IMPROVING IRRIGATION EFFICIENCY PROJECT

Irrigation Scheduling

Soil Moisture Monitoring Tools

Introduction

With water resources limited and quality of the resources diminishing water users need to use their water as efficiently as possible and reduce their impact on the natural resources. This means irrigators are under increasing pressure to manage water resources more efficiently. There are many methods farmers can use to manage and monitor their water application. Soil moisture monitoring is widely adopted with the range and choice for farmers is abundant.

Management and cultural practices of the enterprise influence the choice of devices as well as cost often been the deciding factor. Prior to installing or purchasing equipment an understanding of the soils and irrigation system applications is needed. Soil surveys and systems evaluations should be done to ensure uniform monitoring site selection as well as determining readily available water (RAW) to know how much water can be applied to the soil.

Tensiometers

Measures energy plants needs to exert to draw water from the soil. (e.g. Soilspec, ?)

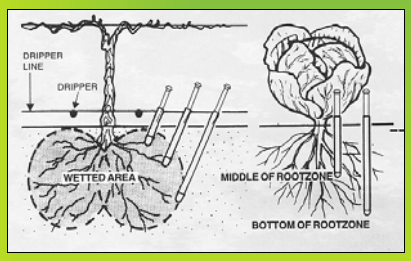

Photo: H&TS Electronics Australia P/L

A tube that has a ceramic tip is filled with water and sealed. The soil trying to extract water through the ceramic tip creates a vacuum within the tube. The suction is converted to a pressure and measured on a gauge as kPa.

Gypsum Blocks

The gypsum blocks, which are porous, take on the soil water characteristic of the surrounding soil. This creates equilibrium between the soil and the blocks. Electrical resistance within the blocks is then measured and related to moisture content as a tension. Gypsum blocks can be continuously logged using the GBug systems.

Capacitance

These probes measure the soil dielectric by placing the soil between two electrical plates, voltage is applied to these plates and a frequency is measured. This is then converted using a calibration equation into mm of soil moisture per meter. These systems can be continuously logged and down loaded via telemetry, phone, or manually. Examples of these systems are Enviroscan and C-Probe.

Portable capacitance probes (e.g. Diviner, Gopher) measure soil in a similar method to above. There is one sensor that swipes down the profile (via access tubes), taking readings at 10 cm intervals. This can either be viewed in the field or downloaded to a computer.

River Murray Catchment Water Management Board
A healthy river – sustainable uses

RENMARK TO THE BORDER LOCAL ACTION PLANNING ASSOCIATION INC.

Natural Heritage Trust
Helping Communities Helping Australia

Mid Murray Local Action Planning Association

Riverland West Local Action Planning

Loxton to Bookpurnong
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COORONG DISTRICT COUNCIL

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TDR (Time Domain Reflectometry)

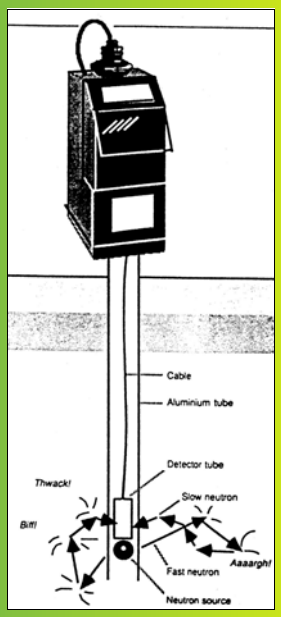
The probe is buried in the soil at a desired depth. A signal is sent down steel probes. When the signal reaches the end of the probe it is reflected back. The time taken for the signal to return varies according to the soil dielectric and is directly related to water content.

TDT (Time Delay Transmission)

These systems are continuously measuring the moisture content in the same method as the TDR system. Depending on the time interval you want to log a reading the device will average all the readings it has taken since the last logged reading. This average figure is the water content that will be logged and stored. This limits variations and errors that could be incurred from spot readings. An example of this system is the Aquaflex probe, and Gro-Point)

Neutron Probe

The probe (sensor) is lowered at set depth intervals to take the readings. The neutron probe is based on measuring fast-moving neutrons that are scattered through the soil. The neutrons are deflected by hydrogen, most commonly water, and are slowed. The amount of deflection is directly related to the soil moisture in the soil and is recorded by the sensor.



Heat Probes

Measures the amount of heat energy needed to increase the temperature of water by 1 degree. Therefore the wetter the soil the lower the increase in temperature.

Monitoring System	Type	Technical Support	Ease of Use	Capital	Labour	Maintenance	Continuous Logging	Suitable soils
Shovel Auger	Feel	High Experience	High	Low	High	Low	No	All
Tensiometer	Tension	Low	High	Low	High	High	No	Light Medium
Gypsum Blocks	Tension	Low	High	Low	Low - Moderate	Moderate - High	Yes	Heavier - (Lighter)
Heat Disspation	Heat Dissipation	High	Low	?	?	?	No	?
Neutron Probe	NMM	High	Low	High	High	Moderate	No	All
Permanent Capacitance - Enviroscan, C-Probe	Capacitance	High	High	High	Low	Low	Yes	All
Portable Capacitance - Diviner, Gopher	Capacitance	Low	High	Moderate	High	Low	No	All
Aquaflex	TDT	Low	High	High	Low - Moderate	Low	Yes	All
Gro-Point	TDT	Low	High	High	Low - Moderate	Low	Yes	All

For Further information contact your local Irrigation Field Officer:

Renmark Irrigation Trust	85 864 510
Central Irrigation Trust	85 807 100
Private Areas - Riverland	85 824 477
Private Areas – Lower Murray	85 325 262