The Role of Lucerne in Mallee Farming Systems

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What we know
Lucerne is well adapted to up to 80% of Mallee soils. It can help address salinity and be useful in managing erosion. As a component of a cropping rotation it may also provide biological soil health benefits, through fixing N and controlling difficult weeds, with improved competition and greater opportunity for non-selective herbicide use.

It has the potential to improve returns from a prime lamb livestock enterprise, more so in response to the predicted climate change scenario of increased size and number of “out of season” rainfall events.

However, the ability of lucerne to dry out the soil profile can have a negative impact on the subsequent annual crop yield (see # 27 “Farming systems to reduce recharge”).

While perceptions that the failure of lucerne to establish successfully and persist restricts the widespread use of lucerne, there is much scientific and commercial experience showing low risk establishment options.

What it means
The research measured the 2005 lucerne persistence, production and water use on 3 commercial farms involved in the 2001 project, 4 years after establishment.

In 2006 and 2007 the transition from lucerne to annual cropping was measured at 2 of the commercial sites through the crop water use efficiency.

The persistence and production performance of 54 lines of alternative perennial legumes were evaluated from 2004 – 2007.

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Lucerne

Table 1: The 2005 lucerne biomass (t/ha), persistence (plts/m²) and estimated soil water deficit (mm) since the 2001 sowing at 3 commercial sites.

<table>
<thead>
<tr>
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<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>3.5</td>
<td>20</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Site 2</td>
<td>1.8</td>
<td>16</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Site 3</td>
<td>3</td>
<td>8</td>
<td>100</td>
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All 3 sites maintained adequate lucerne populations (~10 plants/m²) produced valuable biomass and had reduced soil water content in the 0-1.6m soil profile after 4 years.

Table 2: 2006 and 2007 water use efficiency (kg grain/mm of available water) of wheat following lucerne at 2 sites.

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<th></th>
<th>2006</th>
<th>2007</th>
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<tr>
<td>Site 1</td>
<td>13</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 2</td>
<td>9</td>
<td>20</td>
<td></td>
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The wheat following lucerne had a higher than average Mallee water use efficiency at both sites in 2007. In one case it reached the optimum level of 20 kg/mm.

Alternative perennial legumes

<table>
<thead>
<tr>
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<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Site 1</td>
<td>3-4</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 2</td>
<td>2-3</td>
<td>4</td>
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Commercial lucerne lines were the top 6 biomass producers. Ten *Argyrolobium uniflorum* (alternative genera) lines maintained high densities until the extended 2006 drought. Four lines of *M. sativa ssp. caerulea* (wild lucerne) maintained similar plant densities to the commercial lucerne lines. The other alternative species *Lotus, Melilotus, Hedysarum, Astragalus, Cullen, Bituminaria and Onobrychis* lines failed to persist over 3.5 years.

Where to next

Commercial stands of lucerne were shown to be productive and quite persistent on Mallee cropping land. They accessed more soil water than is normally available to annual crops and pastures.

Returning the land to crop following a lucerne phase produced less than potential yield in a dry year (2006). Potential yield was achieved in response to a season of above average early season rain (2007).

An animal enterprise that can capitalise on season production is necessary to allay the cost of lucerne establishment and management.

Viable legume plant alternatives or options for lucerne (*Medicago sativa*) suitable for the Mallee are not currently available.

The study has confirmed the production and persistence advantages of commercial lucerne in the low rainfall Mallee environment over a range of perennial species. This is understandable when the many centuries of commercial lucerne plant development are considered.

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