Resilient EP
2020 SARDI Soil Characterisations

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Information current as of 28 March 2021

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Australian Government | National Landcare Programme

Delivery Partners

AIR EP | Ag Innovation & Research Eyre Peninsula

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Background

Soil characterisations were undertaken by SARDI Minnipa Agricultural Centre staff in 2020 at eight 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), new and emerging 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 though 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, Crop Agronomy group between August to October 2020 at eight grower soil moisture probe sites. Amanda Cook was responsible for undertaking the soil characterisations along with Ian Richter, Neil King, Katrina Brands and Steve Jeffs. 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.

2020 sites which were soil characterised were:

- Rudall, Burton
- McEvoy Road, Heddle
- Wharminda, Hunt
- Port Kenny, Little
- Cootra, Matthews
- Mt Dutton, Morgan
- Lock, Polkinghorne
- Buckleboo, Schaefer

The sites were wet up and sampled according to the Burk and Dalgliesh protocols. The 1000L 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^{o}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 Phosphous Buffering Index and DGT P level to 30 cm depth were also analysed.

Soil Test Methodology
Extracted from CSBP Lab Methods, Updated May 2020.

Aluminium (CaCl2) Bromfield method (1987) Units of Measurement: mg/kg Soils are extracted using a 0.01M Calcium chloride solution in a ratio of 1:5. Colloidal material is separated from the extract through freezing and centrifugation, which is then analysed for aluminium using inductively couple plasma (ICP) spectroscopy. Bromfield, S.M. (1987). Simple tests for the assessment of aluminium and manganese levels in acid soils. Australian Journal Agriculture 27, 399-404.

Boron Rayment and Lyons Method 12C2 Units of Measurement: mg/kg Soils are extracted using 0.01M calcium chloride, at a ratio of 1:4. The mixture is heated to 90oC and the extract is read for boron using inductively coupled plasma (ICP) spectroscopy.

Calcium Carbonate Percentage Rayment and Lyons Method 19B2 Units of Measurement: % The carbonates in soil samples are neutralised using dilute hydrochloric acid. This reaction produces carbon dioxide and is performed in a closed vessel. The pressure increase within the vessel is thus proportional to the amount of carbonate in the closed system. This test cannot be performed on soil samples with high carbonate content due to the large amount of carbon dioxide produced.

Chloride Rayment and Lyons Method 5A2b Units of Measurement: mg/kg Water soluble chloride in soil is determined using a 1:5 soil:water extraction. Chloride concentration in the resulting extract is determined colourimetrically.

Exchangeable Cations in Water - Calcium, Magnesium, Sodium, Potassium Rayment and Lyons Method 5A4 (derivative of) Units of Measurement: meq/100g Water soluble exchangeable cations are determined using a 1:5 soil: water extraction. Exchangeable cations in the resulting extracts are determined using inductively couple plasma (ICP) spectroscopy.

Iron and Aluminium (Reactive, Oxalate) Rayment and Lyons Method 13A1 Units of Measurement: mg/kg Soils are extracted using Tamms reagent (oxalic acid/ammonium oxalate). The concentration of iron is determined using atomic absorption spectroscopy and aluminium is measured using inductively coupled plasma (ICP) spectroscopy. Tamm, O. (1922) Medd. Skogforsoksanst, 19,1-20

Nitrate Nitrogen and Ammonium Nitrogen Rayment and Lyons Method 7C2b Units of Measurement: mg/kg Soil nitrate nitrogen and ammonium nitrogen are extracted using 2M potassium chloride solution. After dilution of the resulting soil solution, ammonium nitrogen is measured colourimetrically. Nitrate nitrogen is reduced to nitrite through a copperised cadmium column and measured colourimetrically.

Organic Carbon (Walkley-Black) Rayment and Lyons Method 6A1 Units of Measurement: % The Walkley-Black method uses concentrated sulfuric acid and dichromate solution, which are added to soil samples. The chromic ions produced are proportional to the oxidised organic carbon and measured colourimetrically. The heat of the acid based reaction is used to induce oxidation of organic matter. Walkley, A. & Black, I.A. (1934). An Examination of the Degtjareff Method for Determining Soil Organic Matter, A Proposed Modification of the Chromic Acid Titration Method. Soil Science. 37(1):29-38

Particle Size (Wet Chemistry Method) "Pipette" method Units of Measurement: % Particle Size Fraction Physical Size Clay <2 µm Silt 2-20 µm Fine Sand 20-200 µm Coarse Sand 200-2000 µm

Prepared soil samples (<2 mm) are treated with hydrogen peroxide to remove organic matter and shaken with a 1:1 Calgon and sodium hydroxide solution to disperse soil particles. Using known particle sedimentation times, aliquots of solution are removed at set times and the remaining sample is sieved by size. Solution from aliquots taken are evaporated and weighed to determine the percentage of soil in the coarse sand, fine sand, silt and clay fractions. S.J. Indorante, L.R. Follmer, R.D. Hammer and P.G. Koenig 1990. Particle-Size Analysis by a modified Pipette procedure. Soil Sci. Soc. Am. J., Vol 54

pH (Water), pH (CaCl2) and Electrical Conductivity Rayment and Lyons Method 4A1 (pH water); 4B41 (pH CaCl2); 3A1 (Conductivity) Units of Measurement: pH; dS/m Soils are extracted in deionised water at a ratio of 1:5, stirring for one hour. Water pH and electrical conductivity of the extract are measured using a pH and conductivity electrode. Calcium chloride is added to the mixture to the equivalent of 0.1M and the calcium chloride pH is measured.

Phosphorus and Potassium (Colwell) Rayment and Lyons Method 9B and 18A1 Units of Measurement: mg/kg Measures plant available phosphorus and potassium. Using a soil to solution ratio of 1:100, soils are extracted with 0.5M sodium bicarbonate solution adjusted to pH 8.5 for 16 hours. The extract is then acidified and measured colourimetrically for Phosphorus. Potassium is determined using atomic absorption spectroscopy. Colwell, J.D. (1965). An automatic procedure for the determination of Phosphorus in sodium hydrogen carbonate extracts of soils. Chemistry Industry. pp. 893-895.

Phosphorus (DGT) Units of Measurement: ug/L Soil samples are taken to water holding capacity using deionised water, before a diffuse gradient thin-film (DGT) device containing a filter and two gels makes contact with the soil surface for a minimum of six hours. The second gel at the back of the device contains ferrihydrite, which traps phosphate. The devices are then pulled apart and the ferrihydrite gel containing the phosphate is digested using hydrochloric acid and the resulting extract analysis colourimetrically. Mason S (2012). DGT Commercial Protocol (2) – Deployment and analysis. The University of Adelaide

Phosphorus Buffering Index (PBI) Rayment and Lyons Method 9I2c Units of Measurement: Phosphorus buffering index Phosphorus buffering index is measured by the amount of phosphorus sorbed by the soil when the solution concentration of phosphorus is increased by 100 mg/mL. Soil is extracted using a calcium chloride and sodium dihydrogen phosphate solution and the phosphorus sorption is measured colourimetrically using an ammonium molybdate/ammonium metavanadate reagent. Phosphorus buffering index is then calculated using the phosphorus sorption measurement and measurement of Colwell phosphorus or Olsen. CSBP laboratory offers calculation of phosphorus buffering index using Colwell phosphorus measurement by default, but can also offer an Olsen phosphorus adjusted or unadjusted PBI result upon request. Allen, D.G. and Jeffrey, R.C. (1990). Methods for analysis of phosphorus. Western Australian Soil Report of Investigation No.37 Chemistry Centre WA, p. 37

Sulfur (KCl 40) Rayment and Lyons Method 10D1 Units of Measurement: mg/kg Plant available sulfur in soil is determined by extracting soil using a 0.25M potassium chloride solution. The sulfur content of extracts are then analysed by inductively coupled plasma spectroscopy. Also known as the Blair/Lefroy Extractable Sulfur method. Blair, G., Chinoim, N., Lefroy, R., Anderson, G. & Crocker, G. (1991). Aust J Soil Res 29: 619-626.

Texture (in-house method) Texture Code Texture Category 1.0 Sand 1.5 Sand/Loam 2.0 Loam 2.5 Loam/clay 3.0 Clay 3.5 Very heavy clay

Texture is assessed by wetting soil samples with deionised water. The texture category of the soil is determined by the technician based on the amount of stretch of the soil when rubbed against the fingers. Texture is a subjective physical characterisation of the soil.

Texture – Hand Bolus Texture - Hand Bolus is a measure of the behaviour of a small handful of soil when moist and kneaded into a ball and then pressed out between thumb and forefinger. The texture reflects the proportion of sand (2 – 0.02mm), silt (0.02 – 0.002 mm) and clay (<0.002mm) in soil. Texture Grades: Sand; Loamy Sand; Clayey Sand; Sandy Loam; Loam; Silty Loam; Sandy Clay Loam; Clay Loam; Silty Clay Loam; Sandy Clay; Light Clay; Medium Clay; Heavy Clay. McDonald, R.C, Isbell, R.F, Speight, J.G, Walker, J and Hopkins, M.S. (1998). Australian Soil and Land Survey Field Handbook (2nd ed.), Department of Primary Industries and Energy and CSIRO Australia.

Trace Elements (DTPA: Copper, Zinc, Manganese, Iron) Rayment and Lyons Method 12A1 Units of Measurement: mg/kg Soils are extracted with diethylene-triamine-penta-acetic acid (DTPA) solution (ratio of 1:2) for 2 hours and the concentration of copper, zinc, manganese and iron is measured using atomic absorption spectroscopy.

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 sight. 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 10-15mm. 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 20-25mm.

2.5 LOAM/CLAY	Not quite homogeneous powder. Compact-crumbly but not so hard.	Coherent and plastic. Smooth to manipulate, forming a ribbon 45-50mm.
3.0 CLAY	Fine homogeneous powder. Very compact. Forms very hard crumbs.	Plastic, smooth and easy to work. Forms a ribbon of 60-65mm.
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 80mm or more.

SOIL COLOUR DESCRIPTION CHART

Soils may be classified according to a single colour selected from the accompanying list.

Many soils however are a combination of more than one colour and better described say as *Gray-Yellow* or *Brown-Orange.* When deciding on a two colour combination the dominant colour should be placed first and qualified by the second; eg a brown-orange soil would be predominantly brown with a slight orange shade.

In addition to the above, the terms *Light* and *Dark* may be applied to colours in order to achieve a more accurate description. NOTE: It should be noted that the colour of a soil sample when wet can be quite different from it colour dry.

COLOUR	**ABBREVIATIONS**
BROWN	BR
GREY	GR OR GY
BLACK	BK
BROWN-GREY	BRGR
GREY-BROWN	GRBR
LIGHT BROWN	LTBR
DARK BROWN	DKBR
LIGHT GREY	LTGR
DARK GREY	DKGR
BROWN-YELLOW	BRYW

BROWN-RED	BRRD
BROWN-ORANGE	BROR
BROWN-BLACK	BRBK
BROWN-WHITE	BRWH
GREY-BLACK	GRBK
GREY-WHITE	GRWH
GREY-YELLOW	GRYW
GREY-PINK	GRPK
WHITE	WH
YELLOW	YW
YELLOW-BROWN	YWBR
YELLOW-GREY	YWGR
ORANGE	OR
RED	RD
PINK	PN OR PK

Crop Lower Limit (field)

Crop Lower Limit (CLL) soil samples were collected, however early October rainfall events resulted in horizontal soil water movement at some sites (eg Hunt and Burton) due to clay layers present in the profile. Larger rain out shelters will be used to cover a larger crop area in 2021. CLL will be resampled at the sites in 2021 or 2022 in cereal. Not having an accurate CLL in 2020 prevents an accurate calculation of overall Plant Available Water (PAWC) content of the soil profile. Thank you to Therese McBeath CSIRO, for help producing the PAWC graphs.

Buckleboo site covered with plastic to prevent evaporation for DUL and bulk density. Circular layout of dripper hose for wetting up soil profiles.


Sampling hole after bulk density sample taken using slide hammer and paring back soil samples to collect bulk density and DUL.


SARDI drill rig used to collect soil chemistry samples and rain out shelter to collect CLL soil samples.

1. Rudall, Burton.

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Burton	Rudall	-33.3628	136.10.4	Sand with clay horizon	120	4000L	4.5 weeks	7 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat	Description
Set up 2 Sept	8 Oct	2 Sept 1000L	10 Sept 1000L	15 Sept 1000L	1 Oct 1000L	120	70	Brown sand 0-10cm, red sandy loam 10-25cm, 25-40cm red clay loam with limestone nodules, 55-75cm light clay with gravel, 75-110cm light clay no gravel.

Site photo with slope, 8 October 2020.

Soil Profile, 8 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	BRGR	0	1.0	7.03	72.45	20.51	92.96	< 0.01
10-30	BR	5	3.0	28.21	47.82	20.07	67.89	3.90
30-60	GRPK	5	2.5	36.48	33.57	20.34	53.91	9.61
60-90	GRPK	5	2.5	33.21	39.00	18.29	57.29	9.50
90-120	GRPK	5	2.5	35.85	33.91	20.54	54.45	9.70
120-150	GRPK	5	2.5	40.59	27.03	20.10	47.13	12.28

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conducti -vity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	2	6	27	224	2.3	0.42	0.082
10-30	1	7	5	245	3.8	0.24	0.199
30-60	< 1	19	3	256	25.8	0.18	0.456
60-90	< 1	13	3	338	25.4	0.18	0.623
90-120	< 1	14	< 2	312	53.6	0.14	0.742
120-150	< 1	11	< 2	300	63.1	0.16	0.696

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	7.0	8.0	18.5	0.21	147.25	0.08	0.95
10-30	8.2	9.3	84.7	0.76	9.11	1.36	4.40
30-60	8.3	9.8		14.47		4.63	13.97
60-90	8.4	10.2		5.90		7.39	21.94
90-120	8.4	10.2		25.34		8.67	20.52
120-150	8.5	10.3		17.21		7.74	17.09

Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.45	10.90	2.14	1.08	0.030	3.82	0.94	0.50
10-30	0.47	19.40	0.41	0.38	0.040	9.48	5.10	0.61
30-60	1.42	16.40	1.05	0.35	0.040	11.26	9.44	0.69
60-90	1.24	10.70	0.64	0.35	0.030	7.50	8.30	0.80
90-120	0.91	8.60	0.53	0.29	0.020	6.83	6.20	0.78
120-150	0.90	7.70	0.59	0.17	0.030	7.05	6.40	0.73

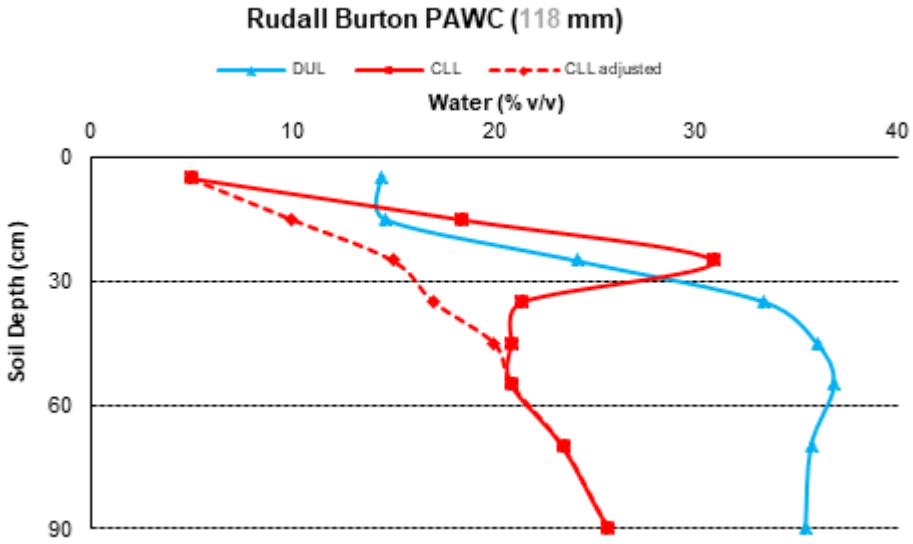
Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 cm, middle 90-120 cm, bottom 120-150 cm.

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)
Burton, J	Rudall	0-10	1.47	14.38	4.96	9.42	118	5
Burton, J	Rudall	10-20	1.67	14.66	18.38	4.66	Too wet	15
Burton, J	Rudall	20-30	1.72	24.13	30.87	3.13		25
Burton, J	Rudall	30-40	1.47	33.44	21.42	12.02		35
Burton, J	Rudall	40-50	1.43	36.02	20.88	15.15		45
Burton, J	Rudall	50-60	1.46	36.89	20.87	16.02		55
Burton, J	Rudall	60-80	1.50	35.74	23.41	24.64		70
Burton, J	Rudall	80-100	1.51	35.46	25.69	19.55		90
Burton, J	Rudall	100-120	1.47	35.25	28.46	13.58		110

PAWC Diagram - DRAFT

NOTE: The CLL and PAWC is not finalised for this site as profile was too wet at CLL sampling due to October rainfall events. Estimated CLL is the dotted line.



2. McEvoy Road, Heddle

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Heddle 2	Minnipa McEvoy Rd	-32.8794	135.13.01	Red loam	120	4000L	4 weeks	7 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat	Description
Set up 31 Aug	9 Oct	3 Sept 1000L	9 Sept 1000L	17 Sept 1000L	2 Oct 1000L	120	100	0-25 cm brown sandy loam graduating down profile with limestone nodules from 50-120 cm.

Site photo with slope, 9 October 2020.


Soil Profile, 9 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	GRBR	0	1.5	12.93	46.88	31.20	78.08	8.99
10-30	LTGR	5	2.5	16.08	31.62	39.97	71.59	12.33
30-60	GR	5	2.5	20.98	38.69	29.82	68.51	10.51
60-90	LTGR	5	2.5	21.87	32.45	35.19	67.64	10.48
90-120	LTGR	5	2.5	25.27	35.79	27.24	63.03	11.69
120-150	BRBK	5	2.5	27.49	42.02	20.65	62.67	9.84

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	2	7	21	548	7.0	1.50	0.134
10-30	< 1	9	4	519	8.7	0.93	0.209
30-60	1	24	3	405	41.4	0.47	0.665
60-90	< 1	20	3	487	145.3	0.31	1.234
90-120	< 1	18	< 2	460	159.5	0.18	1.305
120-150	< 1	7	< 2	431	24.1	0.17	0.617

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100 g	mg/kg
0-10	7.7	8.7	92.6	6.82	9.87	0.11	2.17
10-30	8.0	9.1	163.7	13.30	< 5.00	0.58	2.95
30-60	8.3	9.6		6.44		3.59	9.29
60-90	8.6	10.1		7.18		7.85	25.10
90-120	8.7	10.2		7.43		8.03	23.90
120-150	8.4	10.3		13.61		5.35	26.62

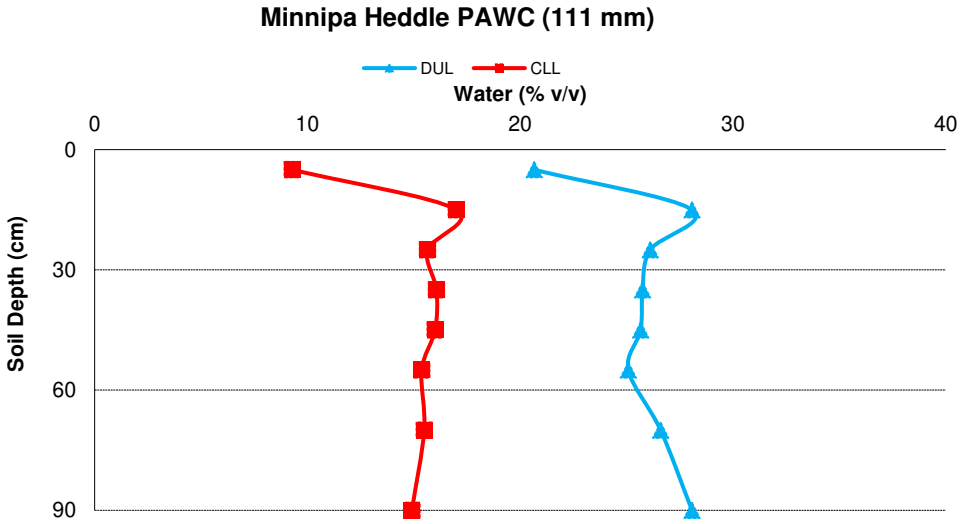
Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.44	5.90	5.29	1.05	0.010	16.14	1.48	1.31
10-30	0.43	6.60	2.61	0.33	0.020	16.81	2.77	1.24
30-60	0.60	6.40	1.88	0.38	0.010	10.96	5.50	0.96
60-90	0.70	5.50	0.72	0.43	0.010	6.92	4.44	1.17
90-120	0.58	5.20	0.57	0.36	0.010	5.95	3.58	1.09
120-150	0.48	5.00	0.54	0.15	0.020	4.96	2.55	0.99

Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 cm, middle 90-120 cm, bottom 120-150 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	McEvoy Rd	0-10	1.30	20.66	9.29	11.37	111	5
Heddle, B	McEvoy Rd	10-20	1.26	28.07	16.99	11.08		15
Heddle, B	McEvoy Rd	20-30	1.25	26.11	15.64	10.47		25
Heddle, B	McEvoy Rd	30-40	1.26	25.75	16.07	9.68		35
Heddle, B	McEvoy Rd	40-50	1.34	25.66	16.00	9.66		45
Heddle, B	McEvoy Rd	50-60	1.36	25.08	15.37	9.71		55
Heddle, B	McEvoy Rd	60-80	1.37	26.60	15.49	22.23		70
Heddle, B	McEvoy Rd	80-100	1.44	28.07	14.91	26.33		90
Heddle, B	McEvoy Rd	100-120	1.48	23.02		46.03		110

PAWC Diagram



3. Wharminda, Hunt

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Hunt	Wharminda	-34.0023	136.21.17	Sand with clay horizon	60	7000L	5 weeks	10 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Water Date	Water Date	Water Date
Set up 2 Sept. Not wet enough on 7 Oct in clay layer. Extra 3000L applied then drained for 7 days	Soil chemistry taken 7 Oct DUL and Bulk Density 26 October	2 Sept 1000L	10 Sept 1000L	1 Oct 1000L	8 Oct 1000L	12 Oct 1000L	14 Oct 1000L	16 Oct 1000L

Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat	Description
120	75	Sandy clay loam 0-11cm, sandy loam 11-23 cm. Sandy light clay with carbonate rubble at 30 cm, light clay 30-90 cm with light gravel layer below 90cm.

Site photo with slope, 7 October 2020.

Soil Profile, 7 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	LTBR	5	1.5	4.00	68.36	26.63	94.99	1.01
10-30	LTBR	5	3.0	15.73	57.16	25.14	82.30	1.97
30-60	LTBR	5	3.0	32.88	37.39	20.32	57.71	9.41
60-90	LTBR	5	3.0	27.14	44.55	18.00	62.55	10.31
90-120	BRGR	5	2.5	30.97	34.50	20.84	55.34	13.68
120-150	LTBR	5	1.5	42.79	35.22	16.28	51.50	5.71

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	1	12	23	92	5.8	0.72	0.103
10-30	1	5	8	231	3.7	0.33	0.227
30-60	1	8	4	610	37.6	0.25	0.944
60-90	< 1	6	3	667	168.7	0.20	1.750
90-120	< 1	4	2	640	107.7	0.23	1.335
120-150	< 1	5	< 2	730	13.6	0.13	0.656

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	7.1	8.0	13.0	0.17	119.92	0.22	0.85
10-30	8.3	9.7	44.1	0.42	36.43	1.39	2.55
30-60	8.6	9.9		10.66		8.58	14.04
60-90	8.3	9.5		13.36		12.94	15.10
90-120	8.5	9.9		14.35		11.82	16.04
120-150	8.4	10.2		9.46		8.93	20.54

Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.41	10.80	1.54	0.52	0.030	4.91	1.04	0.18
10-30	0.37	13.00	0.32	0.30	0.060	4.42	2.19	0.51
30-60	0.69	16.80	0.29	0.33	0.040	7.28	6.30	1.54
60-90	0.65	9.70	0.35	0.42	0.020	7.22	5.87	1.51
90-120	0.69	11.20	0.30	0.42	0.040	6.52	5.98	1.59
120-150	0.52	8.80	0.23	0.16	0.060	5.97	6.18	1.76

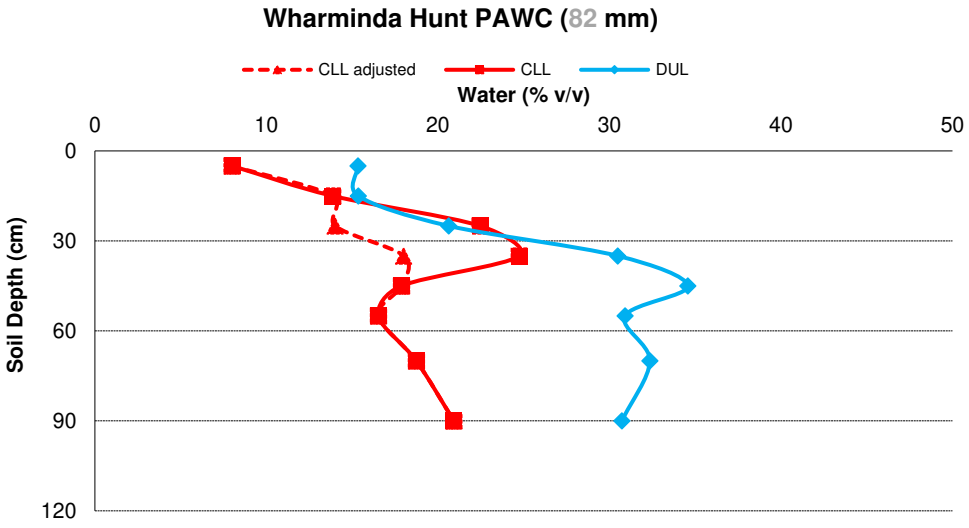
Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 cm, middle 90-120 cm, bottom 120-150 cm.

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)
Hunt, E	Wharminda	0-10	1.45	15.34	7.99	7.35	91	5
Hunt, E	Wharminda	10-20	1.65	15.35	13.86	1.50	Too wet	15
Hunt, E	Wharminda	20-30	1.65	20.63	22.45	-1.82		25
Hunt, E	Wharminda	30-40	1.52	30.48	24.74	5.74		35
Hunt, E	Wharminda	40-50	1.37	34.57	17.87	16.69		45
Hunt, E	Wharminda	50-60	1.41	30.91	16.53	14.37		55
Hunt, E	Wharminda	60-80	1.34	32.35	18.74	27.23		70
Hunt, E	Wharminda	80-100	1.44	30.73	20.93	19.59		90
Hunt, E	Wharminda	100-120	1.41	32.57		65.15		110

PAWC Diagram - DRAFT

NOTE: The CLL and PAWC is not finalised for this site as profile was too wet at CLL sampling due to October rainfall events. Estimated CLL is the dotted line.

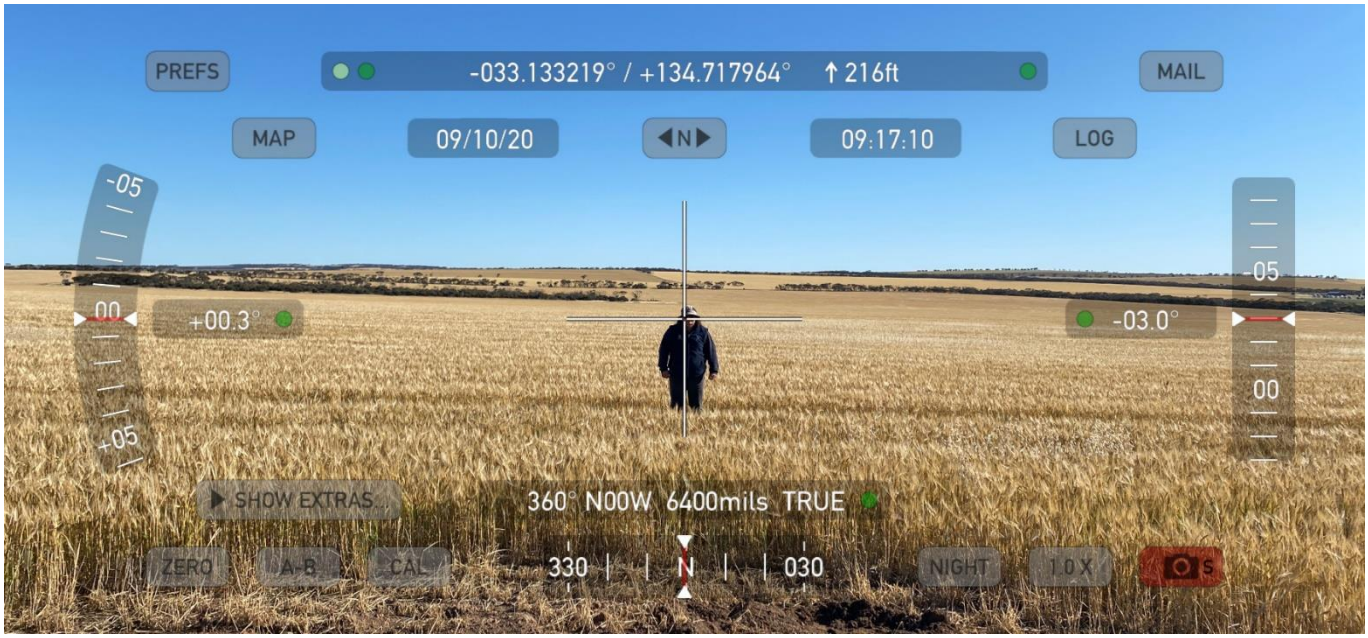


4. Port Kenny, Little

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Little	Port Kenny	-33.07986	134.43.076	Sandy loam	70	4000L	4 weeks	7 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) Barley	Description
Set up 3 Sept	9 Oct	3 Sept 1000L	9 Sept 1000L	17 Sept 1000L	2 Oct 1000L	110	Barley 60	0-12 cm brown loamy sand, 12-55 cm reddish brown loamy sand, 55-100 cm sandy clay loam with small limestone nodules (1-3 cm diameter). Limestone sheet 100-110 cm.



Site photo with slope, 9 October 2020.


Soil Profile, 9 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	GR	5	1.5	15.60	34.70	34.04	68.74	15.65
10-30	GRYW	0	2.5	13.17	35.89	33.65	69.54	17.29
30-60	LTGR	5	2.0	17.44	33.57	33.44	67.01	15.55
60-90	LTGR	5	2.5	19.20	32.04	35.29	67.33	13.47
90-120	LTGR	5	2.5	22.03	26.59	36.98	63.57	14.40
120-150	LTGR	5	2.5	13.82	30.60	37.75	68.35	17.83

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	4	17	57	804	6.5	2.27	0.218
10-30	2	7	4	488	14.2	0.90	0.341
30-60	< 1	9	6	554	66.9	0.58	1.279
60-90	< 1	15	3	562	94.8	0.45	1.479
90-120	< 1	9	5	496	92.7	0.38	1.121
120-150	< 1	13	2	531	115.0	0.44	1.486

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	7.7	8.7	181.9	20.86	14.42	0.52	4.09
10-30	8.0	9.3	278.3	11.96	< 5.00	2.15	8.64
30-60	8.6	10.0		9.09		8.91	31.24
60-90	8.5	10.2		44.20		10.83	34.08
90-120	8.5	10.3		48.24		9.80	32.42
120-150	8.5	10.2		3.33		10.86	30.85

Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.36	8.30	6.67	1.68	0.020	21.04	2.51	2.06
10-30	0.34	7.50	1.30	0.24	0.010	15.68	5.38	1.27
30-60	0.33	6.80	0.74	0.23	< 0.001	7.64	7.16	1.31
60-90	0.39	6.60	1.01	0.31	0.010	6.56	5.63	1.35
90-120	0.41	6.40	1.00	0.32	0.010	6.19	4.29	1.18
120-150	0.42	6.40	0.84	0.52	0.010	6.30	5.13	1.23

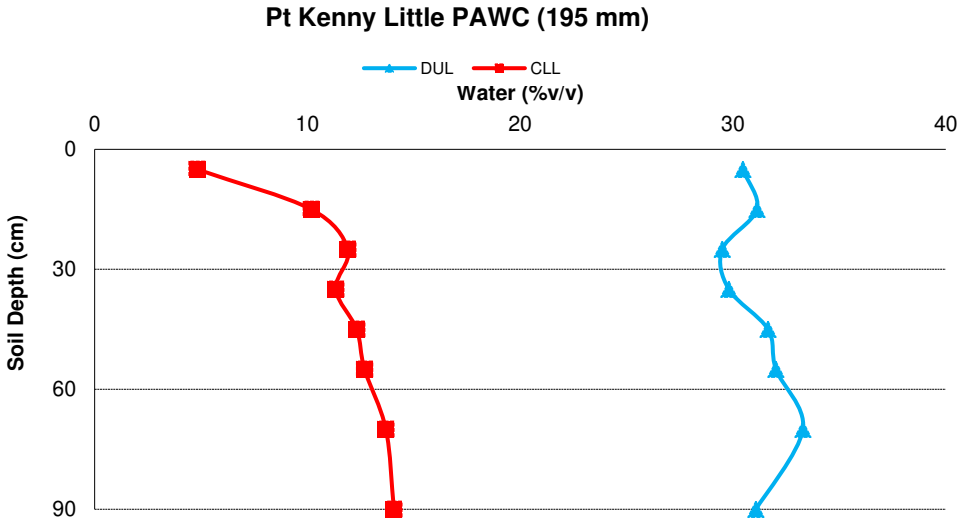
Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 cm, middle 90-120 cm, bottom 120-150 cm.

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)
Little, N	Port Kenny	0-10	0.99	30.47	4.81	25.65	195	5
Little, N	Port Kenny	10-20	1.12	31.12	10.18	20.95		15
Little, N	Port Kenny	20-30	1.14	29.49	11.90	17.59		25
Little, N	Port Kenny	30-40	1.22	29.80	11.33	18.47		35
Little, N	Port Kenny	40-50	1.28	31.65	12.31	19.33		45
Little, N	Port Kenny	50-60	1.32	32.02	12.68	19.34		55
Little, N	Port Kenny	60-80	1.40	33.28	13.69	39.19		70
Little, N	Port Kenny	80-100	1.44	31.07	14.06	34.02		90
Little, N	Port Kenny	100-120	1.42	27.59	Too dry (trees?)			

PAWC Diagram - DRAFT

NOTE: The CLL seems too dry for this site possibly due to tree line nearby, and hence PAWC is not finalised for this site.



5. Cootra, Matthews

Field Log

Site/ Farmer	Location	GPS Co-rdinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Matthews	Cootra	-33.275618	135.944818	Red Loam	120	5000L	4 weeks	3 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat
Set up 1 Sept	12 October	1 Sept 1000L	7 Sept 1000L	14 Sept 1000L	7 Oct 1000L	9 Oct 1000L	120	80

Description
0-30 cm Brown sand, 30-45 cm light red sand, 45-60 cm light sandy clay loam, 60-120 cm red sandy loam with limestone nodules

Site photo with slope, 12 October 2020.


Soil profile on 12 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	BRGR	0	1.0	5.00	83.03	11.97	95.00	< 0.01
10-30	LTBR	0	1.0	4.95	81.09	13.96	95.05	< 0.01
30-60	GRBK	0	1.5	11.51	67.97	20.52	88.49	< 0.01
60-90	LTBR	5	2.5	24.54	54.51	18.98	73.49	1.97
90-120	BRYW	0	2.5	26.00	50.17	19.97	70.14	3.86
120-150	LTBR	5	2.0	26.73	46.23	20.35	66.58	6.69

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	2	12	20	178	2.8	0.57	0.086
10-30	2	5	10	92	2.0	0.24	0.052
30-60	2	4	5	196	2.5	0.15	0.120
60-90	< 1	8	< 2	427	4.4	0.15	0.289
90-120	< 1	5	< 2	571	5.5	0.08	0.535
120-150	< 1	4	< 2	488	2.7	0.11	0.305

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	7.3	8.1	15.1	0.23	89.56	0.09	0.63
10-30	7.5	8.5	10.5	0.19	66.79	0.09	0.45
30-60	8.4	9.5		1.10		0.33	1.56
60-90	8.6	10.1		3.63		2.29	7.62
90-120	8.6	10.4		2.47		5.36	13.57
120-150	8.3	10.1		10.06		2.57	8.60

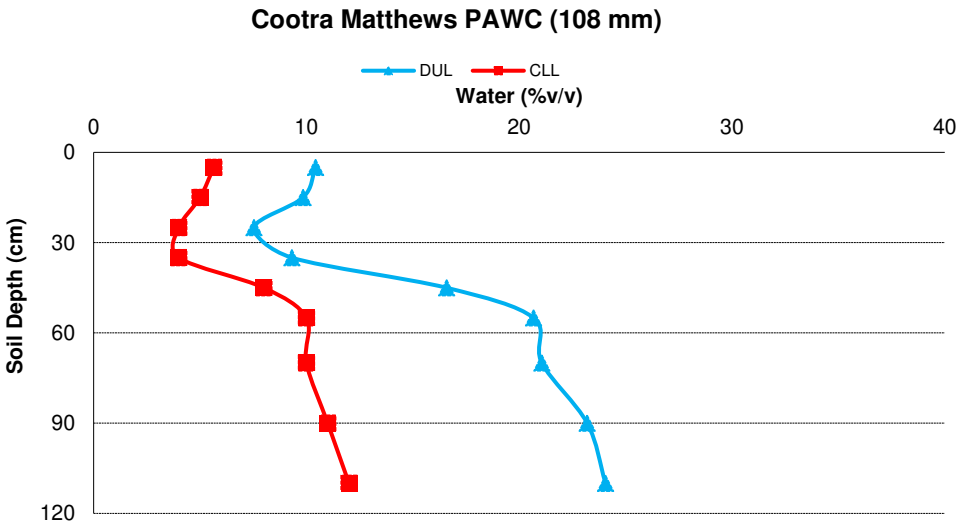
Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.35	14.60	2.71	1.22	0.030	2.99	0.69	0.30
10-30	0.23	7.00	1.09	0.37	0.050	2.35	0.48	0.17
30-60	0.45	7.20	0.60	0.27	0.040	5.51	1.86	0.43
60-90	0.65	9.30	0.64	0.33	0.030	7.52	4.35	1.01
90-120	0.61	9.10	0.43	0.16	0.050	4.94	4.14	1.22
120-150	0.71	8.20	0.49	0.18	0.040	7.54	5.05	1.05

Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 cm, middle 90-120 cm, bottom 120-150 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)
Matthews, T	Cootra	0-10	1.46	10.43	5.64	4.79	108	5
Matthews, T	Cootra	10-20	1.64	9.84	5.00	4.84		15
Matthews, T	Cootra	20-30	1.65	7.54	4.00	3.54		25
Matthews, T	Cootra	30-40	1.62	9.32	4.00	5.32		35
Matthews, T	Cootra	40-50	1.61	16.59	8.00	8.59		45
Matthews, T	Cootra	50-60	1.65	20.67	10.00	10.67		55
Matthews, T	Cootra	60-80	1.63	21.06	10.00	22.12		70
Matthews, T	Cootra	80-100	1.51	23.19	11.00	24.39		90
Matthews, T	Cootra	100-120	1.45	24.06	12.00	24.11		110

PAWC Diagram



6. Mount Dutton, Morgan

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Morgan	Mt Dutton	-33.9863	136.34.01	Loamy sand over clay	60	5000L	5 weeks - 1000L week	7 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat
Set up on 26 Aug	7 Oct	26 Aug 1000L	4 Sept 1000L	8 Sept 1000L	16 Sept 1000L	29 Sept 1000L	100	40

Description
Light clay to 15 cm, 15-30 brown clay with gravel at 23 cm to 40 cm. Gravel content/ironstone increasing to depth.

Site photo with slope, 7 October 2020.


Soil Profile, 7 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	GR	0	2.5	19.50	42.41	29.86	72.27	8.23
10-30	YWGR	5	2.5	40.14	24.36	27.66	52.02	7.84
30-60	GRYW	5	3.0	49.82	14.98	23.68	38.66	11.51
60-90	YWGR	5	3.0	37.27	11.04	36.22	47.26	15.47

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	5	7	43	257	11.6	1.30	0.080
10-30	3	5	8	294	22.2	0.61	0.093
30-60	2	5	5	272	15.4	0.50	0.083
60-90	2	4	3	222	34.9	0.30	0.115

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	5.6	6.3	62.6	0.21	38.71	0.15	0.99
10-30	6.3	7.1	184.0	0.22	< 5.0	0.41	1.86
30-60	6.6	7.5		0.24		0.44	1.97
60-90	7.1	7.9		0.23		0.58	2.29

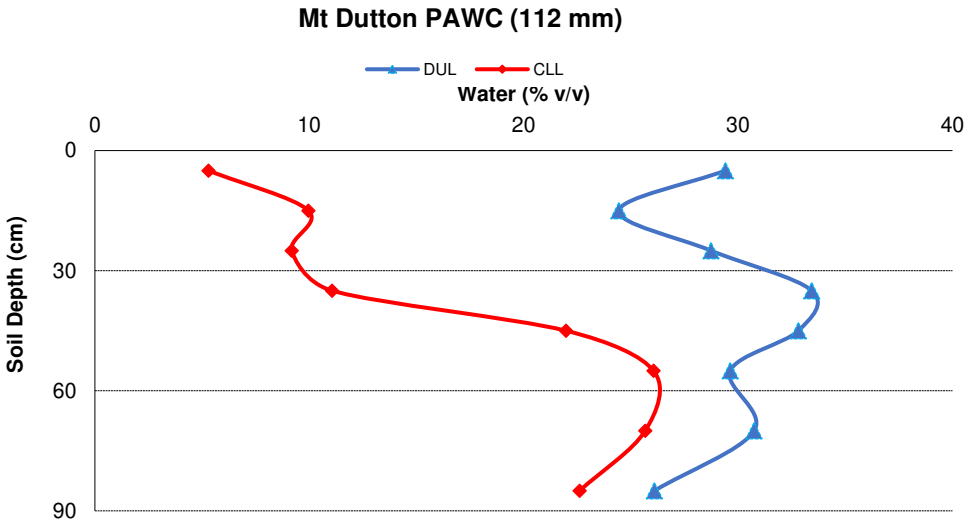
Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	1.27	52.70	8.99	2.50	0.020	5.87	0.82	0.52
10-30	0.29	13.30	1.94	0.29	0.040	6.58	3.61	0.70
30-60	0.29	10.10	1.05	0.43	0.060	7.07	4.31	0.70
60-90	0.22	5.40	0.20	0.29	0.060	6.31	5.71	0.55

Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 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)
Morgan, B	Mt Dutton	0-10	1.51	29.41	5.30	24.11	112	5
Morgan, B	Mt Dutton	10-20	1.71	24.44	9.96	14.48		15
Morgan, B	Mt Dutton	20-30	1.69	28.74	9.18	19.55		25
Morgan, B	Mt Dutton	30-40	1.28	33.43	11.06	22.38		35
Morgan, B	Mt Dutton	40-50	1.38	32.82	21.97	10.84		45
Morgan, B	Mt Dutton	50-60	1.38	29.63	26.05	3.58		55
Morgan, B	Mt Dutton	60-80	1.43	30.75	25.67	10.16		70
Morgan, B	Mt Dutton	80-100	1.36	26.09	22.61	6.97		85

PAWC Diagram



7. Lock, Polkinghorne

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of wateri ng	Drain -age time
Polkinghorne	Lock	-33.3926	135.40.0	Shallow red loam over shallow limestone	Shallow limestone sheet. Consulted with CSIRO, limestone is the limit of PAW to crop.	4000L	4 weeks	6 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat	Description
Set up 3 Sept	8 Oct	3 Sept 1000L	9 Sept 1000L	17 Sept 1000L	2 Oct 1000L	30	30	Brown sandy loam with limestone rubble from 20 cm, impenetrable limestone sheet from 35-40 cm.

Site photo with slope, 8 October 2020.


Soil Profile, 8 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	GRBR	5	1.5	11.29	66.20	20.44	86.64	2.06
10-30	LTBR	5	3.0	24.58	39.16	27.39	66.55	8.87
30-60	LTGR	5	2.5	22.90	27.79	39.72	67.51	9.58

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	3	8	27	366	3.3	1.16	0.127
10-30	1	5	16	223	3.9	0.63	0.160
30-60	2	8	6	124	10.3	0.68	0.232

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	7.3	8.2		0.38	135.86	0.12	0.96
10-30	7.8	8.6		6.10	9.87	0.22	2.04
30-60	7.9	8.8		22.50		0.42	3.39

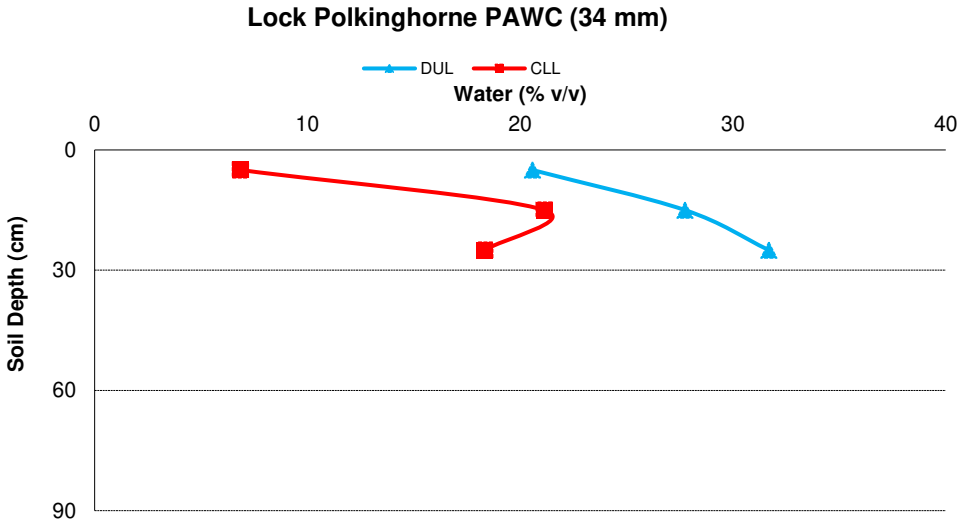
Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.43	8.70	4.25	3.03	0.030	8.97	1.40	0.80
10-30	0.50	20.90	0.75	0.49	0.040	18.10	2.46	0.62
30-60	0.75	18.60	0.77	0.82	0.030	19.68	3.19	0.38

Photo: Top tray 0-10 cm, middle 10-30 cm, bottom 30-45 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	Lock	0-10	1.44	20.57	6.85	13.72	34	5
Polkinghorne	Lock	10-20	1.49	27.74	21.12	6.62		15
Polkinghorne	Lock	20-30	1.27	31.69	18.33	13.35		25
Polkinghorne	Lock	30 - 45	1.24					

PAWC Diagram
NOTE: Impenetrable limestone sheet rock from 30-45 cm which limited soil characterisation and PAWC.



8. Buckleboo, Schaefer

Field Log

Site/ Farmer	Location	GPS Co-ordinates GPS South	GPS East	Soil type	Previous sampling depth (cm)	Amount water applied	Time of watering	Drainage time
Schaefer	Buckleboo	-33.333	136.4.900	Sandy loam (red)	90	4000L	5 weeks	7 days

Notes	Sampling date	Water Date	Water Date	Water Date	Water Date	Maximum Sampling Depth for BD and CLL (cm)	Root Depth (cm) - Wheat	Description
Set up 1 Sept	12 Oct	1 Sept 1000L	7 Sept 1000L	14 Sept 1000L	5 Oct 1000L	120	90	Reddish brown sandy loam graduating to light sandy loam. 60-80 cm layer with small calcrete nodules, 80-120 cm sandy loam.

Site photo with slope, 12 October 2020.


Soil Profile, 12 October 2020.

Soil Chemistry

Depth	Colour	Gravel	Texture	% Clay	% Coarse Sand	% Fine Sand	% Sand	% Silt
0-10	DKBR	0	1.5	11.88	69.69	17.43	87.12	0.99
10-30	BROR	0	2.5	14.81	59.05	21.19	80.24	4.95
30-60	BR	0	2.5	18.40	57.81	19.90	77.71	3.88
60-90	GRPK	5	2.5	23.81	43.56	25.00	68.56	7.63
90-120	GRPK	5	2.5	33.69	33.73	26.79	60.52	5.78
120-150	GRPK	5	2.5	24.40	45.22	17.67	62.89	12.71

Depth	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	dS/m
0-10	5	10	54	544	6.0	0.94	0.183
10-30	1	5	7	380	2.4	0.44	0.112
30-60	< 1	4	4	248	6.6	0.26	0.266
60-90	< 1	14	< 2	454	100.6	0.20	1.150
90-120	2	42	2	430	182.9	0.19	1.475
120-150	1	5	< 2	514	13.1	0.13	0.561

Depth	pH Level ($CaCl_2$)	pH Level (H_2O)	PBI	Calcium Carbonate	DGTP	Exc. Sodium	Boron Hot $CaCl_2$
				%	ug/L	meq/100g	mg/kg
0-10	7.2	7.8	38.6	0.29	13.66	0.12	1.09
10-30	8.1	9.2	60.6	2.50	224.67	0.21	1.73
30-60	8.4	9.6		7.86		1.41	4.09
60-90	8.6	10.1		18.58		8.09	16.11
90-120	8.6	9.9		13.22		9.07	19.10
120-150	8.5	10.4		14.21		5.75	24.66

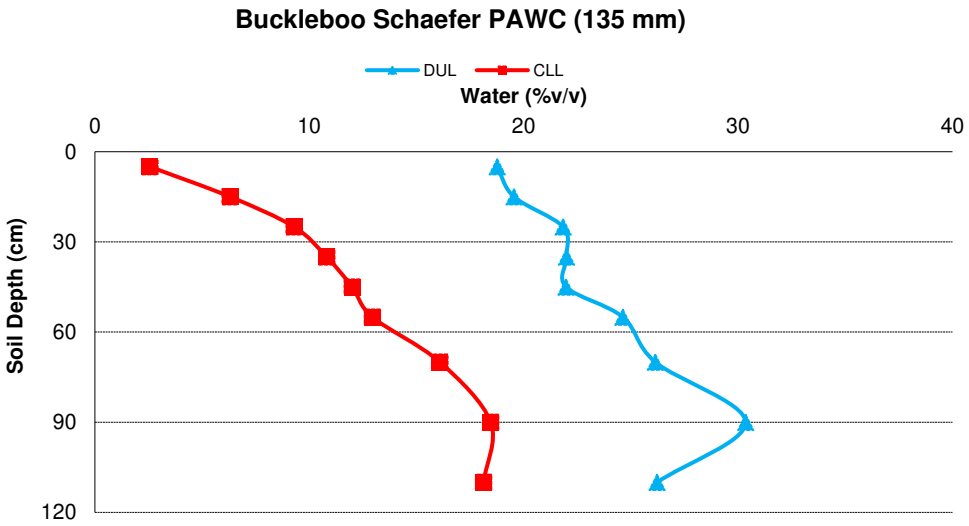
Depth	DTPA Copper	DTPA Iron	DTPA Manganese	DTPA Zinc	Exc. Aluminium	Exc. Calcium	Exc. Magnesium	Exc. Potassium
	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g
0-10	0.63	15.60	6.22	1.43	0.020	7.76	1.57	1.31
10-30	0.65	6.40	0.94	0.28	0.030	10.65	2.37	0.78
30-60	1.17	6.30	1.28	0.19	0.040	8.99	4.57	0.49
60-90	1.59	6.30	0.60	0.20	0.020	7.31	4.74	0.95
90-120	1.14	5.90	1.55	1.52	0.080	6.72	4.91	1.06
120-150	1.16	6.20	0.37	0.12	0.020	6.36	3.92	1.14

Photo: LHS (top tray) 0-10 cm, middle 10-30 cm, bottom 30-60 cm.
RHS (top tray) 60-90 cm, middle 90-120 cm, bottom 120-150 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)
Schaefer, P	Buckleboo	0-10	1.46	18.77	2.57	16.20	135	19
Schaefer, P	Buckleboo	10-20	1.43	19.55	6.31	13.24		20
Schaefer, P	Buckleboo	20-30	1.52	21.84	9.29	12.55		22
Schaefer, P	Buckleboo	30-40	1.45	22.00	10.81	11.18		22
Schaefer, P	Buckleboo	40-50	1.43	21.97	12.00	9.97		22
Schaefer, P	Buckleboo	50-60	1.36	24.62	12.94	11.68		25
Schaefer, P	Buckleboo	60-80	1.36	26.14	16.09	20.09		26
Schaefer, P	Buckleboo	80-100	1.37	30.35	18.46	23.78		30
Schaefer, P	Buckleboo	100-120	1.42	26.22	18.13	16.18		26

PAWC Diagram



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