimpton Lake	60-80	1.18	25.17	24.00	2.35		70.00
Moroney, L	Brimpton Lake	80-100	1.22	25.43	nd	nd		90.00
Moroney, L	Brimpton Lake	100-120	1.29	24.91	nd	nd		110.00

nd- no data

PAWC Diagram



This project is funded by the Australian Government's NLP2 Smart Farming Partnerships program



Delivery Partners

