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Farmnote

Salinity Series

Lucerne – a high water use production package

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Lucerne (*Medicago sativa cv.L)* has been cultivated for more than 3,000 years to become the world's oldest forage plant and the major forage of the temperate regions. It is native to Iran, where the climate is typified by cold winters and hot semi-arid summers. Much of the agricultural zone of Western Australia has a similar climate.

Being perennial, lucerne will respond to winter and summer rainfall events and survive dry periods in a dormant state by accessing stored soil water and energy reserves in the crown and tap root. The deep root system can explore and access soil moisture down to 2 to 3 metres or deeper depending on soil type and structure. This provides an opportunity for lucerne to be used on recharge areas to help prevent waterlogging and salinisation of agricultural land.

In phase rotation, lucerne also produces high quality fodder for stock, improves soil fertility by adding nitrogen to the soil, and is highly competitive against annual weed species. Lucerne is also frost-tolerant and the only perennial pasture legume currently considered suitable for widespread sowing in the 600 mm and below rainfall zone.

Lucerne is only one species of perennial legume pasture available to land managers. Others include strawberry clover *(Trifolium fragiferum)*, white clover *(Trifolium repens)* and red clover *(Trifolium pratense)*. However they are adapted to higher rainfall zones.

Role of lucerne in salinity management

Lucerne must be integrated with other perennial plant and engineering options over a significant area of the farm, the catchment and the agricultural landscape to have a significant impact on salinity.

Re-introducing perennial plants into the landscape is one of the best options to prevent salinity and confine the area of affected land. Perennial agricultural species closely mimic the water-use pattern of native vegetation, which was in equilibrium with the rainfall pattern before clearing. Lucerne has been integrated into cropping systems as a long-term pasture phase (more than two years) separating cropping phases of similar duration in the recently developed 'phase farming' system.

The deep root system allows plants to use most of the incoming rainfall as it moves down the soil profile. Less recharge occurs on the area where lucerne is planted. Lucerne also uses summer rain that falls outside the growing season of annual pasture species and would otherwise contribute to the watertable. Figure 1 shows results collected from experiments in medium and low rainfall zones of south-western Australia. Lucerne is shown to use 100 mm of stored soil water more than annual pastures over summer and autumn, and also produces equal or greater biomass.

The ability of lucerne to reduce recharge by using more incoming and stored soil water improves the sustainability of cropping systems. The lucerne phase dries the soil profile to create a 'buffer' which may be maintained through the first years of the cropping phase. This is a compromise between long-term sustainability and short-term cash profits.

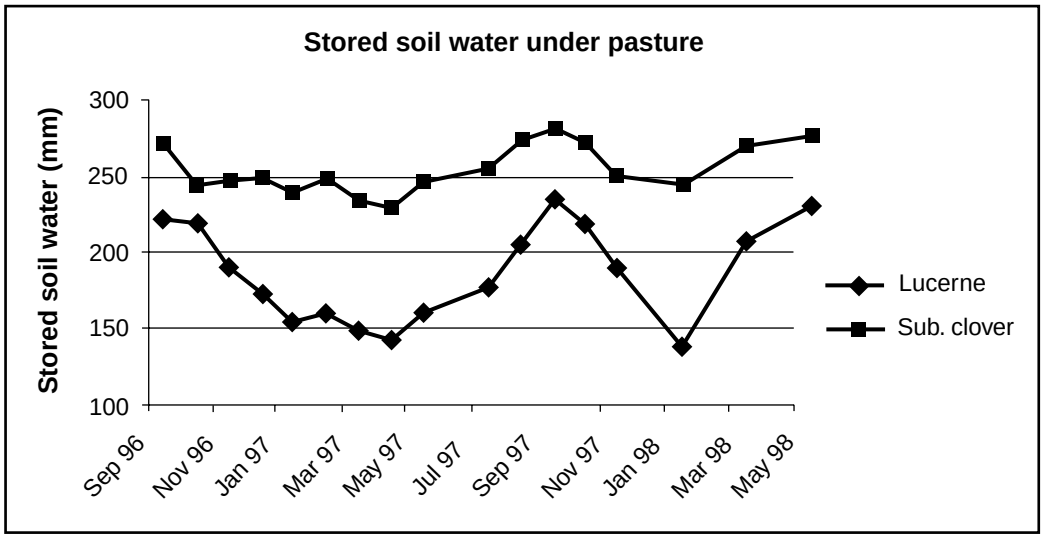

Figure 1: Comparison of stored soil water in the top 150 centimetres under lucerne and sub. clover in crop rotation

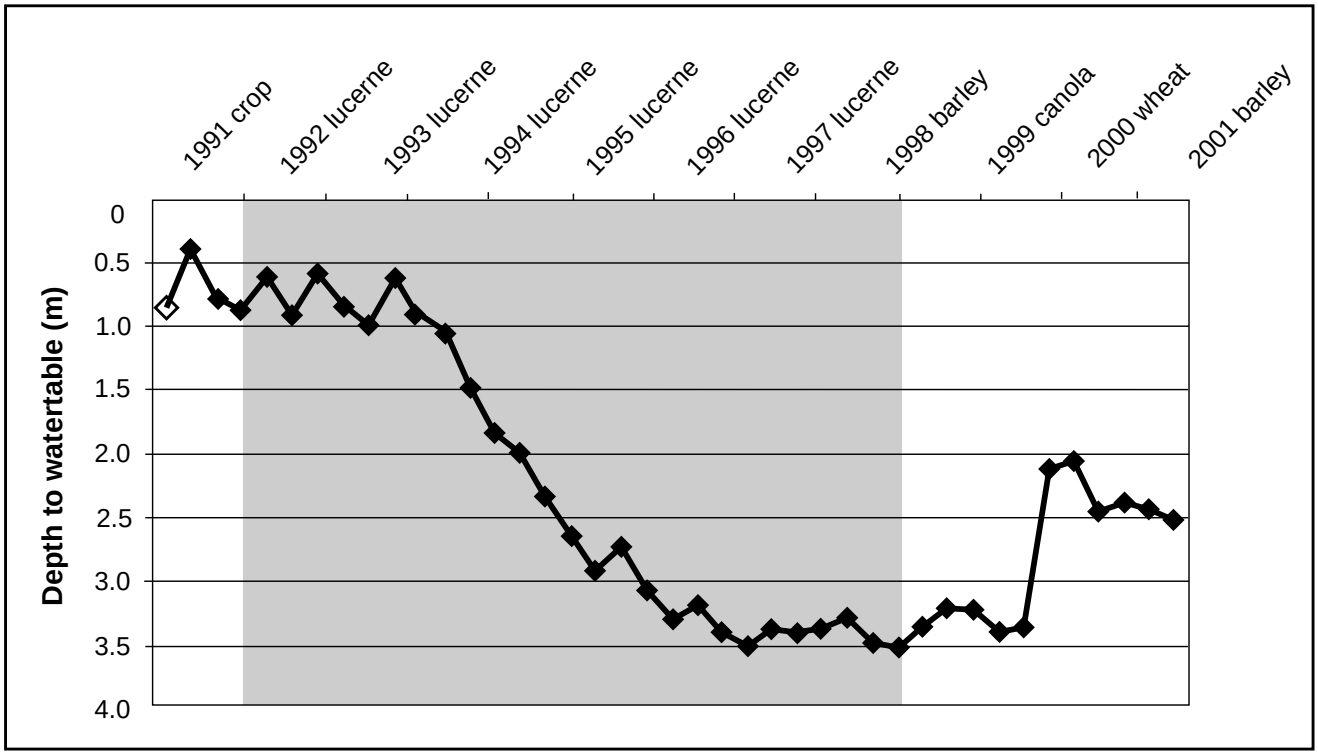

Figure 2: Farmer-measured impact of lucerne on the watertable (results courtesy of G & D Bee, Jacup)

The effect of lucerne on the watertable can be measured using a peizometer. Figure 2 shows how a lucerne phase from 1992-97 measurably lowered the watertable. The grower can then adjust the lucerne and crop phases to manage the watertable and compensate for wet or dry seasonal conditions.

Planting for greatest impact on salinity

To have the greatest effect on local hydrology and low-lying areas at risk of salinisation, lucerne should be planted on mid-slope recharge zones (see Figure 3). Lucerne is well suited to the duplex soils and well-drained surface horizons that are characteristic of these zones. Its water-use and feed producing potential is reduced on low and flat country. Lucerne is susceptible to root rot and cannot survive or be productive in waterlogged soils and discharge zones.

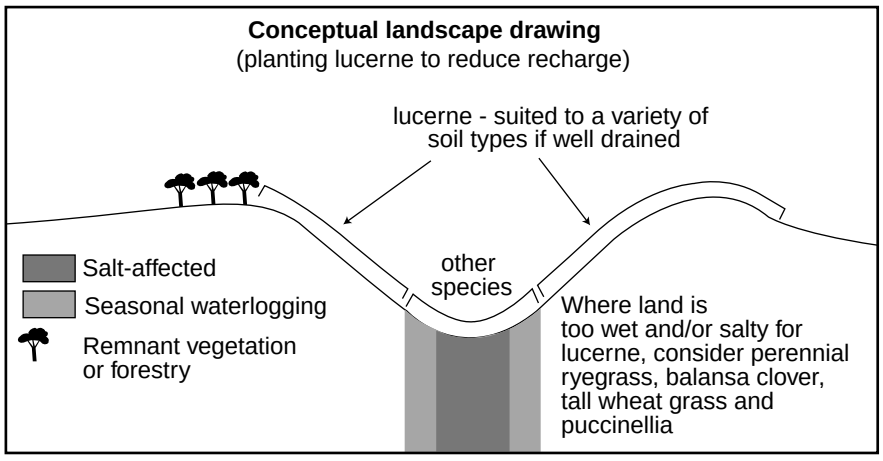

Figure 3: Recommended landscape positions for successful lucerne cultivation to reduce recharge and maximise production.

Apart from waterlogged or saline sites, lucerne can be grown throughout the landscape on a range of soil types and is the most extensively grown perennial legume in Australia. However, soil and environmental constraints determine its water-use, productivity and persistence.

Lucerne will *establish, use maximum soil water and persist where:*

- The pH ($CaCl_2$) is 4.8 or above in the top 30 cm of the soil;
- The soil is not saline;
- Water is freely drained from the surface; and
- There is a low weed burden (such as a paddock that has just come out of crop).

Further information

- Farmnote No. 135/2000 'Lucerne in pasture-crop rotations – Establishment and Management'
- Western Australian Lucerne Growers Inc., C/- Department of Agriculture, 10 Dore Street, Katanning WA 6317. Tel: 9821 3333 or email walg@agric.wa.gov.au

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