Harvest Electronics

How to use soil moisture readings for irrigation

(with examples for orchards and vineyards)

Soil acts much like a sponge. When you immerse a sponge in water and repeatedly squeeze it, it becomes saturated. If you remove it from the water it will drain rapidly then drip for a while. Gravitational forces act against capillary forces until equilibrium is reached and the sponge stops dripping. This equilibrium state is called **Field Capacity**.

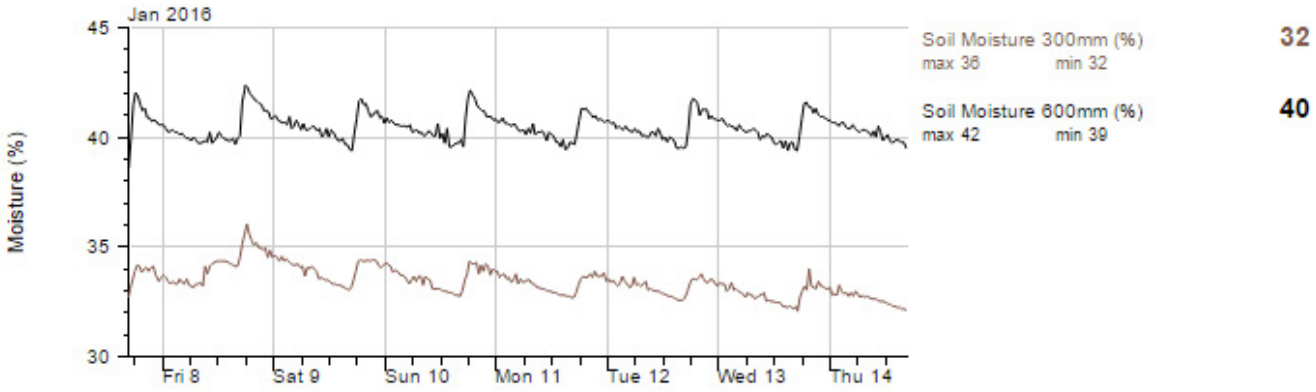
When soil is at Field Capacity and slightly below, conditions are excellent for plants. The addition of water above field capacity wastes water, causes leeching, and depletes the soil of valuable nutrients while also contaminating the groundwater with pesticides and fertilizers. It can also drive oxygen out of the soil and suffocate the roots.

As soil dries out from field capacity, a point is reached where plants have difficulty drawing water out of the soil and begin to experience stress. This lower limit is called the **Refill Point** or the **Stress Point**. This is the percentage of the available water in the soil that can be removed by plants before irrigation is required. This is also the point where irrigation water must be applied to keep the plants from experiencing stress.

If water is not applied the soil will eventually dry to the **Permanent Wilting Point**. This is the point at which the plant will eventually die. The proper moisture level for maximum growth is between Field Capacity and the Stress Point.

Probe Depth

Grape vines and kiwifruit have very deep roots but the plants draw most of their moisture from the soil zone going from the surface down to about 600mm, so it is best to place the probe halfway down that zone i.e. at 300mm depth. It is advisable to have at least two probes (one at 300mm and one at 600mm) to see irrigation effects. See the graph below as an example of this.



The Field Capacity and Permanent Wilting Point for various soil types is shown on the table below.

Texture	FC (v%)	PWP (v%)
Sand	10	5
Loamy sand	12	5
Sandy loam	18	8
Sandy clay loam	27	17
Loam	28	14
Sandy clay	36	25
Silt loam	31	11
Silt	30	6
Clay loam	36	22
Silty clay loam	38	22
Silty clay	41	27
Clay	42	30

Vineyards are often planted in stony free draining soils with low Field Capacity which can be difficult to determine, Viticulturists are often more interested in seeing that water from irrigation is getting to the roots and then adjusting irrigation to get the results they require for fruit size and taste.

The stress point is generally considered to be halfway between the field capacity and the wilting point.

Note: The Acclima sensors measure absolute volumetric water content without calibration if they have been correctly installed.