farmtalk

This article contains information most relevant to the less than 350 mm rainfall mallee farming region

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MALLEE SUSTAINABLE FARMING INC. SA NSW VIC

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Farmtalk is a product of the Mallee Sustainable Farming Inc. Tri-State Research and Extension team

The DEEP DOWN on Deep Drainage in the Mallee

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The Issue

Deep drainage is water that leaks through the soil profile beyond the root zone of annual crops and pastures. This water is lost from the annual crop production cycle and is therefore **not available** for extraction by crop roots.

When deep drainage water adds to the water table, it is then known as **groundwater recharge**. Groundwater recharge increases pressure in aquifers, which forces the flow of saline groundwater into the river system and can increase the risk of dryland salinity where water tables are close to the soil surface.

- Deep drainage, on average under Mallee woodland and perennial pasture, is **less than 0.1 mm/year**, and
- under cropping systems can increase by 300 fold, to around **5 to 35 mm/year**.

To utilise this water, plants with a deeper root system, such as lucerne need to be incorporated into the farming system.

What do we know about deep drainage in the Mallee?

Rainfall

Mean annual rainfall is low in the Mallee (<350 mm per year). Occasionally, large rainfall events (e.g. more than 100 mm in a month) can occur and cause water to leak beyond the reach of cereal crops (fig.1).

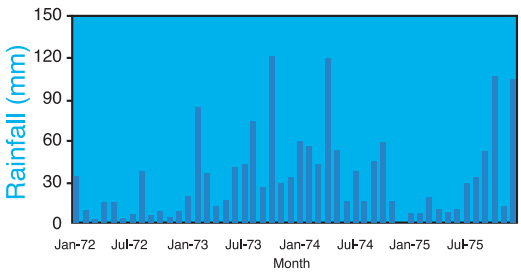

Figure 1. Monthly rainfall for Mildura between January 1972 and December 1975 that shows 4 months where rainfall was greater than 100 mm

Soils

The light textured sandy soils of the Mallee have a low water holding capacity and therefore, less ability to store the extra water these rainfall episodes provide.

These sandy soils will leak faster and earlier compared with clay soils, given the same amount of rainfall.

Deep drainage often accumulates beyond the root zone in the lower profile (> 6m deep) before adding to ground water recharge. There are strategies for stored soil water, deep in the profile, to be returned to the production cycle before the water accesses the water table.

Fallow

Fallows (chemical or conventional) contribute the largest amount of deep drainage of any phase of the farming cycle. When large rainfall events occur during the fallow, water often drains below the rootzone before crops have a chance to use it. Therefore, deep drainage can be minimised by reducing the time that paddocks are in fallow.

Agronomy

Crops with poor growth, due to inadequate nutrition, subsoil constraints or disease factors, use less water compared with healthy crops and so compound these water losses. Subsoil constraints (see Subsoil Constraints Farmtalk) reduce a crop's ability to take up stored soil water and thus dramatically increase the risk of deep drainage occurring. **Therefore, healthy, actively growing plants use the most water and reduce the risk of deep drainage potential in the system.**

What this means

On Mallee farms, it is likely that there is a substantial store of water in the sub-soil that will be larger in direct proportion to the length of farming history. If that water is not returned to the production cycle, then it will contribute to rising water tables and subsequently, river salinity. If we can retrieve this water, and get it back into the production cycle before it reaches the watertable, we will lessen the flow of salt to the river.

Results from Mallee Sustainable Farming Inc. focus paddock monitoring for summer 2001-02 indicate that around 70% of paddocks surveyed have at least a year's rainfall supply of stored soil water in the profile (i.e. >250 mm water).

Lucerne can retrieve the lost water (fig. 2) as well as provide agronomic benefits such as additional soil nitrogen, increased organic matter levels, improved soil structure and effective disease breaks.

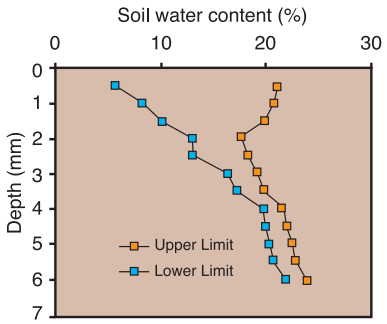

Figure 2. A graph of soil water content that shows that lucerne extracted approximately 310 mm of stored soil water from this profile. The difference between the upper limit and the lower limit equals the amount of water extracted.

Actions/options to consider

Agronomic solutions

• Close crop rotations so that there is less time when water may leak beyond the root zone. This means reducing the length of fallow and sowing crops when opportunities are available.

• Avoid fallows on sand hills, as these soils are highly leaky (high hydraulic conductivity for deep drainage) and fallow efficiency is likely to be low.

• Investigate any subsoil constraints that may limit the ability of your crops to take up stored soil water, and that may impede the use of deep rooted perennial pastures.

• Incorporate a phase of lucerne (see Lucerne in the Mallee Farmtalk) to return deep drainage water to the production cycle.

Where to from here?

• Determine how much stored soil water is in the lower profile of a paddock, beyond the reach of annual crops and waiting to be used. The amount of stored moisture will be a function of your cropping history, soil type and rainfall events over many years. MSF Inc. Focus Paddocks can give an indication of how much water might be available in a particular soil type.

• Soil sampling may be used to determine the amount of stored soil water in your paddocks. Calculation guides are on the project web site at www.msfp.org.au.

• Once you have determined how much stored soil water is in the profile, and any subsoil constraints, investigate opportunities for establishing lucerne to return deep drainage water to the production cycle.

• If the deep drainage water is not returned to the production cycle it will result in an increased salt flow into the river systems. Mallee farming systems are not sustainable if they contribute to increased salt loads in the river systems (see Sustainability Farmtalk note).

• Seek the guidance of local agronomists and MSF Inc. for information relating to soil water monitoring, soil testing, and appropriate lucerne management.

Other relevant information

• Lucerne in the Mallee - Farmtalk
• Managing Water in Mallee Farming Systems - Farmtalk 5
• Subsoil Constraints on Mallee Farms - Farmtalk
• Risk of Deep Drainage on the Mallee Sustainable Farming Project Focus Paddocks Final Report - 2003

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