

Lucerne performance in the southern Mallee

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Lucerne (*medicago sativa*) is being utilised for a range of benefits in modern farming systems. This includes the incorporation of phase farming principles into dryland cropping systems within the Mallee and Wimmera. In the Mallee, recharge rates vary from 5 to 35mm per year under traditional cropping systems. The principle of phase farming involves the tactical insertion of a lucerne pasture in a crop rotation to retrieve deep soil moisture and create a dry band below the rootzone of annual crops.

The ability of lucerne to extract soil moisture is dependent on sub-soil constraints and subsequent effects on rooting depth. These effects will determine the period between lucerne phases. Sub-soil constraints may significantly reduce the ability of lucerne to extract soil moisture. The placement of lucerne in the landscape needs to be considered when designing high water-use farming systems.

For example, the Hopetoun land system is comprised of ridges that are typically 1000m wide, a gilgaied plain of 500m and a dune of 100m. Given that the typical Mallee block of 285ha (700 acres) has a linear boundary length of 1600m and is now being farmed as one paddock, it is assumed that lucerne will be grown over a range of soil types including sandy loams, light clays and sands.

A lucerne demonstration plot was sown at the BCG farming systems site in May 2003. Six varieties of lucerne were sown under peas. Three dormancy types were chosen to demonstrate the physical differences of winter dormant, semi-winter dormant and high-winter active lucerne. Future work will look at the rooting depth achieved at the site.

"Handbrake" on lucerne performance at farming systems site

Recent northern Mallee (Mallee Sustainable Farming Project) studies recorded lucerne rooting depths of up to 3.5 and 8.0m on clays and sands, respectively. The maximum rooting depth of lucerne in the Mallee depends on sub-soil constraints and plant available water.

Soil tests were conducted by BCG adjacent to the lucerne demonstration plots at the Farming Systems trial site. Results indicate that the critical soil salinity cut off level below which lucerne can be expected to perform is 2ds/m (2000 ec). The BCG soil tests revealed that three of the nine samples taken in a relatively small area were above this level.

The depths at which this critical level was reached were between 50 and 100cm in the sub-soil. It is evident that lucerne performance will be very limited at the Farming Systems site, with the plant relying on annual rainfall during the season rather than being able to capitalise on sub-soil moisture. Roots will not be able to extract moisture deeper than 50-100cm due to high soil salinity levels.

How much stored soil water can lucerne use?

In soils without extreme sub-soil limitations lucerne has the potential to achieve maximum rooting depth. Disregarding sub-soil constraints, rainfall in the Mallee is not usually enough to satisfy the water requirements of lucerne. So, using its extended root system, lucerne retrieves stored water from below the root zone of annual crops. Crops typically contributing to deep drainage add water to the 'bank' stored for lucerne use.

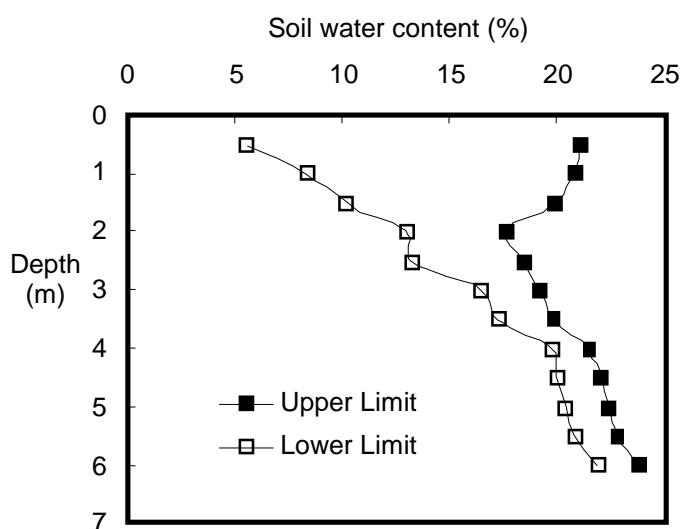


Figure 1. A graph of soil water content showing the upper and lower limits of soil moisture down a soil profile. The difference between the 'upper' and 'lower' limits equals the amount of water extracted.

How much water and how quickly?

A healthy stand of lucerne can grow roots at a rate of up to 1.5 to 3.5m/year in clay and sandy soils, respectively. So, depending on the total amount of stored soil water available, lucerne may efficiently dewater the profile in a 2-3 year phase, enabling a return to the cropping rotation. During this phase, lucerne is likely to extract an additional 150-300mm of stored soil water compared with annual crops (see Figure 1 above). Depending on rainfall events following the lucerne phase, it may take 10-50 years to store enough water to grow lucerne again.

Considerations for lucerne establishment in the southern Mallee

- Extent of sub-soil salinity
- Adequate stored soil water. Mallee Sustainable Farming Project studies suggest that greater than 250 mm of stored soil water, which is available to plants, is required to grow a successful lucerne stand
- Good agronomy including choice of lucerne and sowing methods
- Paddock size, stocking rates and stock water access.

If your farm has a long cropping history, there may be deep stored soil water waiting to be used. The question is - how much do you have?

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