IMPROVING IRRIGATION EFFICIENCY PROJECT

Soils

Soil Water

Introduction

The amount of water that a crop can take from a fully wet soil before it suffers stress is referred to as readily available water (RAW). The point at which all RAW has been used up by the crop and stress begins is referred to as the refill point. This is the point where irrigation needs to occur to avoid productivity losses.

The amount of water in a soil that has drained for approximately 12 – 24 hrs after a full irrigation or rainfall event is known as field capacity (RAW has been refilled).

When a clay soil is wet to field capacity, virtually all of the pore space is filled with water. Conversely, in a sandy soil, a much lower proportion of the pore remains filled with water because water drains out of the large pore spaces between the particles. Consequently, both the volume of soil water available for crop use and the amount of irrigation water that should be applied to a crop will be dependent on the texture of the soil.

Texture

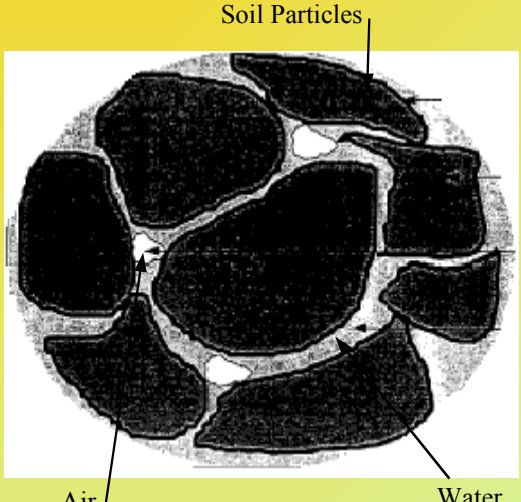
Texture is important because it affects movement, retention and availability of water and nutrients in the soil. Texture also affects other aspects of the soil, such as structural behaviour and susceptibility to erosion. The clay component is very important because it holds most of the water and nutrients. However, soils with a high clay content can have drainage problems.

What's holding the water holding

Water clings to the surface of soil particles, but drains out of large pores (sands). Plant roots can only draw off the available part of the water clinging layer. Small soil particles, like clays, have a large surface area to which water can cling as well as smaller pore spaces which reduces drainage. Conversely, large soil particles, like sand, have a low surface area to which water can cling to and larger pore spaces that allows water to drain more freely. Therefore, water retention is very much related to the surface area of the particles and size of the poor spaces between them.

Depth of Root zone

It is important to know the root zone depth as this influences where and how much water will be applied to the soil. The root zone is the only area that can be used to draw moisture from the soil and thus if you have a 1m rootzone there is no point in irrigating to a depth of 1.3 meters. This would result in water passing through to drainage which is undesired unless leaching salts.



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
Action for our environment...

COORONG DISTRICT COUNCIL

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Calculating RAW

To calculate RAW for your soil and crop you need the texture of the soil, rooting depth of the crop and how much stress you are willing to induce on your crop. Different crops can take different levels of stress and table 1 illustrates commonly used levels for crops.
Example: a Citrus crop grown on a Sandy loam soil with a rooting depth 1.2 meters, and it is planned to irrigate at −40 kPa. The calculation would be as following:
From table 1 for a Sandy loam soil at −40kPa the RAW is 60mm/m

Therefore for a rooting depth of 1.2m RAW = 60mm/m x 1.2 = 72mm

If there are stones in the soil layer, the RAW will be reduced by the same percentage as the percentage of stone in the soil (visual percentage)

Calculation with stones in soil profile and different textures
A lucerne crop with a root depth of 0.8m consisting of a 0.5 meters of Loamy sand and 0.3 meters of Sandy clay loam with a stone percentage of 20% (visual), therefore the sane percentage of the soil would be 80% (100-20). It is planned to irrigate at −40kPa.

From table 1. at −40kPa

Loamy sand 50mm/m x 0.5m (depth of soil) = 25mm
Sandy clay loam 60mm/m x 0.3m (depth of soil) = 18mm x 0.2 (percentage not stone 80%) = 14.4mm

Soil Surveys

Soils survey can be done by consultants and are very be useful in providing information for developing a whole farm plan and a management plans of your enterprise.
There are many ways soil surveys (or IDMP's) can aid the irrigation manager in scheduling and management issues (NSW Agriculture).

- Planning an irrigation development or re-development
- Getting more from less water
- Purchasing irrigation water
- Adopting the best irrigation practices for the farm
- Sustaining natural resources
- Integrating irrigation and drainage management into other farm plans
- Meeting environmental requirements of markets
- Negotiating finance for irrigation development

Table 1: Readily available water for soils and suction levels

Soil Texture	Readily available water (mm/m) between -8kPa and:				
	- 20 kPa	- 40 kPa	- 60 kPa	- 100 kPa	- 200 kPa
Sand	30	35	35	40	45
Loamy sand	45	50	55	60	64
Sandy loam	45	60	65	70	85
Loamy sand	45	65	75	85	105
Sandy clay loam	40	60	70	80	100
Clay loam	30	55	65	80	105
Clay	25	45	55	70	90

- 20 kPa	used for vegetables, pastures
- 40 kPa	used for perennial horticultural crops, or during periods that stress must be avoided
- 60 kPa	used for perennial horticultural crops, (e.g. vines and stonefruit) mild stress acceptable
- 200 kPa	used for vines during periods of regulated deficit irrigations

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