DEEP DRAINAGE - WHAT ARE THE NEUTRON PROBE SITES TELLING US?

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TAKE HOME MESSAGE

- Over the past 8 years, top 2m of soils have been getting drier. for most neutron probe sites established in the LMD catchment
- Only two major wetting events have occurred since the installation of the neutron probe sites - November 1999 and February 2000.
- Since 2000, soil water in the top 2m of soil has decreased by an average of 30mm at sites in each vegetation type.
- Stored soil water between 2 - 6 m has remained relatively constant or increased for sites in each vegetation type.

Objectives

No net increase in the risk of land and river salinisation due to the effect of dryland cropping between 2002 and 2015 as determined by measuring soil moisture, deep drainage, water table levels and crop management decisions (Lower Murray Darling Catchment Blueprint, 2002).

Background

In 1997/98 60 neutron probe sites were established on cropping lands throughout the catchment by the South West Land Management Group (SWLMG) to gain an understanding of deep drainage risk. In 2001/02, Mallee Sustainable Farming (MSF) Inc. expanded the network to include a further 13 sites, again on cropping land. In 2005, the Lower Murray Darling Catchment Management Authority (LMD CMA) added a further 18 new sites of which 9 occur in rangeland areas corresponding to vegetation communities and a further 9 sites are on cropping land. Of the 18 new sites established in 2005, 5 sites are located west of the Darling/Anabranch areas on both cropping and rangeland areas as no sites were established in this area initially.

This project forms part of an on-going project till June 2007. Collaborating natural resource agencies: Lower Murray Darling CMA, NSW Department of Primary Industries, Department of Natural Resources (formally Department of Infrastructure Planning and Natural Resources - DIPNR) and contributing landholders.

Method

Stored soil water at each site is measured with a neutron probe down to a depth of 6 metres in autumn of each year and prior to the break in season. The sites were grouped according to the original vegetation community that occurred prior to any clearing events or cultivation. The current project will continue to measure stored soil water each year at the neutron probe sites and also take soil samples to analyse for chloride content at 5 - 7 year intervals after sites were established (a way of measureing gross water movement). Thirty of the original sites were redrilled earlier

this year and the next group of sites will be redrilled in 2006/07 and measured for chlorides, giving a measure of water movement.

Results

Measurements at the neutron probe sites have shown that soils in the top 2m have been getting drier over the past 5 years. This indicates that no significant wetting events have occurred since February 2000. Two major profile wetting events have occurred post 1997; November 1999 and February 2000, where rainfall totals were greater than 75mm (e.g. see rainfall chart for Kerribee). Also, rainfall during the 2000-growing season was above average at many sites.

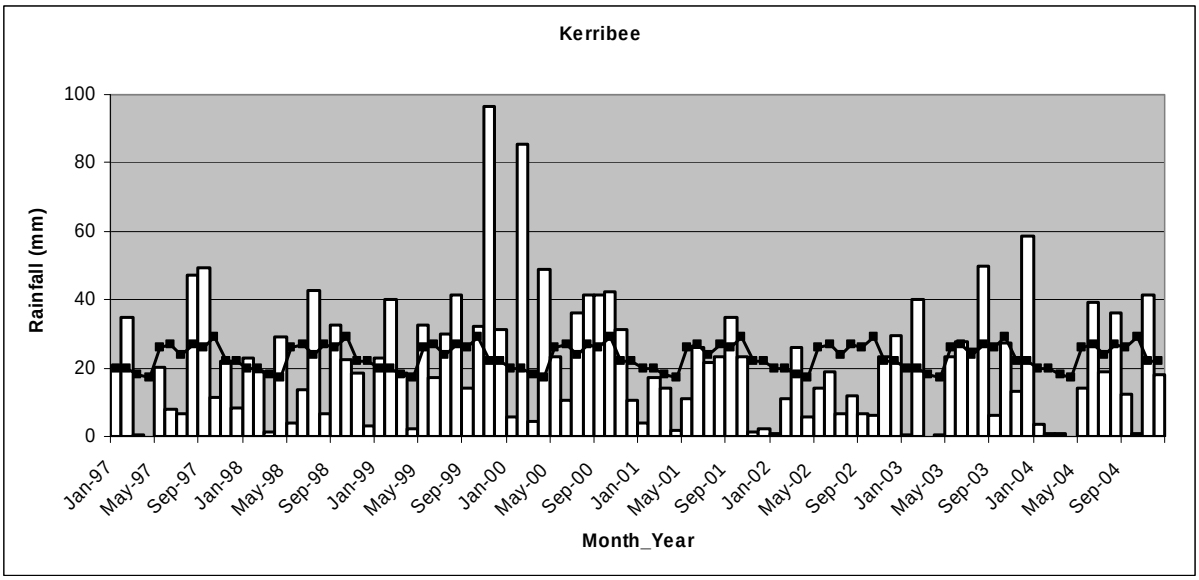

Figure 1: Monthly rainfall for Kerribee between January 1997 and December 2004, compared with the long term average, showing just 2 months with rainfall greater than 75 mm.

Stored soil water between 0 - 2m showed good response to the 1999/2000 rainfall with a substantial increase in the amount of water stored. The bar graph for sites on 'Chenopod Mallee' lands shows that average stored soil water has decreased from 286 to 253 mm at the end of the 1999 and 2004 cropping seasons, respectively.

Since 2000, stored soil water has decreased by 30mm at most sites in each vegetation type. However, stored soil water between 2 - 6m has remained relatively constant or increased at all sites in each vegetation type.

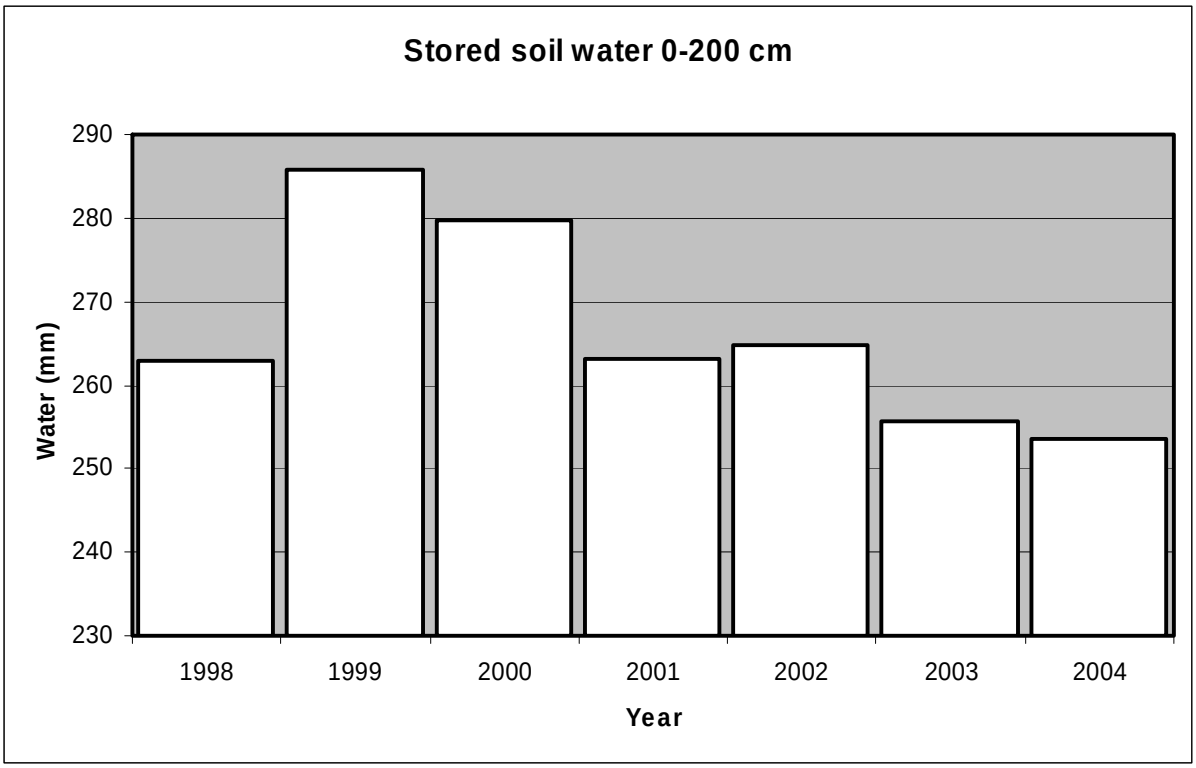

Figure 2: Stored soil water at sites on Chenopod Mallee cropping sites, showing response to rainfall in 1999 and 2000, followed by consistent decline to lower levels in 2004.

WHAT WE KNOW ABOUT LUCERNE IN THE MALLEE

Lucerne can grow year round depending on the cultivar and its level of winter activity. Lucerne has the ability to:

- Utilise deep stored soil water reducing the risk of deep drainage;
- Provide organic benefits such as adding nitrogen to the soil and increasing organic matter levels;
- Improve soil structure;
- Reduce wind erosion when grazed strategically;
- Provide summer weed control;
- Be an effective disease break crop; and
- Be an alternative crop for livestock, producing quality green and dry fodder matter that has high nutritional value.

In the Mallee, many landholders have successfully grown lucerne in mixed farming enterprises. Neutron probe site 3204 is one such site where lucerne has been successful.

Site 3204 at Petro Station was sown to lucerne in 2001 at 1kg/ha, achieving a stand density of 6 plants per metre. The lucerne variety sown was Pioneer L69. It was sprayed for grass in 2002 using Jaguar. Stored soil water measures clearly show that

the lucerne has extracted water to a depth of at least 3m, and has dried the profile by 75mm over the 3 years since establishment (see graph of change in stored soil water). After two years, and most probably due to the dry climatic conditions that the Mallee has been experiencing, the lucerne stand density has decreased to 3 plants per metre and has nearly come to the end of its cycle as a productive pasture phase in the cropping program. During this time the lucerne has served its purpose in reducing deep drainage and has provided valuable green feed for livestock during summer when all other annual pasture species have died off.

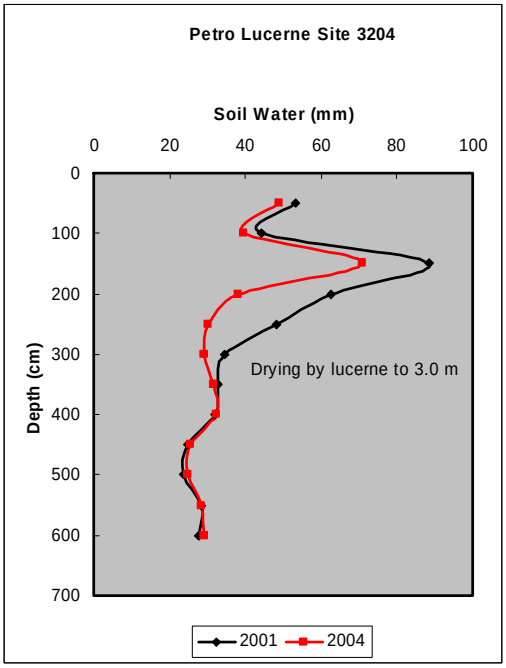

Figure 3: Stored soil water down the profile for site 3204 showing how lucerne has extracted water to a depth of at least 3.0m drying the profile by more than 75 mm in total.

The Lower Murray Darling CMA, together with Grain & Graze has established lucerne trials at a Leon and Luke Follets property near Euston. It has a neutron probe access tube established so soil water can be monitored. The site was sown in July 2005 with a number of lucerne cultivars of varying winter activity and a variety of sowing methods. A wind erosion risk assessment will also be conducted at the site. A field walk is being planned at this site this coming summer.

For further information

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