24. Improved Soil Water Data Decisions across the South East Cropping Region

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KEY MESSAGES

- Knowing how much water is available at any point in time, and where the crop is using water from is extremely valuable when making management decisions
- Potential water extraction depends not only crop type but also crop growth during the season
- Correct data interpretation is critical for success when using soil moisture data

Background

The project aims to provide grain growers across the south east (SE) region with access to real-time soil moisture data through a website that pulls together information from the existing MacKillop Farm Management Group (MFMG) network and the South East Natural Resource Management (SENRM) weather station network.

The availability of this information in an easy to use and access format will allow growers and advisors to make more informed decisions around crop management.

Activities

In 2018, the MFMG soil moisture probe network was expanded across the SE so that information around crop water use is being collected and collated at most of the locations where MFMG have cropping trials located (Figure 1). The SENRM weather station network has also been incorporated into the viewing platform with key indices being identified and easily displayed for use by farmers across the region (Figure 2).

In addition, MFMG have collaborated with SARDI to allow the inclusion of their moisture probe data being generated at the GRDC/SARDI Bilateral Agreement integrated farming system rotation trials in the medium rainfall zone sites in the south east. These probes highlight the water use of different crop and pasture species at the same location under different crop rotations.

How to access to the platform was presented to growers and industry at Field Days throughout 2018, and an agronomists training day was held in February 2019 to upskill agronomists in the use of the platform to allow them to use the data to make more informed decisions for their clients. This will be followed up with farmer training sessions throughout 2019.

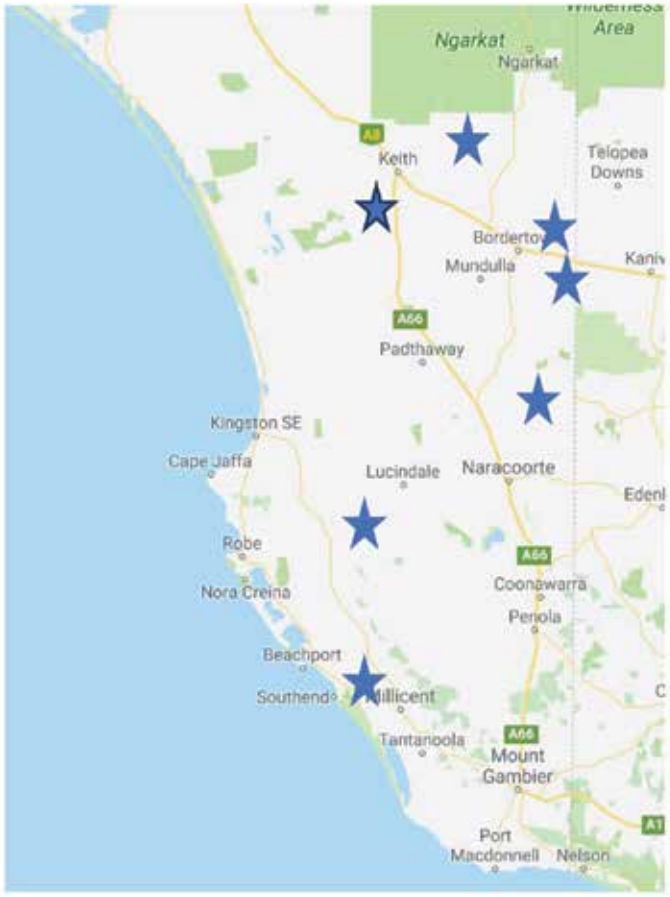

Figure 1: Location of MFMG Soil Moisture Probe Sites

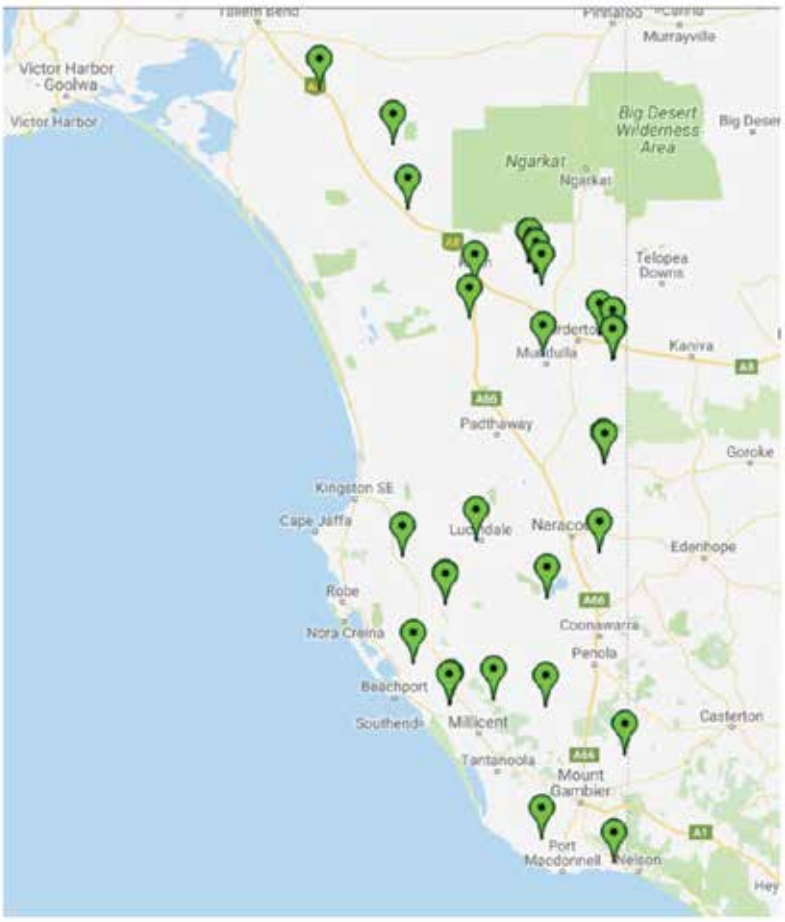

Figure 2: Location of weather station data (MFMG and SENRM)

Results & Discussion

Soil Moisture Probe network

Understanding how full your 'bucket' is, what the rooting depth of the crop is and how effective the rainfall has been at pushing moisture to depth are all important factors when growing a crop and are very difficult to determine without the assistance of soil moisture probes. The first step however is the most important one which is often missed. That is simply explaining to growers and advisors exactly what they are seeing when looking at soil moisture probe data.

The graphs are displayed as either summed (total moisture from all of the sensors) or stacked (shows different soil moisture levels at different depths). The summed graph gives a snapshot of the total amount of moisture that is present. The stacked will show where the moisture is located, and where the crop is pulling moisture from at any point in time.

How full is the bucket at seeding?

Figure 3 shows three summed graphs from three different seasons, and the initial soil moisture levels in each season at the traditional Anzac break. Even though all three seasons had different summer conditions, initial soil moisture levels at seeding do not vary greatly. This information is critical in some environments where seeding decisions are based on how much fuel is in the tank (or water is in the soil).

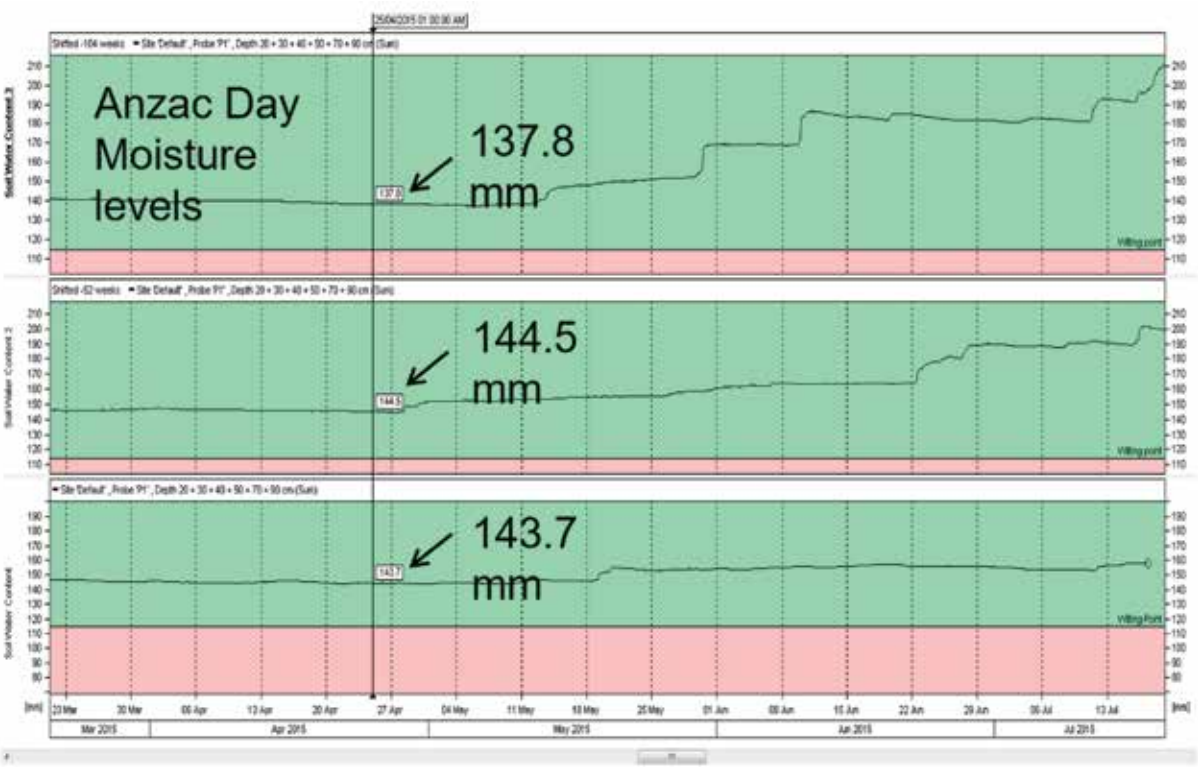

Figure 3: Sherwood 2013-15 soil moisture levels at sowing

What is the rooting depth of my crop?

The stacked graph (Figure 4) shows the depth at which water is being used. In this graph the 'stepping' which shows the diurnal pattern of plant water use where water is being used during the day (step down) and not at night (step across) at 20, 30, 40 and 50cms. The rainfall event on July 6-8 was 11.4mm – this pushed water as far down as 70cm, and the rainfall event (13.5mm) on July 19 pushed water down to the 90cm sensor. After these rainfall events, it can be seen where the majority of the stepping is occurring in the 20cm sensor, and not as much at depth.

Figure 4: Stacked moisture at Sherwood, June-July 2017.

When looking at soil moisture data and how much is left in the bucket, it is important to know the crop that is being grown currently and where it's ability to extract moisture from the soil sits compared to other crops. Figure 5 shows the same site where there have been dry finishes and it has been assumed that the plant has extracted all available moisture. The extraction levels of the three crops in the rotation; oats, beans and wheat are shown. It can be seen that there is quite a large difference in the amount of water being extracted by the various crops. This potentially has large impacts on seeding the following year as the amount of initial soil moisture can vary greatly.

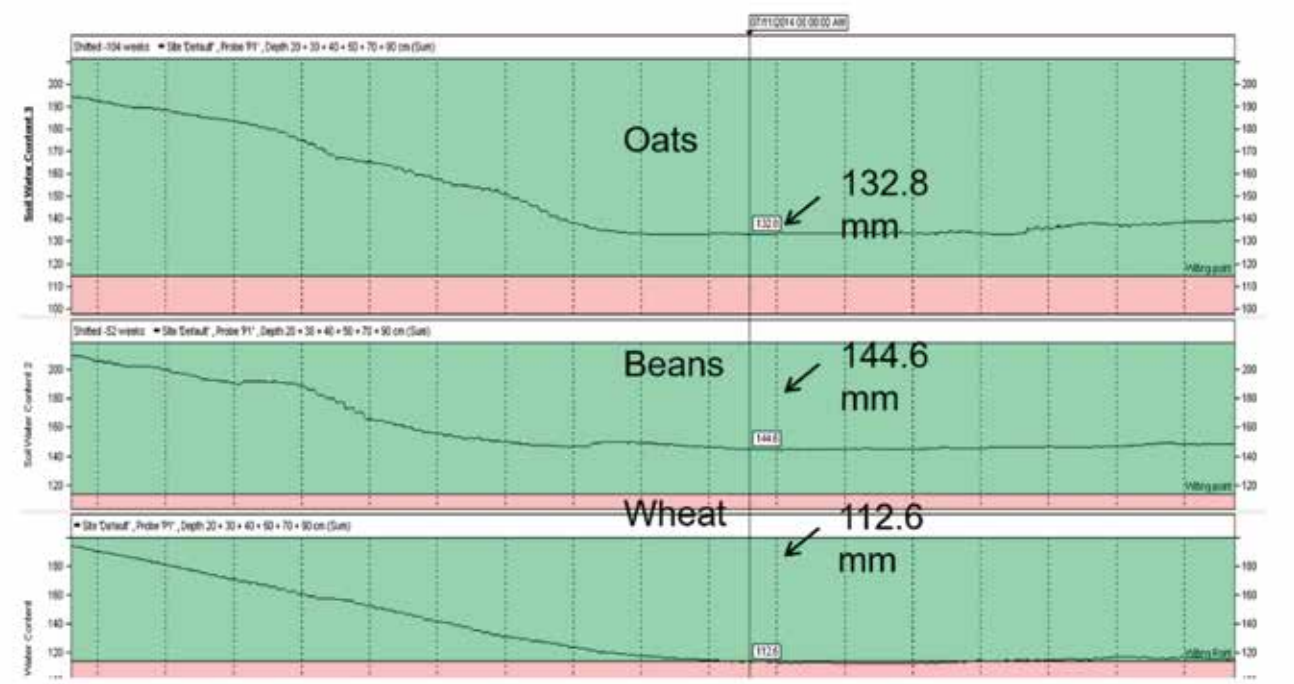

Figure 5: Differences in soil water extraction levels across a rotation.

The probes at Millicent and Conmurra are also providing information around the movement and height of the water table throughout the season, however the impact that this has on crop growth is yet to be determined.

Weather station network

The weather station platform has been updated to a dashboard view which contains a quick snapshot of current weather conditions, including current wind speed and direction, temperature and humidity (Figure 6).

It also calculates useful derivatives of the weather data which is becoming critical in current agricultural practices, including the Delta T and the Fire Danger Index (FDI) across a range of MFMG, SENRM and SARDI weather station sites.

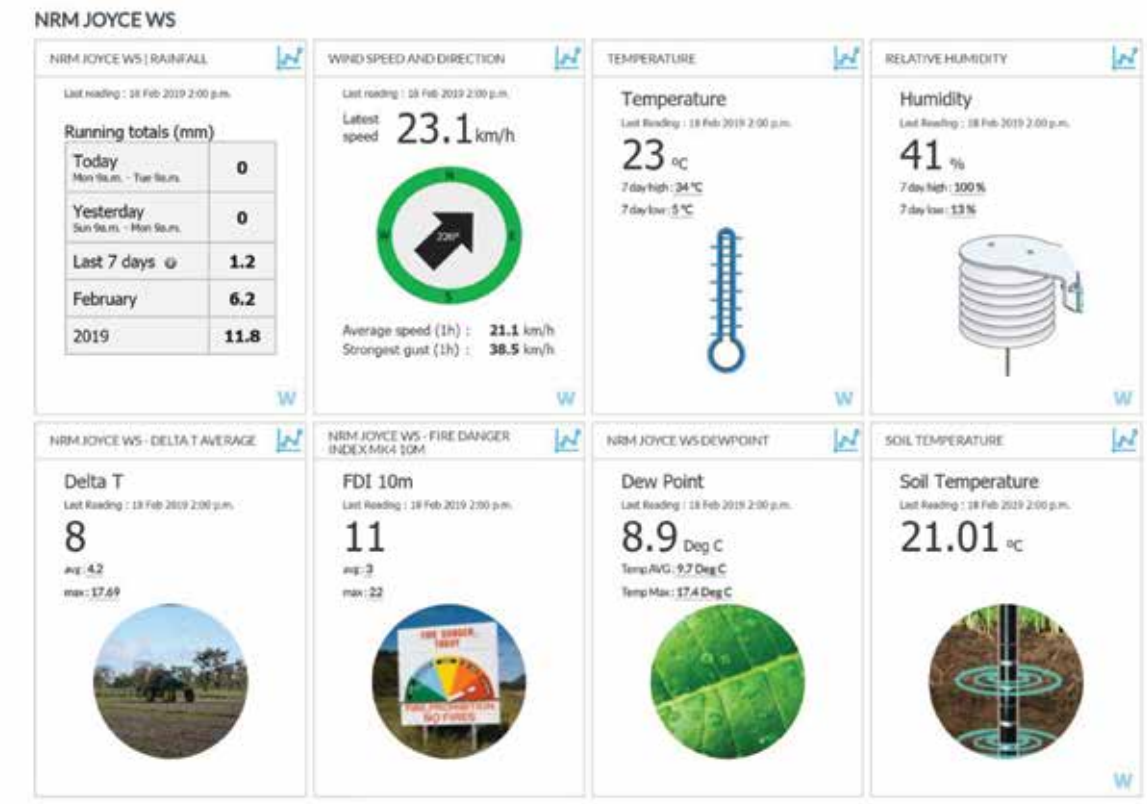

Figure 6: Dashboard display of weather station data.

From this dashboard, individual factors can be further investigated and historical data for each of the factors looked at further (Figure 7-8).

Figure 7: Weekly windspeed and direction

Figure 8: Weekly rainfall data

The easy to use dashboard will allow growers to utilise the data being generated more readily to make more informed decisions around management on their farms. It will also provide historical information to assist with record keeping on farm.

Conclusions

The soil moisture probe data can be very powerful in helping growers make more informed decisions. This power increases when data has been captured over multiple seasons and has captured multiple rotations.

Understanding individual crop growth, water use and their extraction limits, as well as the performance of various crops under different seasonal conditions can all contribute to improved management decisions from marketing through to fertiliser or fungicide applications, and the impact on subsequent crops based on how much water has been extracted.

Delta T, Dew Point and Fire Danger Index are all critical weather factors that can impact on management practices (eg. Delta T - do I spray today or not? Fire Danger Index – is it still safe to harvest? And the Dew Point – is my hay going to be ready to bale?

Although the weather station network can never replace individual on-site weather stations, they provide a snapshot for farmers about where things are at on a regional basis and the information can be used as a guide.

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