

FINAL REPORT

RAI00003

Plant Available Water (PAW) Information and Tools for better crop management decisions for Albany and Esperance RCSN Zone consultants and farmers

PROJECT DETAILS

PROJECT CODE: RAI00003

PROJECT TITLE: PLANT AVAILABLE WATER (PAW) INFORMATION AND TOOLS FOR BETTER CROP MANAGEMENT DECISIONS FOR ALBANY AND ESPERANCE RCSN ZONE CONSULTANTS AND FARMERS

START DATE: 01.01.2013

END DATE: 24.05.2013

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Summary

In August 2012, both the Albany and Esperance Port Zone Regional Cropping Solutions Network (RCSN) members ranked water use efficiency and soil knowledge highly as an issue in their respective zones. Consequently, they allocated funds towards this combined project.

Numerous soil tools and models exist but many of these regions' complex soils are not covered by these systems – this is slowing adoption of new technologies in these areas. This project aimed to address this under-representation by identifying gaps in soil descriptions for the regions. Yield Prophet[®] (YP) sites were implemented, creating a forecasting model for the majority of the region's growers to use.

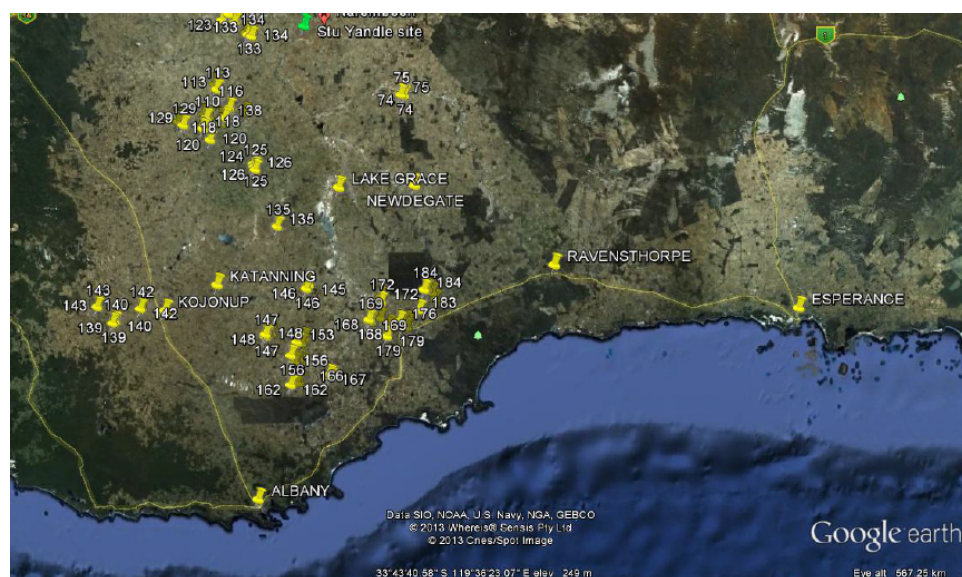


Figure 1: Numbered yellow pins above are current Focus Paddock sites which DAFWA plans to link (in the future) to YP - note the gaps in the eastern and southern areas.

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Recommendations

Precision Agronomics Australia (PAA) is currently engaged in a complementary project (also with the assistance of the GRDC RCSN) whereby additional probes and YP sites have been established. This is closing the last of the 'soil type' gaps. As outlined above, possible improvements include:

- Localised weather, especially rainfall, but potentially radiation and temperature.
- Adjust APSOils: Soil hydraulic characteristics, toxicity and texture from moisture probe and laboratory samples.
- Adjust YP for non-wetting sands and waterlogging.

Outcomes

Background

Numerous soil tools and models exist. The Department of Agriculture and Food WA's (DAFWA's) website mentions NP Decide, PYCal, SYN, WA Wheat and MySoil – to name a few. There are many others apart from these, including YP(which gathers information from many of the models above). These tools are sound but are under-used.

YP is one tool that can assist growers in making management decisions based on modelling soil water capacity, soil fertility status, and crop requirements, as well as giving indications of potential yield. However, the system is based on APSOils soil characterisations and there are many inconsistencies within that system that create issues. There is also an absence of soil descriptions for many types in the Albany and Esperance regions.

This project also strived to provide information and tools on soil water measurement to advisers who can then extend the information out to growers - YP being one focus for this to happen.

Other benefits of this project were more weather stations, using existing on-farm research and value adding to existing soil moisture probes which have been installed privately.

Objectives

This project aimed to identify gaps in soil descriptions for the Esperance and Albany Zones. Key focus sites representing these gaps were identified and addressed with soil characterisations and installation of YP sites (complete with rain gauge, telemetry, APSOils characterisation and registered as YP sites.) This project will assist growers to make better informed decisions when it comes to addressing their soil constraints and crop management decisions.

This project also aimed to upskill growers and industry on the tools and models available to them and how to interpret the data generated from soil moisture probes. This will be achieved through extension activities and workshops.

Outcomes

Probes were installed and the data generated from these probes was loaded onto the PAA and South Eastern Premium Wheat Growers Association (SEPWA) websites for all to view:

http://www.precisionag.com.au/probes_and_prophets.php

Rainfall, soil moisture, and temperature can all be viewed at these links.

Extension activities were undertaken in Munglipup, North Ravensthorpe, Jerdacuttup/ Hopetoun, West Ravensthorpe, Lake King and Salmon Gums.

Due to seasonal constraints, the adviser workshops in this project were not delivered. They will, however, be delivered in another GRDC RCSN project run by PAA.

Achievements/Benefits

Methodology

A group meeting led by David Hall, DAFWA was arranged in Ravensthorpe February 20th 2013. Key stakeholders and industry members were invited from both zones to discuss the project. The focus was on what already exists and how to close the system gaps by using what is already available.

Workshop Outcomes: Ravensthorpe 20th February 2012 – David Hall (DAFWA)

Meeting Objectives

- Identify where current APSOils sites are and where there is information that has not been captured in the APSOils database including research sites and weather stations with soil water probes.

- Identify where gaps are in terms of :
 - Spatial distribution
 - Sites reflecting key soil types
 - Quality of information
- Select sites that are representative of the Esperance and Albany soil types and climates for further investment (soil probes, weather stations).

Results

1. There is a spatial file that lists current APSoil sites, existing weather stations with water probes and research sites that have crop upper and lower limits.
2. Suggested groups and soil types have been identified as requiring further soils or weather station and soil probe information for delivering YP (high priority). The actual locations would be best determined by the grower groups based on access to mobile coverage and extension value of the site.
 - a. West Arthur group (West of Hwy) - loamy gravel
 - b. Nyabing farming group - duplexes
 - c. FBG - Jerramungup - gravelly or sandy duplex
 - d. Lake King/Holt Rock Farming Group - alkaline sandy or loamy duplex
 - e. RAIN (Nth Ravy -Burrell) - alkaline sandy duplex
 - f. Jerdacuttup Topcrop group (?) - deep sandy gravel duplex
 - g. Cascade (Carmody?, Welke?) - alkaline sandy or loamy duplex
3. Suggested sites to fill gaps (lower priority). Some of these sites may already have information that is currently not in the APSoil database.
 - a. Kojonup (Webbs?) - sandy and gravelly duplexes (CSIRO)
 - b. West Arthur /Nyabing - sandy duplex (DAFWA)
 - c. Jerramungup - shallow sandy duplex
 - d. Jerramungup - Moort soils (Bakker and Hamilton)
 - e. Jerramungup - Red Loamy duplexes
 - f. Nt Ravensthorpe - Shallow domed clays
 - g. Salmons Gums - Deep circle valley loams
 - h. Beaumont - Alkaline sandy duplexes – calcareous (DAFWA Survey)

Recommendations

1. There is a need to harvest existing soils information not currently listed in APSoil that has been collected by CSIRO, DAFWA and advisers (PAA, farm and general) for the purpose of running Agricultural Productions System Simulator (APSIM) or YP. This may be achieved within the project GRDC is currently funding with Neil Dalgliesh and Yvette Oliver. These organisations have significant soils databases which either have the relevant data or could be used to generate the soils parameters required to run YP using Soil Water Express (<http://www.apsim.info/swe/Default.aspx>).
2. Provide funding to grower groups (i.e. the Ravensthorpe Agricultural Initiative Network (RAIN), SEPWA) to provide web based access to climate and soil water data currently held by individual growers. Registered members could view these sites for a fee. The fee could be used to maintain, upgrade or develop new sites. SEPWA is currently exploring this idea.
3. Develop a 'lucid' key to identify soil types that are similar to that at a YP site. The emphasis then becomes matching soils as opposed to assuming that the closest soil in the APSoil database is the most appropriate.
4. It is recommended that GRDC invest in climate stations and water probes and harvest existing soils information. Detailed characterising of further APSoil sites is seen as a lower priority.

5. Co-investment with growers in water probes with data made available through grower group sites.

Meeting attendees

Andy Duncan	RAIN
Jenny Chambers	RAIN
Elisa Spengler	RAIN
Quenten Knight	PAA,
Andrew Heinrich	Farm & General
Jeremy Lemon	DAFWA, Albany
Brendan Nicholas	DAFWA, Esperance
Steve Tunbridge	DAFWA, Katanning
David Hall	DAFWA, Esperance

Input was also sought and provided by

Ben Whisson
 Stuart Witham
 Dennis van Gool
 Paul Galloway
 Greg Warren
 Courtney Piesse
 Yvette Oliver

From this meeting the following sites were identified for probes:

Area	Host Name	Related Grower Group	Soil Type	Any existing data/weather stations?
Gnowangerup	Richard House; ALBANY ZONE	North Stirlings Pallinup	Duplex loam	Has CSBP probe, good records, hosted YP in 2012 weather station there already. Just coring and analysis required. CSBP Manager Albany is Wade Anning. ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis
Lake Grace (Holt Rock Group)	Landon Bristow-Boahm; ALBANY ZONE	LIFT	Deep sand over gravel	ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis, 80cm probe and weather station
Lake King/ Holt Rock	Anna-Lisa and Craig Newman; ESPERANCE ZONE	Lakes Grower Group/ RAIN	Alkaline sandy or loamy duplex	ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis, 80cm probe and weather station
Ravensthorpe	Lloyd Burrell; ESPERANCE ZONE	RAIN	Gravelly sand over clay	Non-wetting soil trial site, good yield maps, has EM38s of some of farm. 10km from a DAFWA Weather Station - it's on the same east-west bearing. ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis, 60cm probe and weather station

Jerdacuttup	Stott Redman; ESPERANCE ZONE	Jerdy Top Crop/ RAIN	Deep sandy gravel duplex	Good yield maps, has done some EM work, has experience with YP. 15kms from Hopetoun North weather station but would like one at his site. ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis, 80cm probe and weather station
Munglinup	Doc Fetherstone-Haugh; ESPERANCE ZONE	Munglinup Grower Group?	sand over gravel/ clay at bottom	Good yield maps, already has a soil probe on site funded and managed through CSBP. ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis
Cascade	Welke - 'Willost' property; ESPERANCE ZONE	SEPWA only	Loamy clay where DAFWA weather station is	Existing DAFWA weather station ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis, 60cm probe
Salmon Gums - North East	Andrew Longmire; ESPERANCE ZONE	North Mallee	Heavy red soils	Hostile subsoils at 60cm. COGGO probe going in. Has done EM38 mapping and header records. Soil coring, analysis and YP registration Covered by DAFWA YP Project. ACTION REQUIRED: Soil core and characterisation only
Salmon Gums	Rory Graham; ESPERANCE ZONE	North Mallee	Duplex	Under boron layer deeper than 60cm. Has done YP work in the past. ACTION REQUIRED: YP site registration and YP database set up; soil coring and analysis, 60cm probe and weather station
Beaumont	Gavin & Elaine Egan; ESPERANCE ZONE	SEPWA only	Alkaline sandy duplexes - calcareous	EM maps, variable rates etc. Soil coring, analysis and YP. ACTION REQUIRED: 80cm probe and weather station

PAA cored the sites and installed the probes and weather stations in May 2013.

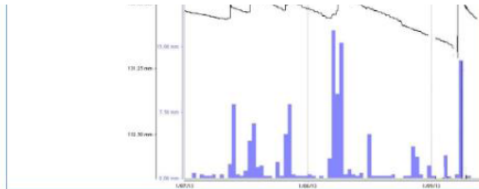
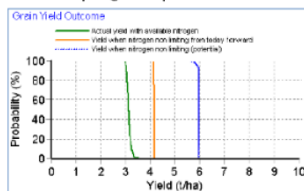
Below examples of information included in Field Day booklets and event handouts:



soil YP results

Depth	0 - 10	10-20	20 - 40	40 - 60
NO3N	18	2	3	2
NH4N	< 1	< 1	< 1	< 1
Col P	26			
Col K	55			
KCl S	19			
O C	1.2			
Cond	0.156	0.169	0.453	0.802
p H Ca Cl2	5.3	6.2	8	8.4
Cl	91	66	257	563
%Clay	10	24	40	38

- Accurate soil characterisation required for reliable Yield Prophet® results
- Incomplete characterisation of soil water profiles for major soil types across the South Coast region
- Soil moisture probes enable accurate, cost effective soil water with additional, ongoing benefits
- Soil moisture probe data and YP reports available at: www.precisionag.com.au/probes_and_prophets.php



2. Marginal rate of return (calculated as: \$ return as difference between 2 scenarios)

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Photo 1: Frank D'Emden (PAA) at Munglinup Field Day discussing the probe at Doc Fetherstonehaugh's



Photo 2: Bevan Tuckett talking about the probe installed at his property – North Ravensthorpe



Photo 3: Frank D'Emden (PAA) soil coring at Tuckett's – North Ravensthorpe

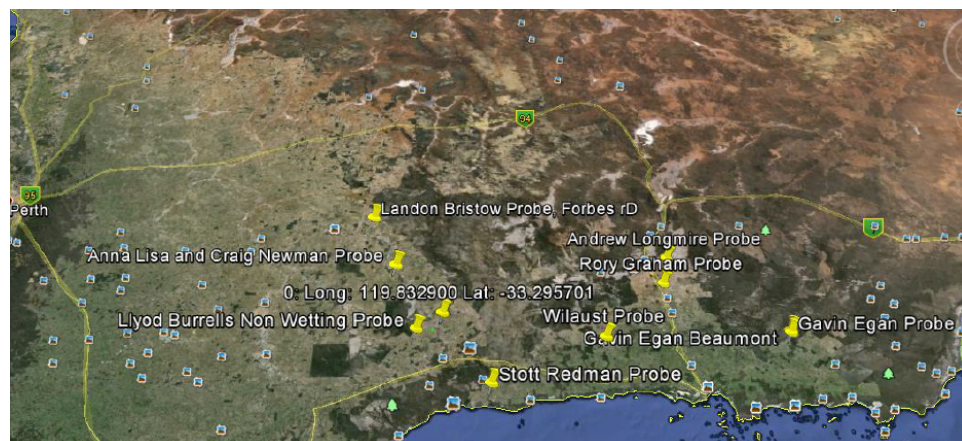


Photo 4: David Hall (DAFWA) discussing a soil core at West Ravensthorpe Spring Field Day

Discussion

Results

Probes were installed at the following locations:



The data from these probes was loaded onto the PAA and SEPWA websites for all to view:

http://www.precisionag.com.au/probes_and_prophets.php

Rainfall, soil moisture, and temperature can all be viewed at these links.

Extension activities on YP sites and soil monitoring tools were undertaken at the following field days:

- 20/06/2013 – Munglinup Field Day visiting the Soil Moisture Probe at Doc Fetherstonehaugh's – 36 attendees
- 26/06/2013 – Soil Monitoring Workshop – North Ravensthorpe visiting the site at Bevan and Karyn Tuckett's
- Included a soil core demonstration – 41 attendees
- 10/09/2013 – Jerdy Top Crop Spring Field Day – Jerdacuttup – visiting the site at Stott Redman's (Hopetoun) – 40 attendees
- 17/09/2013 – RAIN West Ravensthorpe Spring Field Day – discussing the probes and undertaking a soil core demonstration. – 80 attendees
- 24/09/2013 – Lakes Grower Group Spring Field Day – Lake King – visiting the probe at Craig and Anna-Lisa Newman's – 40 attendees
- 20/03/2014 – North Mallee Farm Improvement Group Crop Updates – Salmon Gums – 50 attendees

Due to seasonal constraints the adviser workshops in this project were not delivered. They will, however, be delivered in another GRDC RCSN project run by Precision Agronomics Australia.

Discussion of Results

Key findings:

- Calibration of soil moisture sensors (especially 10cm) is key to achieving reliable measurements
- The 2013 growing season was too wet for most soils to reach the crop lower limit; larger data time series required
- The high 2013 rainfall diluted soil toxicity, causing deeper root growth than expected
- Care has to be taken with inserting fertiliser applications applied before/during seeding
- Data have to be filtered for errors and missing data
- Possible improvements:
 - Localised weather, especially rain, but potentially radiation and temperature
 - Adjust APSOils: Soil hydraulic characteristics, toxicity and texture from moisture probe and laboratory samples
 - Adjust YP for non-wetting sands and waterlogging
- YP yield estimates (see Table below) are generally not far off. Deviations are mainly caused by missing rainfall, non-wetting sands and waterlogging. Landon Bristow and Craig and Anna-Lisa Newman's yield predictions show unexplainable results.

Grower Name	Paddock Name	Yield	YieldProphet	Comments
Bevan Tuckett	Adelong/15	4.2	3.6	(North)
		3.8	3.0	(South)
Landon Bristow	East Hyden	2.7	5.5	?
Doc Fetherstonhaugh	Munglinup	2.4	3.2	(Waterlogging)
Stott Redman	Hopetoun	3.9	3.9	
Lloyd Burrell	Mt Madden	2.4	3.2	(Non-wetting sands)
Craig and Anna-Lisa Newman	Varley	3.4	5.6	?
Rory Graham	Salmon Gums	2.4	2.0	(Missing rainfall)
Scott Welke	Cascade	4.0	1.3	(Missing rainfall)
Gavin and Elaine Egan	Beaumont	4.1	3.9	
Andrew Longmire	Salmon Gums	4.2	4.1	

Implications

This project has had a large impact on Albany and Esperance growers. The underrepresented soil types are now predominantly covered making the YP project more relevant to the area. Growers can access the information in the paddock on smart phones and tablets. This enables them to make better informed decisions when it comes to soil inputs and

management.