Using soil moisture data

Water Use Efficiency – factsheet

Interpreting soil moisture graphs

Summed soil moisture

A summed soil moisture graph displays the total amount of water in the soil by adding together moisture readings from multiple depths over time (Figure 1). Typically shown as a line graph, it helps track soil water availability, with the x-axis representing time and the y-axis showing total soil moisture (usually in millimetres or volumetric water content (% VWC)). This visualisation is useful for understanding irrigation needs, rainfall impacts, drainage, and crop stress risks. Rainfall is usually displayed on the graph as well on the second y-axis (as in Figure 1).

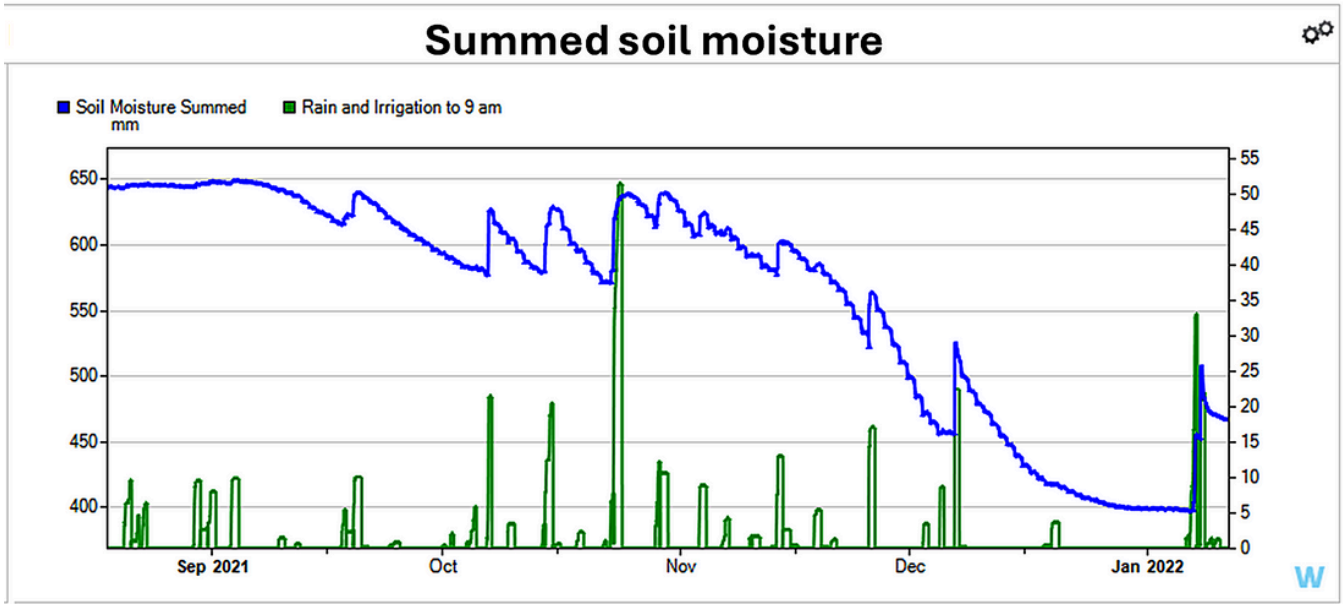

Figure 1 : Example of a summed soil moisture graph (Image source: Ag Logic).

Stacked soil moisture

A stacked soil moisture graph visually represents how water is distributed across different soil depths over time (Figure 2). Each soil layer (e.g. 0–10 cm, 10–20 cm) is shown as a coloured line stacked on top of the others, with the total height reflecting the overall soil moisture. This format allows users to not only see how much water is in the soil, but also where in the profile it is. This helps identify trends like surface drying, deep infiltration, or water retention at certain depths. It's especially useful for assessing irrigation effectiveness, rainfall penetration, and root-zone moisture availability.

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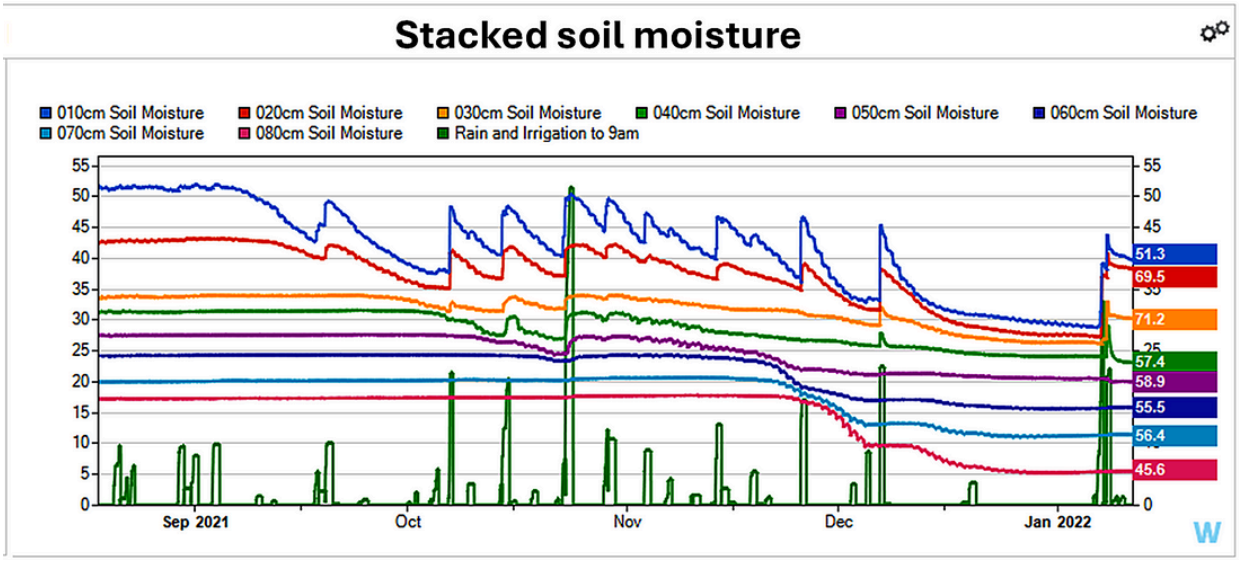

Figure 2 : Example of a stacked soil moisture graph (Image source: Ag Logic).

Full, refill and stress lines

On a soil moisture graph, the full, refill, and stress lines represent key thresholds for managing irrigation (Figure 3). The full line (or field water capacity (FWC)) marks the maximum amount of water the soil can hold after drainage, indicating no irrigation is needed.

The refill line is the point where irrigation should begin to maintain optimal plant health. Below this, water becomes limiting.

The stress line represents the level at which plants begin to suffer from water deficiency, leading to reduced growth or permanent wilting. Staying between the full and refill lines helps optimise crop performance, while avoiding moisture levels dropping below the stress line prevents crop damage.

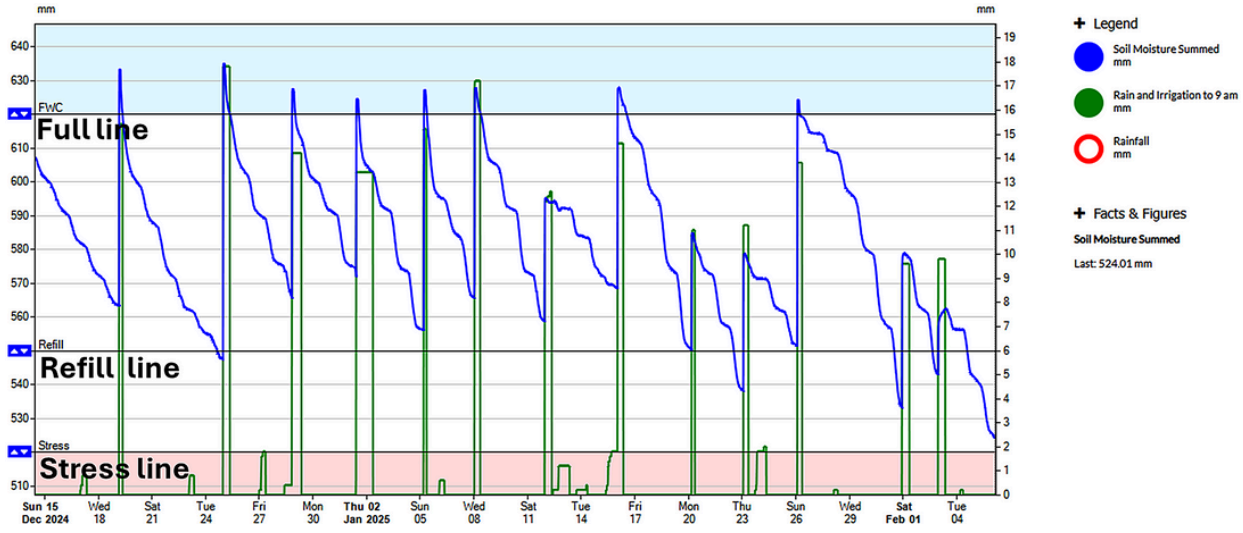

Figure 3: Irrigation scheduling from a summed soil moisture graph is often guided by water budget lines that tell you the full, refill and stress points for the soil (Image source: Ag Logic).

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Understanding soil moisture patterns

Diurnal stepping - plant water use

Diurnal stepping is the regular daily fluctuations in soil moisture, typically showing a decrease during the day due to plant water uptake and a slight recovery or stabilisation at night. This pattern indicates active plant water use and responsive soil conditions (Figure 4).

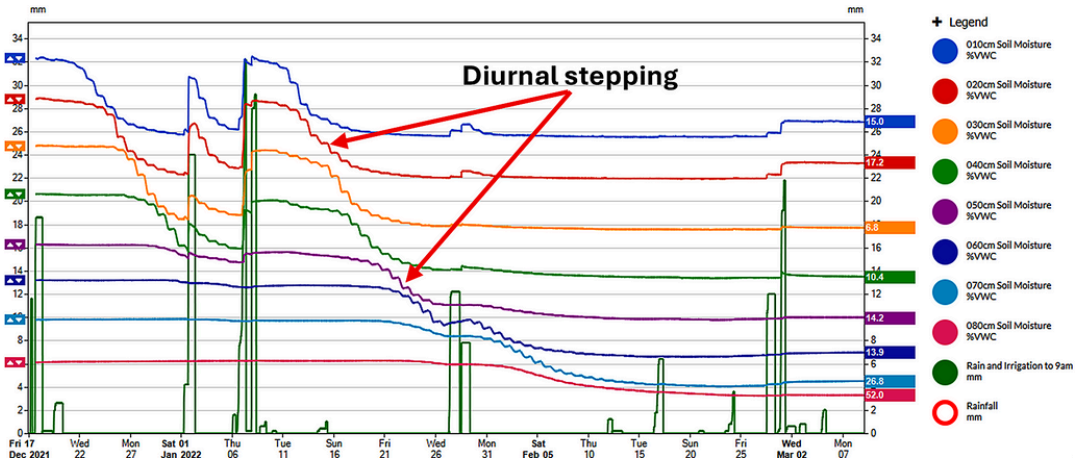

Figure 4: A stacked soil moisture graph illustrating diurnal stepping at different soil depths that indicates plant day/night water use (Image source: Ag Logic).

Cracking in soils

It is important to identify when a soil starts to exhibit cracking, as this will change how water moves through the profile. This can be seen in soil moisture data when water begins to bypass the upper sensors and is then recorded on sensors lower in the profile (Figure 5). Soil cracking can often be mistaken for a poor probe installation.

Soil cracking will reoccur as it goes through its seasonal wetting and drying cycle and this will be reflected in the data as in Figure 5. This is distinguished from poor probe installation which results in consistent abnormal spiking of soil moisture throughout the year.

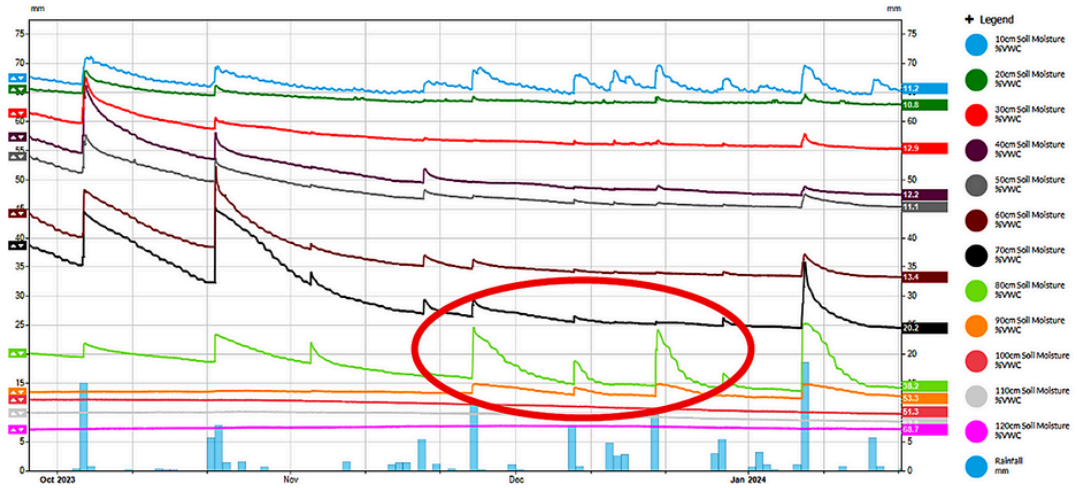

Figure 5: A stacked soil moisture graph indicating cracking and preferential flow of water down through the soil profile (Image source: Ag Logic).

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Saturation

Saturation of a soil can be identified by an increase in moisture followed by a plateau near the soil's maximum moisture capacity. This indicates that all pore spaces within the soil are filled with water. If the graph levels off at these values after rainfall or irrigation, the soil is likely saturated (Figure 6). Prolonged high moisture levels suggest poor soil drainage, while quick drops in moisture levels imply good soil drainage and that the saturation period was brief.

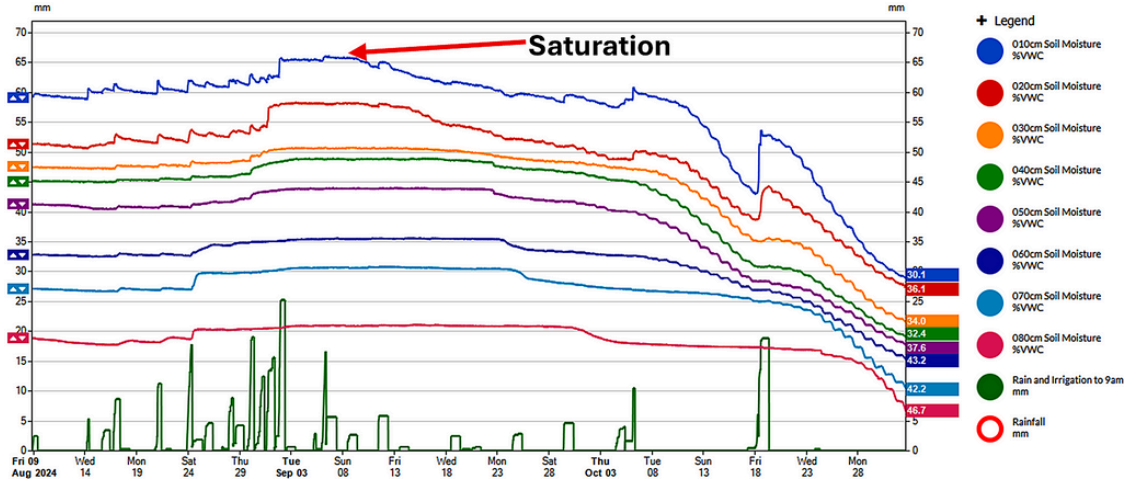

Figure 6: A stacked soil moisture graph showing data that indicates when a soil is at saturation point (Image source: Ag Logic).

Poor infiltration

To detect water infiltration issues in a soil, it is best to observe how moisture levels change across different soil depths after rainfall or irrigation. Poor infiltration is indicated when layers show little or no increase in moisture (Figure 7). This result suggests compaction, crusting, or hydrophobic soil conditions — particularly under irrigation with high instantaneous application rates. A healthy infiltration pattern shows a gradual rise in soil moisture from the surface down through to the deeper sensors. A useful exercise is to compare recent rainfall events and irrigation applications of similar amounts to see if they have similar soil moisture patterns.

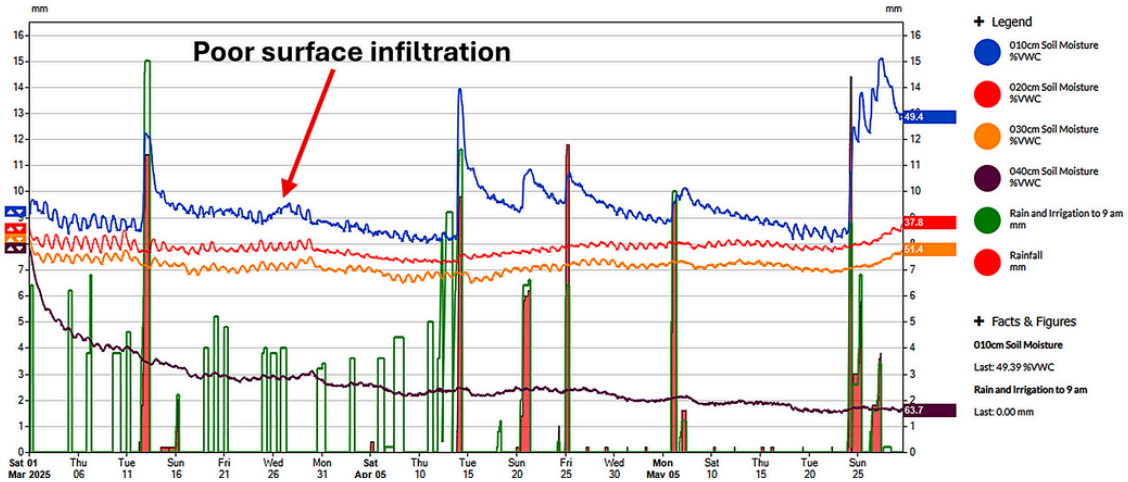

Figure 7: A stacked soil moisture graph showing a soil that is not responding to irrigation due to poor infiltration (Image source: Ag Logic).

For more resources to assist with optimising water use efficiency visit:

https://www.tasfarmhub.com.au/water-use-efficiency-project/

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