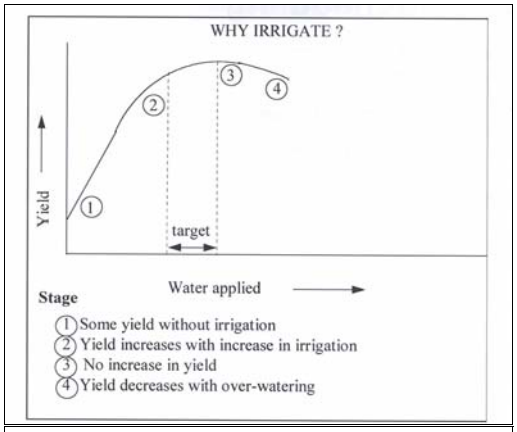
MALLEE WELLS IRRIGATION MANAGEMENT FACT SHEET

IRRIGATION SCHEDULING

Introduction[1]

With the need for efficient use of a limited water resource irrigators are increasingly being encouraged to match their water application with the crop's requirements and avoid wasting water. Measuring soil moisture content or tension is an essential part of this process, as knowing how much water the soil holds at any one time, helps the irrigator to determine how much more water to apply and when, to achieve the aim of matching the available water in the soil profile to the crop's requirements.



Source: Irrigated Crop Management Services

Maximising water use for production efficiency can be described by the graph above, which shows that there is an optimum level of watering. Both under and over-watering affects the crop yield.

The aim then is to find the points between (2) and (3) where the water you apply gives you the maximum return in yield. This is done through irrigation scheduling.

Irrigation scheduling brings together information about your soils, irrigation system and crop requirements. If you make decisions without knowledge of these aspects, you risk:

Over-irrigation

- Causing waterlogging
- Wasting water and increasing pumping and water costs
- Leaching nutrients out of the rootzone

Under-irrigation

- Stressing plants, reducing productivity
- Nutrient deficiencies
- Potential salinisation of crop rootzone

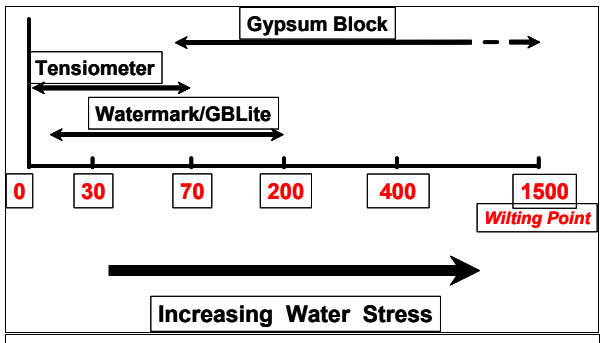
Determining how much water to apply and when involves knowing:

- Water holding capacity of your soil (the Readily Available Water or RAW value)
- How much water the soil is holding at present, which is where soil moisture monitoring is a vital tool
- How much water your irrigation system applies at a time

From this information you can calculate how much water you need to apply to refill the soil and how long you should run the irrigation system to do so.

Soil Moisture Monitoring Systems[2]

There are a wide range of different systems and products available, using a variety of different methods to measure soil water tension or content. The range of suction levels that the various 'tension' products can measure are illustrated.



Source: Improving Irrigation Efficiency Project

Irrigation management in vegetables for example, operates on a suction level of -20 kPa. When the soil is full (at field capacity) the suction required to extract water from the soil is between 0 and -8 kPa. As the soil dries, greater pressure is required and beyond the limits of suction that a crop's roots can apply, it will experience stress.

-20 kPa is relatively low and reflects the fact that vegetable roots are not as sturdy as the roots of tree or vine crops for example, that can exert pressures of -40 kPa and –60 kPa and greater respectively. Refer to page 2 for a list of acceptable suction levels for various crops.

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Choosing your system[2,3]

There are many factors that may influence your decision as to which system will best suit your needs. The table below gives a quick overview of what are perceived to be the advantages and disadvantages of the different types of soil moisture monitoring systems. Cost is often a contributing factor in the decision and is an aspect that has not been covered in much detail here.

Prior to installing or purchasing equipment, it is important that you have an understanding of your soils and irrigation system, as these will influence the type of system you require. Soil surveys and system evaluations should be carried out to ensure that you are able to select appropriate sites, frequency and depths to monitor soil moisture. It is advisable to show this information to the supplier of your system, as they will be able to provide you with advice on maximising your success with their product or service.

Monitoring System	Type	Ease of Use	Capital	Accuracy/ influence	Labour input	Ease of installation	Maintenance	Continuous Logging	Suitable soils
Shovel / Auger	Feel	Easy	Low	Arguable	High	N/A	Low	No	All
Tensiometer	Tension	Easy	Low	OK, small	High	Easy	High	No	Light Medium
Gypsum Blocks	Tension	Easy	Low	Good, small	Low - Moderate	Moderate	Moderate - High	Yes	All, with right product
Heat Dissipation—AquaSensor	Heat Dissipation	Easy	Moderate	OK, small	Low - Moderate	Easy - Moderate	Low	Yes to PC, raw data not seen	All
Neutron Probe	Neutron Scattering	Technician required	High	Excellent, large	High	Technician required	Moderate	Intrinsic	All
Permanent Capacitance - Enviroscan, C-Probe	Frequency Domain Reflectometry (Capacitance)	Easy	High	Good, small	Low but pay for installation	Technician required	Low	Yes	Not as good in sandy, rocky or shallow soils
Portable Capacitance - Diviner, Gopher	Frequency Domain Reflectometry (Capacitance)	Moderate	Moderate	Good, small	High	Technician required	Low	No	Not as good in sandy, rocky or shallow soils
Aquaflex	Time Domain Reflectometry	Easy	High	Good, large	Low - Moderate	Difficult, best in initial land preparation	Low	Yes	All
Gro-Point	Time Domain Reflectometry	Easy	Moderate	Good, large	Low - Moderate	Difficult, soil disturbance	Low	Yes	All

The products and companies mentioned on this fact sheet are examples only and are not endorsed in any way. Other tools with similar functions may also be available. Irrigators are advised to speak to an Irrigation consultant or the companies who sell the equipment, for more information on the best system to suit their requirements.

Acceptable suction levels for various crops[1]

-15 kPa or -20 kPa	vegetables and turf
-40 kPa	citrus
-60 kPa	perennial horticultural crops eg. vines and tree crops such as olives, pistachios and stone fruit
-200 kPa	vines or other crops under managed deficit irrigation

References: 1. **Mallee Water Resources Committee and PIRSA** (revised 2002) *Mallee Wells Irrigation Management Course Manual*
2. **Improving Irrigation Efficiency Project** Irrigation Scheduling Equipment workshop Presentation and Soil Moisture Monitoring Fact Sheet
3. **Charlesworth P** (2000) *Irrigation Insights - Soil Water Monitoring,* National Program for Irrigation Research and Development