Lucerne - is it for me? - Workshop development guide for facilitators

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LUCERNE - IS IT FOR ME?

WORKSHOP DEVELOPMENT GUIDE FOR FACILITATORS

National Dryland Salinity Program

GRDC
Grains Research & Development Corporation

Know-how to tackle salinity
Acknowledgments

This workshop has been developed as part of the GRDC/NDSP-funded “A Million Hectares for the Future” Project with support and input from key personnel from the Department of Agriculture, Western Australian (DAWA). Thank you also, to the farmers who participated in the pilot workshops, providing valuable feedback on structure and content.

Developed and compiled by Richard O'Donnell, Department of Agriculture, Northam WA
January 2005

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Cover Picture

Insert local picture onto the cover of the Participants’ Notes with details of cover picture below.

Logo or Badge

Include logo or badge from additional sponsors and organisations linking to the workshop on the front cover of Participants Notes.

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Preface

This Facilitators Guide is designed for use in conjunction with Participants Notes and Presentation material.

Notes with suggestions for facilitators on the running of workshops (running sheet) and additional comments relevant to the information presented in the participants notes are highlighted in the boxes in this document. All other material is set out as in the Participants Notes for easy reference.

The PowerPoint presentations illustrated in these notes and the Participants Notes are in separate files available from the Department of Agriculture, Western Australia. The Guide for Facilitator and the Notes for Participants are available in PDF format form the website (http://www.agric.wa.gov.au).

CDs of all workshop files are available in Microsoft Word format or in the case of the presentation material in PowerPoint by contacting Jo Brown at the Department of Agriculture on phone (08) 9368 3710, fax (08) 9368 1205 or email jbrown@agric.wa.gov.au. These files can then be cut and pasted to incorporate relevant local data or to modify in other ways to meet your specific needs. Workshop material produced from these notes should acknowledge the Department of Agriculture, Western Australia, GRDC and the National Dryland Salinity Program funding and the authors of specific material.

Note: It is strongly recommended that those designing workshops based on these guidelines tailor the presentation material and notes for each specific group with local examples and information where possible. The specific needs of a participating group may dictate that some sections of this workshop are expanded, reduced or modified in other ways. As a facilitator you need to have an understanding of the participants needs and modify material appropriately. Review the learning outcomes at both at the beginning and the end of the modification process to make sure that you are meeting all of your desired learning outcomes.

When customising the documents or the PowerPoint presentation to meet the needs of a specific group, check that references to page numbers and slide numbers remain valid and that slides in the Participants Notes are in correct presentation order so that participants can follow them without getting lost. This may necessitate changing page or slide numbers in the Participants and/or Facilitators Notes.
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<tr>
<td>S+20</td>
<td>Introduction</td>
<td>P1: “Aims”</td>
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<td>S+20 to S+80</td>
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<td>S+80 to S+95</td>
<td>Short break</td>
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<tr>
<td>S+95 to S+110</td>
<td>Making Lucerne work for you</td>
<td>P3: “Making Lucerne work for you”</td>
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<tr>
<td>S+110 to S+120</td>
<td>Short break</td>
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<td>S+110 to S+155</td>
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<td>P4: “Establishment”</td>
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<td>S+175 to S+220</td>
<td>Utilisation</td>
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<td>S+220 to S+310</td>
<td>Case Study site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S+310 to S+330</td>
<td>Where to from here?/ Wrap Up</td>
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<td></td>
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<tr>
<td>S+345 onwards</td>
<td>Social intercourse</td>
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</table>
1. Introduction

Benefits:

Participants will be able to recognise landscape components on their farm, which are at risk of salinity (current, imminent or future) and will be aware of a range of available options available to them to managing this risk.

The workshop will enable participants to achieve the following learning outcome:

**Assess lucerne as a salinity management option for my farm**

To achieve this, the following associated learning outcomes will be required:

- Understand the benefits and limitations of lucerne to different farming systems
- Be aware of how lucerne affects watertable recharge, waterlogging and dryland salinity
- Understand how to identify suitable sites for lucerne on the farm (case studies)
- Understand the financial implications of introducing lucerne and what factors make it profitable
- Set targets for pasture production, growth rates, carrying capacity for lucerne on your land management units (LMUs)
- Identify and design a plan for introducing lucerne into your business (using case study)
- Know how to access further relevant information, including the second lucerne workshop and other Million Hectares project workshops

Key question:

“Is Lucerne a suitable salinity management option for my farm?”

POSSIBLE ADDITIONS TO THE FORMAT OF THE WORKSHOP

Linking the workshop to other relevant activities such as the release of local management strategies or the announcement of funding opportunities can add incentive for participants to adopt management options. Introducing a local perspective from a farmer that has recognised the significance of salinity and been working to manage it can create a sense of ownership of the issues within the group. This can include information on when salinity first occurred after clearing, where it occurred and what has been done (and to what effect) to try and manage the problem.

Agenda/structure

This Guide for Facilitators only shows one option for the structure of the workshop. It is possible to change the workshop timetable to suit the needs of the participants. It is up to the facilitator to decide on the time spent on the various sections and on the activities to be conducted.
2. **Resource checklist**

The following resources should be sourced for the local area where possible to help make the day relevant to participants and enabling change in texture of the information being presented to cater for a range learning styles. Staff working for both government agencies (such as the Department of Agriculture) and private industry in the area will often have local information and props that can be borrowed or utilised for the day. Having invited experts in specific areas to either present some topics or to provide technical backup on the day is particularly useful.

**Notes and handouts:**

- workshop notes, facilitators notes, planning worksheet;
- quiz questions, glossary and other appropriate tools.

**Reconnaissance:**

- local photos for PowerPoint and indicator species, aerial photos;
- Leakage Calculator, modelling results (Flowtube, AgET);
- RCA reports, Land Monitor maps, matrix - saltland capability, history of field site.

**Equipment:**

- pens, coloured permanent felt tip pens to mark map;
- heading on flip chart in advance of meeting;
- shovel, ruler, hand-held salinity meter, plopper, water samples collected from field,
- Salinity Calculator, props such as piezometer tubes, and chip trays from drill holes;
- specimens of indicator species, guide to indicator species (manual and/or handout).
3. Facilitation outline

Pre-workshop activity
Tailoring the workshop to the needs of the specific group (making it relevant)

Local Intelligence (background information on the participants, age range, gender, farming area, farm enterprises and previous seasons etc.) can be important. It is useful to send participants some pre-workshop material, briefly outlining topics covered and including a questionnaire to gauge their expectations. Alternatively, if there are only a small number of participants, this information can be gathered through telephone calls or in person. Take notice of the participant expectations, as you will:
- discover what it is they want to learn and what problems they want to solve;
- realise what their needs are;
- become aware of what they don’t know and conscious of what they need to know;
- identify marketing that needs to be done with the group (managing their expectations);
- understand some of the social, economic and environmental dynamics of the group.

Identify, collect and collate necessary information and supporting resources. Adjust workshop approach and contents to suit needs of participants. Remember to:
- ensure the content is relevant for participants;
- make certain the real needs and problems of the participants are addressed;
- identify sites for field trips and determine mode of transport;
- brief any technical speakers, focussing them on your learning outcomes;
- research the contact details of local consultants and contractors.

If adjustments are made to the PowerPoint presentations, make sure that the corresponding sections in the Guide for Facilitators and Workshop Manual for Participants are also adjusted. In addition, the Guide for Facilitators includes references to page numbers in the Workshop Manual for Participants. Because of this, make sure all references to page numbers match the section that they are referring to.

Setting up field activity
The selected sites may vary in line with the group’s knowledge of the catchment. Choose a site:
- typical for the area or showing specific characteristics relating to course content;
- close to the workshop venue (limit travel time);
- where indicator species are present (ungrazed, or at least not heavily grazed);
- with existing shallow bores and associated bore logs (desirable);
- with identifiable landscape features shown on map or aerial photo of the site;
- with a good viewing point to gain an overall perspective of the catchment issues;
- that can be introduced as part of an indoor exercise (before going into the field).
Make sure OS&H hazards associated with undertaking a site visit are assessed for potential risks. Be aware of the need for safety and implement controls accordingly.

**Setting up the workshop**

Organise venue with appropriate facilities including:

- adequate ventilation, heating and/or cooling;
- space for projection screen;
- lighting (ability to dull lights or block out light for overhead presentations);
- fridge, power for kettle, lunch facilities, coffee mugs;
- toilet facilities.

Arrange seating to encourage participation and participants’ ability to see and hear presentations (e.g. close to front, informal etc.). Tables can be useful for activities throughout the day.

The venue may need to be compromised to be close to the field sites. In this case, makeshift alterations to the facility may be needed, e.g. blacking-out windows, additional seating, fans etc.

Remember to provide water for speakers and tea/coffee and other drinks, plus food for the participants.
4. **Introduction to the workshop**

**Duration:** 20 minutes (S+20)

**Purpose:** To introduce the workshop, context participants’ expectations and explore the topic.

**Suggested approach**

- Introduce yourself and other guests/presenters and context the workshop. Introduce the material being used such as Participants Notes and how they should be used to follow the day’s presentations and activities etc.
- If you are not an ‘expert’ in this field, make sure that the participants know this. Tell them that you are knowledgeable in the workshop content, but if they need more technical information they should let you know and you will get back to them. Another option is to have an ‘expert’ in attendance for part of the workshop to answer questions, or use them to present a specific section that they are experienced with.
- Ask participants to introduce themselves and outline their expectations from the workshop.
- Document participants’ expectations.
- Outline what participants will take away from the workshop.

There is a range of ways to do this! Including an energiser activity to get participants firing and “break the ice” is a good way to start. Rather than going around the tables with formal introductions inside, take participants outside, form a circle, introduce yourself and context the workshop, explaining what participants should take away. Then throw a ball to someone else in the circle who does their introduction etc. and continue until all participants have had a turn. Have someone making notes of what participant expectations are.

**Often the mood created at the beginning of the day will flow through the following sessions and can “make” or “break” the day as a “learning experience” for the participants. Special effort in this session can be well worthwhile.**

**PowerPoint presentation**

Use this as a brief reminder for participants. Slides should include the aims of the workshop, learning outcomes for participants and a timetable for the day. It may also be useful to have the timetable on butchers paper that can be pinned up on a wall for reference by participants and presenters during the day.

**Housekeeping**

- Emergency exits, tea, coffee, toilets;
- Ground rules for discussion - It is important to make sure that all participants are encouraged to have their say and respect the rights of others and their opinions. This
is also a good time to reinforce expectations of areas to be covered and those areas that won’t be covered;

- Mobile phones turned off.

**Presentation 1 - Aims of the workshop**

**Slide 2**

**Aims of this workshop**

- By the end of this workshop, participants will have made an initial assessment of using lucerne as a suitable salinity management option for their farming business.
- This will be developed through:
  - an understanding of the production, environmental and financial benefits, and limitations of lucerne in different farming systems.

**Slide 3**

**Aims of the workshop cont’d**

- How to identify suitable sites for lucerne on the farm following general recommendations.
- Set targets for pasture production, growth rates, carrying capacity for lucerne on your Land Management Units (LMUs), and
- Make a preliminary appraisal for introducing lucerne into your business.
5. **Understand the benefits and limitations of lucerne in different farming systems**

**Purpose:** To give participants a general introduction to the benefits and limitations of lucerne in different farming systems.

**Suggested approach**

**Test for participant knowledge level**

Make sure that you have ‘P2 Benefits and Limitations’ Powerpoint show ready to start. Have butchers paper or a whiteboard ready to go with the two questions below.

- **Why grow lucerne?**
- **Why not grow lucerne?**

Use a whiteboard or butchers paper to record the responses for each question. Ensure that the participant responses stay prominent and can be viewed during the presentation.

**Presentation 2 - Benefits and Limitations**

Duration: **60 minutes** (S+20 to S+80)

*During the presentation, use the Powerpoint slides to add any points not raised in the group responses and to correct any misconceptions.*

**Slide 2**

**Overview**

**Purpose:** To present the benefits and limitations of lucerne in different farming systems

**Areas covered:**
- Benefits
- Limitations
- Lucerne basics

**Slide 3**

Clockwise starting top left:
- Grazing
- Seed production
- Out of season growth
- Fodder conservation
Point 1:
More vegetative cover over the soil means less evaporative loss and greater soil stability

Point 2:
Active participation in managing threats to own resource base and the wider communities’

Point 3:
Currently there is no other commercially available perennial legume available in southern Australia. Research is being conducted but commercially viable varieties are still years away.

Lucerne can be cropped in phase or overcropped (discussed in more detail in the Establishment and Utilisation presentations).

It increases crop yield and quality due to increased plant-available (organic) N in the soil.

Provides opportunity to manage diseases in crops e.g. take-all in wheat.

Increases opportunities to manage herbicide resistance in weeds without fallowing or cultivation e.g. can use non-selective herbicides and strategic grazing to encourage dense stands that will compete with weeds.


But do not use glyphosate unless intending to remove the lucerne! (K. Devenish,
Increasing evidence to suggest lucerne can access leached nutrients down the soil profile, especially S and K.

Leakage is defined as “the movement of water from a localised watertable, due to saturation, to the regional watertable.” Best considered as a bucket that is filled to capacity and overflows into another bucket (Glossary of Terms, 2004).

Think of it as $$$ down the drain!

Recharge – the water that moves into a groundwater body and therefore replenishes or increases sub-surface storage. Recharge typically enters aquifers by rainfall infiltrating the soil surface and then percolating through the zone of aeration (unsaturated soil). Recharge can also come via irrigation, the leakage of surface water storage or leakage from other aquifers. The term recharge is also used to describe the process of water entering a groundwater body. (Glossary of Terms, 2004).

Benefits of growing lucerne:

- Replace annual pasture with perennials
- Good feeling - helping out Landcare
- Fits into the phase cropping system
- Immediate product - grazing value all year
- Cheaper to establish than trees
- Water use is next best after mallee scrub

Back-of-the-envelope value of the nitrogen fixation – 1 unit of N is worth $0.082 (urea 46% N @ $380/t) therefore 100 kg N fixed per year is potentially worth $8.20/ha in saved fertiliser costs.

Provides better use of summer rainfall (as opposed to having summer weeds grow and require control).

Provides out of season feed, especially the autumn feed gap – already established so will get going quicker.

The interest in livestock enterprises has risen following the increase in sale value of livestock for meat and with the demise of the wool stockpile. Also contributing has been the introduction of dual purpose breeds e.g. SAMM Merinos and composite breed cattle, and the increased use of on-farm feedlots for finishing.

Trees approx $180 to $700/ha to establish with no commercially viable short-term markets (Farm Budget Guide 2004);
Lucerne approx $80 to $120/ha with variety of potential end uses – grazing (as mentioned), seed production, fodder (pers comm. K. Devenish, DAWA)

**Point 6:**

Lucerne has been observed to get the taproot down to 8 m in optimal soil types but is more likely to be restricted to 1.5–2 m in most WA soils (Tennant, Farming Systems to Manage Salinity Research Results 2001, page 28).

Extracts more water than annuals, especially over summer when atmospheric demand is highest.

Well documented that watertables have risen under dryland agriculture in WA since clearing – some areas averaging 30 cm rise per year (pers comm. S. Ghauri, DAWA).

Can be used to create a water buffer in phase cropping.

Research by Tennant (Farming Systems to Manage Salinity Research Results 2001), indicated that lucerne could take an extra 118 mm of water out of the soil profile, compared to annual crops in Merredin. Similarly, Latta et al. 2000; Lyons et al. 2000; Dolling 1999 (Western Australian Lucerne Growers Lucerne Newsletter Dec 2003) found that lucerne used up to 130 mm more stored soil moisture than a sub-clover pasture at Borden.

This means that during opening rains, the soil can store a significant amount more water before saturation is exceeded and either run-off (→ surface water management issues) or drainage (→ watertable issues) occurs.

<table>
<thead>
<tr>
<th>Plant type</th>
<th>PT*</th>
<th>RD**</th>
<th>%RU***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual pastures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- sub-clover</td>
<td>0.5</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>- serradella</td>
<td>2.0</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Lucerne</td>
<td>7.0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Mallee scrub</td>
<td>20.0</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

*Plant type  
**Rooting depth (m)  
***% Rainfall used
It is easy to see the years in the rotation that lucerne was established e.g. 1966–68, 1984–88.

In the wet year of 1974, the amount of leakage under wheat after a lucerne rotation was around 100 mm less.

Conversely, a year like 1993 saw the profile fill up quicker than expected.

Overall, there is less cumulative leakage under lucerne than under wheat.

Around a 20% reduction in soil water content under lucerne based pasture than an annual crop – even though canola is described as having a similar root structure.

There will always be fluctuations in watertable readings; however, the more important thing to note is the treated watertable is always lower than the untreated watertable.

Some WA farmers who utilise a strategic lucerne rotation use watertable monitoring to complement their decision when to get into or get out of lucerne.

This is the Leakage Calculator for the Central Wheatbelt, currently being developed by Paul Raper, DAWA. Progress is being made on several versions, specific to different locations throughout the agricultural region of WA. There are full page versions of this slide, the input and output slides in the appendix for follow up if there is interest.
**Slide 14**

<table>
<thead>
<tr>
<th>Questions:</th>
</tr>
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<tbody>
<tr>
<td>• Define leakage</td>
</tr>
<tr>
<td>• On average, % leakage under lucerne is around -</td>
</tr>
<tr>
<td>a) 0-1%</td>
</tr>
<tr>
<td>b) 0-10%</td>
</tr>
<tr>
<td>c) 30-40%</td>
</tr>
<tr>
<td>• Another benefit of lucerne is…?</td>
</tr>
</tbody>
</table>

**Point 1:**

**Leakage** is defined as “the movement of water from a localised watertable, due to saturation, to the regional watertable.” Best considered as a bucket that is filled to capacity and overflows into another bucket.

**Point 2:**

b) 0-10%

**Point 3:**

b) 0-10%

**Point 4:**

You forego opportunities to grow crops for income, e.g. in the order of $150/ha for average yield wheat, for the life of the lucerne. However, this may certainly be recouped through N benefits, reduced weed competition, less pest and diseases and more years of cropping in the phase rotation.

**Point 5:**

In dryland areas, the benefits of lucerne really take 3–5 years to take effect; it is too expensive to establish for 1:1 cropping (WALG).

**Point 6:**

Very sensitive as a seedling, and will not reach production potential as a mature plant if salinity and/or waterlogging present (there will always be a couple of situations that contradict this advice!). Lucerne basically stops growing around 20 mS/cm soil salinity (Success with Lucerne Manual).

“If you can’t grow a crop on the site, lucerne is not a choice”

**Point 7:**

Removal of lucerne can be just as hard as establishment and usually requires a combination of chemical and physical removal for best results. Chemical is usually via...
glyphosate spiked with 2,4-D ester/amine sprayed onto actively growing plants. Physical
is either cultivation by a plough – to chop the crowns off the taproot – or set grazing by
lightly stocking @ 1-3 DSE over summer to run down the energy reserves of the plants
over time (K. Devenish, Dryland Lucerne Information Booklet 2001).

Yield depressions in the crops following lucerne has been observed in recent years –
think year 2002 – where lucerne has extracted the stored soil moisture without it being
replenished by winter rainfall. This has been observed in several trials e.g. Latta &
Devenish, Crop Updates 2002 (wheat after lucerne yielded 0.2 t/ha less than wheat after
an annual pasture). Devenish (Crop Updates 2004), observed a 10–82% reduction in
yields.

Point 6:

Of more issue to following legume and pulse crops. For example, phoma leaf spot has
been detected in several lucerne stands throughout WA and this has yield implications
for pea crops (FSTMS research results 2002, 2003). Similarly, lucerne may allow insect
vectors, such as aphids, to survive over summer and so increase the chance of viruses
like bean leaf roll to multiple earlier in the season than previously seen (FSTMS
research results 2003).

Point 7:

Lucerne’s real value depends on it ability to convert summer rainfall into green biomass;
good stands have the ability to produce 1 t/ha of biomass in 2-3 weeks after a significant
summer rainfall event (Latta, Crop Updates 2003). Otherwise it will go dormant and act
similar to an annual pasture species.

Point 8:

As mentioned, lucerne is a weak seedling and so requires careful management in its
first year. It is generally recommended that lucerne is not grazed in order to allow the
taproot to grow. Rule of thumb is a 1 m taproot will allow the plant to survive over its first
summer. If grazing is required, grab some plants and tug at them. If they cannot be
pulled out, they should tolerate a light grazing with strict management (Success with
Lucerne Manual).

Rotational grazing will allow the lucerne plant to recover and provide new shoots for the
next session of grazing. Set stocking will cause the energy reserve to be run down and
eventually produce no more shoots (K. Devenish, Dryland Lucerne Information Booklet).

Point 9:

Bloat – rare, mainly occurs in cattle grazing lush lucerne stands without adequate
roughage available
Pulpy kidney – rare, could lose stock due to change in quality of feed source. Vaccine
Red gut – minor problem in sheep grazing lush stands of lucerne
Pizzle rot – mainly wether sheep due to higher N content in their urine
Reproductive disorders – rare, requires plants to be stressed to produce large quantities
of plant oestrogens
Sheep 2001).
Common myths about lucerne

- Dryland lucerne can be grown for hay
- Lucerne tolerates salinity
- Taps into the watertable and pumps water
- Overcome problems with high seeding rate
- Can be sown dry
- Seed doesn't need to be inoculated
- OK to use lupin herbicides in first year (e.g., simazine, atrazine)

Point 1:

In dryland areas (>500 mm rainfall), it is recommended that lucerne not be established for hay production unless in an area of abundant soil moisture. Hay, however, may be cut opportunistically in a wetter than average year (K. Devenish, Dryland Lucerne Information Booklet 2001).

Point 2:

As in previous slide, lucerne is very susceptible to salinity as a seedling and does not reach maximum production potential as a mature plant. The odd plant may survive in a niche situation, but the rule of thumb is if you can’t grow a barley crop there, you can’t grow lucerne successfully.

‘Why grow it when there are better adapted annual legumes and perennial grasses?’

Point 3:

Lucerne, like most plants, will not tolerate ‘wet feet’ due to the anaerobic conditions that cause root death. The roots will grow as far as the capillary fringe (above the watertable).

The difference in water use figures between annuals and lucerne is that lucerne grows during the summer when atmospheric demand is greatest. This also applies to the native vegetation.

Point 4:

Lucerne is a small seed, approximately 500,000 seeds/kg, with germinability around 98%. Stand production and persistence can not be overcome by increasing the seeding rate of lucerne. Research by Fedorenko et al. (FSTMS Research Results 2002, 2003) has shown that there is no significant difference in biomass production between 3 stands sown at 2, 4 & 8 kg/ha (1.88, 1.95 & 1.93 t/ha annual respectively). This has been found in trial work by Latta, Devenish, Dawson and others.

The exceptions are low germination percentage or lack of seeding depth control in the establishment equipment. A general rule of thumb is that a lucerne stand will thin out according to rainfall. In the Southern Agricultural Region (south of Great Eastern Highway), the rule of thumb is around “1 plant/inch rainfall in a square metre”, whereas the Northern Agricultural Region will be less than this due to the shorter growing season (K. Devenish, pers comm 2004).
Point 5:

Seed has no dormancy so do not sow dry unless high probability of rainfall within 48 hours

Point 6:

Lucerne has its own specific rhizobia – Group AL – and seed should be inoculated & lime pelleted if lucerne is to be established into a paddock that has not had lucerne before! (Success with Lucerne Manual, Dryland Lucerne Information Booklet)

Point 7:

Lucerne, being a legume, is very sensitive to chemicals that affect lupins, especially atrazine and simazine which have residual carryover.

Slide 17

Review

Questions:
- List 4 benefits of lucerne
- ...
- List 4 limitations of lucerne
- ...

Point 1:

Replace annual pasture with perennials
Good feeling - helping out Landcare
Fits into the phase cropping system
Immediate product - grazing value all year
Cheaper to establish than trees
Water use is next best after mallee scrub

Point 2:

Expensive to establish
Opportunity costs
Committed to longer term (3-5 years)
Does not tolerate salinity or waterlogging
Can be hard to remove
Can depress yield of following crop
Green bridge for disease and pests
Success depends on summer rainfall
Grazing management needs to be spot-on
Potential animal health problems

This is a chance to discuss lucerne informally during a quick break to allow the participants to stand up and stretch!

Slide 18

Lucerne basics

Factors to consider:
- Winter Activity Rating (WAR)
- Landscape location
- Soil type
- Waterlogging
- Salinity
- Rainfall

Point 1:

WAR determines persistence of the stand

Point 2:

Suitable landscape locations give the best chance of establishment and persistence
Point 3:
Soils without restrictions to root growth increase the chance of a persistence and productive lucerne stand.

Point 4:
Soils that are prone to waterlogging are not the best choice of site.

Point 5:
Saline soils inhibit germination and persistence due to the extra energy required to keep salt out of the roots which could be used to develop reserves for harder times.

Point 6:
Rainfall patterns and probability give a good indication if lucerne has a chance of persisting in your area.

Note: Participants Notes will not have the next six slides, they have two summary slides (Slide 25 & 26) instead that will not be displayed during the presentation.

Slide 19

Winter Activity Rating (WAR)

1-2

- "Winter-dormant"
- Dormancy is caused by shortening daylight hours
- Produces less feed than the higher WARs in autumn and spring
- Longest persistence due to crown structure
- Not favoured for dryland establishment
- Example: “Jindera” WAR 1-1.5

Slide 20

Winter-dormant varieties have a dormant period, usually started by shortening daylight hours. Growth during this period virtually stops. They have less winter vigour and so are less suited to sowing in the cooler months. These varieties provide less feed at the critical autumn–early winter period, so are not favoured as dryland varieties (Success with Lucerne Manual).

Flat crown structure so does not stand erect to the same degree as the higher WAR varieties
**Slide 21**

**WAR 3-5**

- "Semi winter-dormant"
- Better autumn and spring growth than winter-dormant varieties
- Short dormancy period in mid-winter
- Better persistence when set grazing has to be used
- Example: "Hunter River" WAR 5

Semi-dormant varieties have better autumn and spring growth than winter-dormant varieties. They have broader crowns which sit lower in the ground compared to more active varieties. These varieties have only a short dormancy period in mid-winter. Where strict rotational grazing is not possible, these varieties may persist better than those with more activity (Success with Lucerne Manual).

Includes some of the original varieties bred in Australia

**Slide 22**

**WAR 6-8**

- "Winter-active"
- Growth slows in winter, but they never become dormant
- Faster recovery after cutting or grazing
- Preferred for dryland establishment
- Example: "Genesis" WAR 7

Winter-active varieties slow down in growth during the cold winter months, but they never become dormant. They will recover faster after cutting or grazing than dormant varieties (Success with Lucerne Manual).

Point out more erect crown and biomass compared to WAR 1-2 and 3-5 groups.

**Slide 23**

**WAR 8-10**

- "Highly winter-active"
- Greater growth than semi-dormant varieties in late autumn and early spring
- Needs to be strictly rotationally grazed to ensure persistence
- Example: "Pioneer L69" WAR 8

Highly winter-active varieties also have slower growth in winter but are highly active in late autumn and early spring. Varieties commonly have narrow crowns which sit above ground level, making them more vulnerable to grazing damage. Most Australian-bred varieties however have retained good grazing tolerance (Success with Lucerne Manual).

**Slide 24**

**WAR 8-10**

- Similar to WAR 8-9 varieties
- Very productive but has poor persistence
- Only recently been added to the winter activity scale
- Example variety: "Rippa" WAR 10

Very highly winter-active lucerne varieties are currently very productive but have poor persistence. They are well suited to short rotations (2–4 years) and require careful grazing management to maximise persistence. This category has only recently been added to the winter activity scale (Success with Lucerne Manual).
Note: Slide to go into Participants Notes as full page rather than Slides 19-24 (will not be displayed in the presentation). It is also inserted as a full page appendix in the Facilitators Notes.

**Slide 25**

**Winter Activity Rating (WAR)**

- 1-2: Winter-dormant
- 3-5: Semi winter-dormant
- 6-8: Winter-active
- 8-10: Highly winter-active

Source: Success with Lucerne Manual

Note: Slide to go into Participants Notes as full page rather than Slides 19-24 (will not be displayed in the presentation). It is also inserted as a full page appendix in the Facilitators Notes.

**Slide 26**

**WAR Summary Table**

<table>
<thead>
<tr>
<th>WAR</th>
<th>Dormancy</th>
<th>Persistence</th>
<th>Production</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Winter-dormant</td>
<td>High</td>
<td>Low</td>
<td>Jinders</td>
</tr>
<tr>
<td>3-5</td>
<td>Hunter River</td>
<td>Genesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>Genesis</td>
<td>Pioneer L69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-10</td>
<td>Winter-active</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

Note: Slide to go into Participants Notes as full page rather than Slides 19-24 (will not be displayed in the presentation). It is also inserted as a full page appendix in the Facilitators Notes.

**Slide 27**

**Landscape locations**

Not applicable to WA

(This slide will not be displayed in the presentation)

**Slide 28**

Newly-sown lucerne on deep sand in spring

Sowing lucerne into deep sand is not recommended in WA

(This slide will not be displayed in the presentation)

**Slide 29**

Note: Sowing into deep sand is generally not recommended in WA
Showing the taproot of lucerne. In favourable soil types, such as this sandy loam, lucerne taproots have been reported to reach more than 8 m. More common for good soil types in WA is 2.5–3 m while restrictive soil types – think duplexes – may limit the taproot to the depth that an annual species can explore (Tennant, FSTMS Research results 2001).

The root structure has two distinct purposes – the fibrous (shallow) roots are to capture subsurface water and nutrients and in turn allow lucerne to produce biomass. The taproot is designed to store reserves of energy (as carbohydrates) but more importantly to explore the deeper soil profile for water to maintain the plant during summer or drought periods (S. Dawson, WALG).

**Slide 30**

![Landscape locations](image)

**Note:** Slide to go into Participants Notes as full page slide. It is also inserted as a full page appendix in the Facilitator's Notes

**Slide 31**

![Soil Characteristics](image)

Soil properties can influence the difference between a productive stand and surviving stand of lucerne. e.g. Boundaries pH down the profile Water-holding capacity Texture Nutrient availability Oxygen availability

**Slide 32**

![Excellent lucerne stand on hill slope](image)

**Slide 33**

![Lucerne on magnesia patch](image)

**Note:** Specific to SA situations, especially on the Eyre Peninsula (This slide will not be displayed in the presentation)
Lucerne is not tolerant of waterlogging at all! Soil that is constantly saturated, or has a fluctuating high watertable, will cause the lower roots to rot, severely weakening the plant by making it prone to disease. So the message is that the soil needs to be free draining. (Dryland Lucerne Information Booklet 2001, Success with Lucerne Manual)

Soil indicators of waterlogging:
- Bleached A-B horizon boundary (as in photo)
- Mottled B horizon
- Oozing water etc.

Shows the role of niche plant adaptation with the potential complementary roles that a perennial grass and perennial legume could have.

As can be seen in the table, the soil salinity level only needs to be around 9 mS/cm for lucerne yield to decrease by 50%, whereas barley can tolerate around that level without yield penalty. This varies between soil types and rainfall regions (Dryland Lucerne Information Booklet 2001, Success with Lucerne Manual).

An exception rather than the rule – you would need to be very confident for this to work. Suspect it could work in a wet year but would not happen in a dry year.
On average, 30% of any district’s annual rainfall falls outside the traditional growing period of May–October. This is where lucerne can convert it into useful feed rather than growing summer weeds (requiring control) or losing any remaining pasture/stubble nutritional value (requiring hand feeding).

Use rainfall recording station ‘closest’ to the workshop site as the example e.g. Mingenew – closest is Mullewa rainfall recording station
45% chance of getting up to 25 mm rainfall between December and April
24% chance of getting 25–50 mm rainfall between December and April
11% chance of getting 50–75 mm rainfall between December and April
20% chance of getting greater than 75 mm rainfall between December and April

Point 1:
Winter Activity Rating (WAR)
Soil type
Waterlogging
Salinity
Rainfall

Point 2:
Utilise more rainfall, especially summer rainfall events
Provide high quality feed throughout the year
Potential use for hay/silage
Recover leached nutrients
Increase productivity
Allow for integrated herbicide management using grazing & spray-topping
Bridge the autumn feed gap reducing the need to hand-feed
plus many others

Short break – recommence in 15 minutes
- Expect questions
- Tea/coffee break
- Prepare for next presentation
6. How to make lucerne work for you

Purpose: To discuss how to use lucerne in a farming system and the $$ required to do it.

Suggested approach:

Presentation 3 - Making Lucerne Work for You

Duration: 15 minutes (S+95 to S+110)

Slide 2

Overview

Purpose: To discuss how to use lucerne in a farming system and the $$ required to do it

Areas covered:
- Systems
- Hypotheticals
- ID costs
- Case study site

Slide 3

Dryland Lucerne

Two main systems:
1. Phase lucerne (2-4 years pasture)
   - use highly winter-active varieties
   - WAR 8 - 10
   Possible crop rotations:
   - 3 years lucerne-wheat-canola-wheat-barley
   - 2-3 years lucerne-wheat-wheat-barley
2. Longer term (5-10 years)
   - use winter-active varieties
   - WAR 6 - 8

Do not use lower WAR varieties unless irrigated, as the lower WAR varieties' persistence is not good in dryland systems (pers comm. Kathi Davies, DAWA)

Slide 4

Lucerne in the farming system

- Lucerne is used in two farming systems
  - long term stands
  - short term stands

Slide 5

Long-term stands

- Persist for a minimum of five years
- Used primarily for grazing, but can also be used in fodder conservation and seed production
- Productive stands have persisted in excess of 20 years
- Inter- or over- cropping
**Slide 6**

**Short-term stands**
- Used in farming systems
- Need only persist for 3 to 4 years
- Build up nitrogen reserves
- Allow for effective weed control
- Restore the water balance

**Note:** Participants Notes will not have Slides 8 & 10, but will have Slides 9 & 11 with blank sections under ‘Introducing Lucerne can/could:’ that will not be displayed during the presentation.

**Slide 7**

**Where could lucerne fit into various farming systems?**
- Let’s discuss the scenarios!
- High rainfall with livestock enterprise and
- Low-medium rainfall mixed enterprises

**Note:** To encourage participation, use this slide to prompt for verbal ideas of how could lucerne be used.

Don’t go to next slide until a couple of ideas have been offered!

**Slide 8**

**High Rainfall livestock**

**Current situation:**
- Longer annual growing season
- Less salinity
- More waterlogging

**Introducing lucerne can:**
- Utilise more rainfall
- Provide high quality feed throughout the year
- Potentially be used for hay/silage
- Recover leached nutrients
- Increase productivity

Note: Participants Notes will not have the 5 points under ‘Introducing lucerne can:’

**Slide 9**

**High Rainfall livestock**

**Current situation:**
- Longer annual growing season
- Less salinity
- More waterlogging

**Introducing lucerne can:**
- ...
- ...
- ...
- ...
- ...

Note: Slide to go into Participants Notes rather than slide 8 (will not be displayed in the presentation)
Slide 10

**Low - Medium Rainfall mixed enterprise**

Current situation:
- Increased threat of land going saline
- Increasing herbicide resistance
- Autumn feed gap
- Reduced feed quality after summer rainfall

**Introducing Lucerne could:**
- Utilise more rainfall, especially summer rainfall events
- Allow for integrated herbicide management using grazing & spraytopping
- Bridge the autumn feed gap reducing the need to hand feed

Note: Participants Notes will not have the three points under 'Introducing lucerne could:'

Slide 11

**Low-medium rainfall mixed enterprise**

Current situation:
- Increased threat of land going saline
- Increasing herbicide resistance
- Autumn feed gap
- Reduced feed quality after summer rainfall

**Introducing lucerne could:**
- 
- 
- 

Note: Slide to go into Participants Notes rather than slide 10 (will not be displayed in the presentation)

Slide 12

**Example of costs/ha ($) for pure lucerne versus alternate-row lucerne and barley**

<table>
<thead>
<tr>
<th></th>
<th>Pure lucerne pasture</th>
<th>Alternate-row lucerne &amp; barley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicide Glyphosate</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Lucerne seed</td>
<td>3 kg</td>
<td>27</td>
</tr>
<tr>
<td>Barley seed</td>
<td>40 kg</td>
<td>0</td>
</tr>
<tr>
<td>Superphosphate</td>
<td>90 kg</td>
<td>25</td>
</tr>
<tr>
<td>Urea</td>
<td>50 kg</td>
<td>24</td>
</tr>
<tr>
<td>Trifluralin</td>
<td>1.5 L</td>
<td>10</td>
</tr>
<tr>
<td>Seeding cost</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Bare earth insecticide</td>
<td>85 mL</td>
<td>6</td>
</tr>
<tr>
<td>Broadleaf Jaguar</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Harvesting</td>
<td>1.25 @ $110</td>
<td>-143</td>
</tr>
<tr>
<td>Total</td>
<td>$36</td>
<td>$1</td>
</tr>
</tbody>
</table>

Note: Insert a local example for the case study

Slide 13

**Dryland lucerne development budget**

<table>
<thead>
<tr>
<th></th>
<th>Dollars per hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishment</td>
<td>9.50</td>
</tr>
<tr>
<td>Spray-topping</td>
<td>107.60</td>
</tr>
<tr>
<td>Maintenance</td>
<td>16.50</td>
</tr>
<tr>
<td>Superphosphate</td>
<td>3.00</td>
</tr>
<tr>
<td>Pest control</td>
<td>16.50</td>
</tr>
<tr>
<td>Weed control</td>
<td>3.00</td>
</tr>
<tr>
<td>Livestock enterprise</td>
<td>30.00</td>
</tr>
<tr>
<td>Vegetable enterprise</td>
<td>30.00</td>
</tr>
<tr>
<td>Farming</td>
<td>50.00</td>
</tr>
<tr>
<td>Piling</td>
<td>60.00</td>
</tr>
<tr>
<td>Trimming</td>
<td>70.00</td>
</tr>
<tr>
<td>Development loan</td>
<td>10.00</td>
</tr>
<tr>
<td>Interest</td>
<td>20.00</td>
</tr>
<tr>
<td>Principal</td>
<td>8.00</td>
</tr>
<tr>
<td>Total</td>
<td>39.50</td>
</tr>
<tr>
<td>Income</td>
<td>78.00</td>
</tr>
<tr>
<td>Total income</td>
<td>78.00</td>
</tr>
<tr>
<td>Balance</td>
<td>38.50</td>
</tr>
<tr>
<td>Cumulative balance</td>
<td>38.50</td>
</tr>
</tbody>
</table>

Note: This slide will be a full page slide in the Participants Notes and as an appendix for the Facilitators Notes

Slide 14

**Case study**

Farmers: Robert & Vicki Beard
System: Mixed farming
- Cropping wheat, lupins & field peas
- AMS Merinos on subclover & serradella pastures
Annual rainfall: 325 mm
Growing period (May-Oct): ~225 mm
Soils: Grey clays, duplex & sandplain, all with shallow topsoil
pH: 4.8-6.0
Why considering lucerne:
- Contain salt spread upslope
- Increase productivity of Merino flock

Note: Insert a local example for the case study
Slide 15

Case study

Note: This slide will be a full page slide in the Participants Notes (insert a local example for the case study – a Digital Elevation Map is useful)

Slide 16

Review

Questions?

Activity 1:
- Use the lucerne site selection check and map to start on selecting potential locations for lucerne in the selected paddocks

Activity 2:
- Use the lucerne establishment costs budget to get a feel for the cost of establishment

Short break – recommence in 15 minutes
- Expect questions & encourage participants to try the activities
- Tea/coffee break
- Prepare for next presentation
7. The Nuts and Bolts of Establishment

**Purpose:** To present to the participants the factors required for successful lucerne establishment in your farming system.

**Presentation 4 - The Nuts and Bolts of Establishment**

**Slide 2**

**Overview**

**Purpose:** To cover the factors required for successful lucerne establishment in your farming system.

**Areas covered:**
- Variety suggestions
- Seeding rate and companion cropping
- Seed preparation and feeding
- Seedbed preparation
- Equipment set-up
- Herbicides (pre-em and post-em)
- Insect & pest control
- Time of sowing

**Slide 3**

**Possible varieties to use**

<table>
<thead>
<tr>
<th>WAR 6-10</th>
<th>WAR 6-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlty winter-active</td>
<td>Winter-active</td>
</tr>
<tr>
<td>Rippon</td>
<td>Genesis</td>
</tr>
<tr>
<td>Pioneer L90 &amp; L69</td>
<td>Trifecta</td>
</tr>
<tr>
<td>Sceptre</td>
<td>Quadrella</td>
</tr>
<tr>
<td>Sequel HR</td>
<td>Hallmark</td>
</tr>
<tr>
<td>Aquarius</td>
<td>Aurora</td>
</tr>
<tr>
<td>Eureka</td>
<td>Hunterfield</td>
</tr>
<tr>
<td>Salado</td>
<td>WL414</td>
</tr>
<tr>
<td>SARDI 10</td>
<td>Flinders</td>
</tr>
<tr>
<td>WL612 &amp; 525 HQ</td>
<td>SARDI 7</td>
</tr>
</tbody>
</table>

**Note:** This slide is not going to be used in WA as we are not going to promote particular varieties. Refer to the WALG variety guide on the next slide (to be inserted into Participants Notes as full page)

More new varieties are being developed all of the time so check with your local supplier. Be aware that new varieties are subject to Plant Breeders Rights and so will cost more than old, public trade varieties.

Since most producers are looking for persistence of their stand for a phase, dryland lucerne really should be WAR 6 and above.

**Slide 4**

**WALG variety guide**

**Source:** WALG

**Note:** This is the 2004 variety guide and may change in future years. There will be a full page of this slide in the appendix of the Facilitators Notes.
Point 1:
The percentage germinability of the seed should be part of the certification label on the bag.

Point 2:
Failure to emerge is primarily due to two things –
1. Lack of moisture (which you can’t control) or
2. Seeding too deep (which you can control!).

Point 3:
Establishment failure is usually due to plant density, lack of moisture or failure to inoculate with the rhizobia.

Emphasise the Group AL inoculum!

This photo really shows what you want to achieve by a healthy plant – many nodules on the root system.
2002 was a good example of when pure lucerne stand establishment did better than alternative row (Source: Dawson, WANTFA trial 2002).

Note: SA specific

Note: Supporting information for slide 9 (will not be displayed in the presentation)
Slide 13

**Nutrition - suggested rates**

- All rates depend on soil availability - SOIL TEST!
- Phosphorus: 10 to 20 kg P/ha
- Potassium: 20 to 30 kg K/ha
- Sulphur: 10 to 20 kg S/ha
- Trace elements: Copper, molybdenum, manganese and zinc are most common required

Consider the cost of soil testing versus the application of a basal rate of these nutrients as fertilisers, especially for the establishment budget.

*Worth getting rough figures for these costs, say only having to apply 75% of the rates listed above.*

---

Slide 14

**Nutrition and soil pH**

- Check soil pH
- Lime pellet seed
- Apply lime when pH too low
- Check pH down soil profile

*Note: Supporting information for slide 15 (will not be displayed in the presentation)*

---

Slide 15

**Liming options**

The use of lime pelleting in lucerne establishment in WA is always recommended as it provides a less hostile environment around the seed for the rhizobia to colonise the roots as well as improving the flow of the seed down the tubes. It is a cheap 'insurance' policy!

Again, emphasise soil testing to help out – it will help with consideration of the cost of liming (product + transport + spreading).

---

Slide 16

**Lime requirements**

<table>
<thead>
<tr>
<th>Soil type</th>
<th>t/ha lime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>1.0–2.0</td>
</tr>
<tr>
<td>Sandy loams</td>
<td>2.5–3.5</td>
</tr>
<tr>
<td>Loams–clay loams</td>
<td>3.5–4.0</td>
</tr>
</tbody>
</table>

*Source: Success with Lucerne Manual*

*Note: Supporting information for slide 15 (will not be displayed in the presentation)*
Slide 17

Seed-bed preparation

- Fallow period prior to sowing of 3 to 6 weeks
- Rhizoctonia
- Seedling damping-off
- Good soil/seed contact
- Sow shallow (10 to 15 mm)

If the paddock has had a history of either rhizoctonia or seedling damping-off, it is crucial to have the fallow period to break the cycle of both diseases.

General message – don’t sow lucerne too deep! Keep to less than 15 mm depth as the seed doesn’t store enough energy to penetrate from deep in the soil to the surface. If lucerne has to be planted deeper than 15 mm to reach moisture then seriously reconsider your time of seeding – wait until the top 15 mm are moist again.

The next couple of slides will show the basic features of good equipment setup to ensure good seeding practice.

Slide 18

Note: Supporting information for slide 17 (will not be displayed in the presentation)

Slide 19

Seeding equipment set-up

Source: Gason <www.gason.com.au>

Use a small seed box or the canola meter for accurate seed rates

Press wheels give the best seed to soil contact of any following apparatus (e.g. harrows, chains etc).

Knife points allow for precision depth control and also minimise soil throw which can cover seeds with too much soil.
Coulters out front are a good investment to ensure any remaining stubble is chopped and can't 'hairpin' in the furrow. (Hairpin is where stubble is wedged into the furrow but then flicks itself out and disrupts seed to soil contact.)

**Note:** Specific to SA situations, lucerne establishment in sandy soils is not recommended in WA (This slide will not be displayed in the presentation)

Lucerne is a very weak seedling and exceptionally prone to wind erosion.

**Note:** Specific to SA situations, lucerne establishment in sandy soils is not recommended in WA (This slide will not be displayed in the presentation)

Clay spreading is a soil amelioration technique to overcome water repellence on sandy soils.

**Note:** Specific to SA situations, lucerne establishment in sandy soils is not recommended in WA (This slide will not be displayed in the presentation)

Tips to increase the success of establishment:
1. Sow in furrow, not on the ridge.
2. Sow on the contour to water harvest.
3. Apply wetting agents in the furrow.
Note: Specific to SA situations, lucerne establishment in sandy soils is not recommended in WA (This slide will not be displayed in the presentation)

Note: Specific to SA situations, lucerne establishment in sandy soils is not recommended in WA (This slide will not be displayed in the presentation)

Note: Specific to SA situations, lucerne establishment in sandy soils is not recommended in WA (This slide will not be displayed in the presentation)

Weed control is one of the most critical agronomic factors that determines the establishment of a good lucerne stand. It is basically the biggest cost in the establishment budget.

“One year ahead preparation is an absolute minimum, three years is better!”
Silver grass is a severe competitor.

**Slide 31**

<table>
<thead>
<tr>
<th>Date</th>
<th>Control</th>
<th>Paraquat 750 mL</th>
<th>Spring Seed</th>
<th>Glyphosate 1 L</th>
<th>% Reduction</th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper</td>
<td>November</td>
<td>December</td>
<td>October</td>
<td>November</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No spray</td>
<td>22 31</td>
<td>25 34</td>
<td>21 33</td>
<td>25 32</td>
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<td></td>
<td></td>
<td>35 39</td>
<td>7</td>
</tr>
</tbody>
</table>

**Effect of spray-topping on plant density for newly-established lucerne - Wongan Hills 2001**

Conclusions:
- Newly-established lucerne was tolerant to paraquat.
- Not tolerant to glyphosate.

Lucerne can be winter cleaned with paraquat. However, if you only have glyphosate on hand, use very low rates and expect the lucerne to be knocked back for a couple of weeks!

**Slide 32**

As mentioned before three years planning ahead is preferable to one year – weed control costs can be minimised by coming out of a cropping phase with good weed control.

**Slide 33**

Insect and pest control

- Redlegged earth mite
- Lucerne flea
- Culex
- Brown pasture loopers
- Blue green aphid
- Spotted alfalfa aphid
- Wingless grasshopper
- White fringed weevil
- Sitona weevil

Damage time:
- Germination to spring
- Plant emergence to spring
- Winter–spring
- Spring–summer

Both blue green aphid (BGA) and spotted alfalfa aphid (SAA) are active in above-normal warmer conditions, e.g. a dryer start to the season may encourage BGA & SAA population growth earlier than spring–summer. However, most of the new varieties of lucerne are being bred with resistance to BGA & SAA.

Like annual pastures, close observation of newly established lucerne is critical to prevent insect & pest damage.

Insect and pest control needs to be factored into the establishment budget as it can become a significant component of the costs.
Bare earth insecticide is the best policy for lucerne flea and redlegged earth mite (RLEM); failing that, try hard grazing or mechanical removal (slasher, baler).

This is a summary of the cream of WA’s trials, demonstrations and observations by members of Western Australian Lucerne Growers (WALG) and key Department of Agriculture employees.

Expect the most seedling losses in the first summer, so consider the seeding rate and cost of seed when the final density will come to what can be sustained by the site.

*Rule of Thumb – “1 plant per inch of rainfall per square metre”; less in Northern Agricultural Region*

These are WA trial results courtesy of K. Devenish, Department of Agriculture, Crop Updates 2004.

Lucerne plant numbers decline significantly after 3 months without rain.

Lucerne persisted longer when not grazed or when grazed by cattle (as compared to sheep).

*Risk of failure from dry season much higher in northern half of the wheatbelt.*
There are farmers who make it work by good management and light grazing.

Lucerne stands will naturally thin out to a sustainable density e.g. 46 plants 1st year, down to 18 plants 2nd year, to 10 plants 3rd year. 10 plants per square metre has still proven to be viable.

**Slide 39**

- Questions?
- Case study...
- What seeding rate is best for this area?
- Can you use existing equipment?
- Do your herbicide choices increase or decrease?

**Short break – recommence in 15 minutes**
- Expect questions
- Tea/coffee break
- Prepare for next presentation
8. Utilisation of lucerne

**Purpose:** To present to participants the factors required for successful lucerne utilisation in their farming system.

**Presentation 5 - Utilisation**

**Duration:** 45 minutes (S+175 to S+220)

---

**Slide 2**

**Overview**

- **Purpose:** To cover the factors required for successful lucerne utilisation in your farming system.
- **Areas covered:**
  - Lucerne growth stages,
  - Target densities,
  - Rotational grazing strategies for cattle & sheep,
  - Seasonal value, and
  - Production targets.

---

**Slide 3**

Once established, lucerne grazing should be carried out once secondary growth reaches 20-50 mm high, approximately 5-6 weeks when moisture is not limiting.

---

**Note:** Participants Notes will not have Slides 4-6, 8, 10 & 11; they will have one summary slide (Slide 13) instead that will not be displayed during the presentation.

---

**Slide 4**

---

---
Slide 5

1-2 plants/m² -- Poor stand, but in a dry season will be nearly as productive as a thick stand.
Source: Success with Lucerne Manual

Slide 6

6-7 plants/m² -- Moderate stand, but will not be capable of top production in a wet year and will not achieve optimal nitrogen buildup.
Source: Success with Lucerne Manual

Slide 7

Merredin - <5 plants/m²
sown 1999, photo taken June 2001
Source: K. Devenish, DAWA

Slide 8

6-15 plants/m² -- Good stand particularly in lower rainfall districts (300-375 mm annual rainfall). Capable of achieving top production in a wet year and good competition with summer weeds.
Source: Success with Lucerne Manual

Slide 9

Sometimes this is as good as it gets
Source: K. Devenish, DAWA
Slide 10

Second year lucerne 22 plants/m²
- note the salt affect in background

Source: K. Devenish, DAWA

Slide 11

Second year lucerne 22 plants/m²
- note the salt affect in background

Source: Success with Lucerne Manual

Slide 12

Source: Success with Lucerne Manual

Slide 13

Target plant densities summary

<table>
<thead>
<tr>
<th>Plants/m²</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>Poor stand, low production and nitrogen fixation</td>
<td></td>
</tr>
<tr>
<td>5–10</td>
<td>Reasonable stand, productive in wet years</td>
<td></td>
</tr>
<tr>
<td>10–15</td>
<td>Minimum target stand for &lt;400 mm zone, productive all year and competitive with summer weeds</td>
<td></td>
</tr>
<tr>
<td>&gt;15</td>
<td>Excellent stand for &lt;400 mm zone, highly productive and very competitive with summer weeds</td>
<td></td>
</tr>
</tbody>
</table>

Note: Full page slide to go into Participants Notes rather than Slides 4-6, 8, 10 & 11. Will also appear as a full page slide in the appendix of Facilitators Notes. This slide will not be displayed in the presentation.

Slide 14

Stock water considerations

<table>
<thead>
<tr>
<th>Water quality</th>
<th>ppm or mg/L</th>
<th>dS/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0–500</td>
<td>0–0.8</td>
</tr>
<tr>
<td>Safe</td>
<td>500–1500</td>
<td>0.8–2.4</td>
</tr>
<tr>
<td>Unsuitable</td>
<td>&gt;1500</td>
<td>&gt;2.4</td>
</tr>
</tbody>
</table>

Source: Success with Lucerne Manual

Make sure the stock water is of safe to good quality to maximise growth rates!
Graph slightly incorrect – winter-dormant varieties do not produce more biomass than winter-active varieties during summer as both are governed by the amount of water available.

Most of the winter-dormant varieties don’t produce half the biomass even in summer that the winter-actives do as they are generally smaller types with less production anyway (pers comm Kathi Davies, DAWA)

This graph shows the ability of established lucerne to match the pasture growth rates of annuals as well as the pasture growth rates when summer rainfall occurs – this the real benefit of lucerne!

Both annuals and lucerne provide similar levels of nutritional value after the break of the season but it is lucerne that provides nutritional value when the annuals aren’t growing.

You may have to forego grazing in the first year to ensure good establishment – this may have to be factored into your decision process to have on-hand stores of fodder.
Cattle do not graze lucerne as closely as sheep.

Source: K. Devenish, DAWA

Cattle are not so selective and don't have the mouth structure to ‘pick’ at lucerne; they ‘rip’ mouthfuls of fodder off. This has implications for the period of time cattle can graze lucerne.

As long as you maintain a ratio of 1:2 (e.g. one week of grazing, two weeks rest), cattle can be stocked for longer time on a stand of lucerne compared to sheep.

Expected cattle growth rate 5 - 7 kg/head/week

Source: Success with Lucerne Manual

Note: Supporting information for Slide 20 (will not be displayed in the presentation)

An alternative grazing strategy for cattle that requires more intensive management but has the potential for quicker turn-off of stock.

Grazing lucerne benefits to sheep

- Maintain weight of ewes over autumn
- Fill the “feed gap”
  - before stubbles become available
  - after stubbles, before the break

Lucerne grazing systems

Current system
- April lambing, no lucerne
- Stocking rate 4.3 DSE/ha
- Results
  - Ewe weight loss to mid-winter: 14.9 kg
  - Lamb weight at 4 months: 21.8 kg
  - Supplements: 90 kg

New system
- August lambing + lucerne
- Stocking rate 5.9 DSE/ha
- Results
  - Ewe weight loss to mid-winter: 7.6 kg
  - Lamb weight at 4 months: 29.7 kg
  - Supplements: 32 kg

Source: K. Devenish, DAWA
Economic modelling by Felicity Flugge (CRC for Plant-based Management of Dryland Salinity) in 2004 indicates that establishing lucerne on its own can increase farm profit by 3%, changing from wool to prime lambs increases farm profit by 12% BUT combining both changes can increase profit by 23% (see references and Slide 33).

Rotational grazing of lucerne using a six-paddock system requires intensive management and may need to consider other things like modifying mob and paddock sizes.

Message – Weekly growth averaged 1.3 kg/hd/week. (Source: Farmnote 36/2001, Grazing sheep and cattle on dryland lucerne).

The use of a three-paddock system (longer grazing period) will run down the stand a lot quicker than a six-paddock system.

Note: Supporting information for slide 29 (will not be displayed in the presentation)
Crude protein (CP) is needed to maintain body weight, metabolisable energy (ME) is needed for growth and digestibility is essential in determining the amount of feed that needs to be consumed to extract CP and ME. In this example, lucerne has a much higher digestibility % so hence comparatively less needs to be consumed to provide the same amount of CP & ME as subclover.

Lucerne averages 65% digestibility, crude protein of 12–24% and metabolisable energy of 8–11 MJ/kg DM. Annual pastures, in comparison, drop from 80% digestibility to below 50% upon maturity, crude protein of 12–22% and metabolisable energy of 8.5–10.5 MJ/kg DM (The Good Food Guide for Sheep, 2001).

<table>
<thead>
<tr>
<th>Location</th>
<th>Property</th>
<th>Crude protein (%)</th>
<th>ME (MJ/kg DM)</th>
<th>Digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morawa Ag. College</td>
<td></td>
<td>24.5</td>
<td>10.4</td>
<td>71</td>
</tr>
<tr>
<td>Mingenew Campbell</td>
<td></td>
<td>23.5</td>
<td>10.6</td>
<td>72</td>
</tr>
<tr>
<td>Wongan Research Station</td>
<td></td>
<td>21.4</td>
<td>10.2</td>
<td>70</td>
</tr>
<tr>
<td>Buntine Halliwell</td>
<td></td>
<td>19.3</td>
<td>9.6</td>
<td>66</td>
</tr>
</tbody>
</table>

Young sheep and cattle require a diet of 14% CP for optimum growth.

Local WA data. Main message – lucerne was certainly providing the CP minimum requirement with satisfactory ME and digestibility levels.

The lucerne plant densities follow similar trends under 2 and 4 DSE stocking rates, however, the 4 DSE stocking rate doubles greasy fleece production without sacrificing plant density in the stand.

Note: SA specific – more applicable to the south east of SA than WA (This slide will not be displayed in the presentation)

The lower scale is months since grazing commenced, upper scale is return in $/ha.
These results were generated from the MIDAS (Model of an Integrated Dryland Agricultural System) and STEP (Simulated Transitional Economic Planning) models using WA data.

More importantly though, the main message that comes from Flugge et al. research is that management changes need to be made in order to capture these increased profits and this will have to be traded off against time and labour demands in a farm business.

Note: Things to remind participants to take are
- Participants Notes with pens
- Hat/ suncream/ water
- Jumper/ raincoat
9. Field Trip to Case Study site

Duration: **90 minutes** (S+220 to S+310)

Allow 90 minutes for travel to and from site as well as a reasonable amount of time on-the-ground. Ensure participants bring their notes and pens to take down information provided by the farmer that is relevant to their local area.

**On the site:**
- Introduce host farmer (if not already participating in the workshop)
- Context and background information.

**Practical skills to be demonstrated:**
- Landscape location and soil type selection
- Plant growth indicators
- WAR choice, and
- Density measurement techniques.

**Discussion to be encouraged:**
- System selection vs. farmer experience
- Cost to set up vs. production value gained
- Establishment techniques (soil pH, weed and insect control, sowing), and
- Management changes.
10. Identify sources of further information on lucerne and role in salinity management

**Purpose:** To summarise information presented in this workshop and provide further direction in gathering information on lucerne.

**Suggested approach:**

**Presentation 6 - Where to from here?**

**Duration:** 20 minutes (S+310 to S+330)

---

**Slide 2**

**Overview**

**Purpose:** To provide information on where to source further references and support in considering lucerne as a salinity management tool.

**Areas covered:**
- Summary of lucerne information,
- Where to access further information, and
- Evaluation and social pleasants!!

---

**Slide 3**

**Successful lucerne establishment**

- Soil and nutrition (pH >4.8, EC <20 mS/m, adequate P + K)
- Weed control in the year prior to establishment
- High germinability seed inoculated with Group AL
- Sow seed 2-4 kg/ha <1 cm into damp compact seedbed
- Apply bare earth insecticide then monitor pests regularly and control as required
- Allow stand to establish good root system and reserves

---

**Slide 4**

**Successful lucerne utilisation**

- Remove cover crop in early spring
- Harvest companion crop in Nov-Dec
- Graze 1st year stand lightly if plants well anchored
- Rotationally graze the stand when well established
- Over-crop if desired

---

**Slide 5**

**Western Australian Lucerne Growers (WALG) contacts**

Lucerne Assistance Package
- Tom Bailey 08 9821 3263
- Daniel Renshaw 08 9690 2155

Agronomy, pests, varieties, other perennials
- Kira Butler 08 9963 1126
- Kathi Davies 08 9921 3253
- Perry Dolling 08 9821 3261
- Diana Fedorenko 08 9690 2228
- Anita Lyons 08 9963 1111
- Soheila Mokhtari 08 9368 3314

---

Note: This slide is included in the Appendix as a full page
Note: These products are available through Groundcover Direct (GRDC communication service)

Free Phone: 1800 11 00 44
Free Fax: 1800 00 99 98
PO Box 7456, Canberra, ACT 2610
Email: ground-cover-direct@canprint.com.au

Slide 8

Thank you...
To:
- The presenters,
- The specialists,
- The participants,
- The caterers, and
- The organisers

Slide 9

Evaluation

**Please fill in the evaluation sheet in the back of your Participants Notes and hand it to the presenter(s)**
Appendix 1. Full Page Slides

1a. Leakage Calculator Ready Reckoner

Central Wheatbelt
Soil-Landscape Zone 258
Representative Location Cunderdin
Mean Annual Rainfall (mm) 370

Rotations
B bare soil
C cereals & pulses
P annual pasture
Se serradella
G perennial grasses
Lu lucerne
OM oil mallees
S salt bush

Orange boxes contain information to use as a guide

<table>
<thead>
<tr>
<th>Land Management Unit</th>
<th>LEAKAGE (mm/yr)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Poor sands</td>
<td>157</td>
</tr>
<tr>
<td>Average sandplain</td>
<td>141</td>
</tr>
<tr>
<td>Good sandplain</td>
<td>109</td>
</tr>
<tr>
<td>Shallow duplex soil</td>
<td>35</td>
</tr>
<tr>
<td>Medium heavy</td>
<td>82</td>
</tr>
<tr>
<td>Heavy valley floors</td>
<td>48</td>
</tr>
<tr>
<td>Sandy surfaced valleys</td>
<td>70</td>
</tr>
<tr>
<td>Deep duplex soil</td>
<td>76</td>
</tr>
</tbody>
</table>

Max. leakage rate: 157 mm

- **High Leakage**: greater than 5% of MAR or greater than 10% of MAR for permeable soils
- **Moderate Leakage**: 2.5% to 5% of MAR or 5% to 10% of MAR for permeable soils
- **Low Leakage**: less than 2.5% of MAR or less than 5% of MAR for permeable soils
Appendix 1b. Leakage Calculator Input Screen

Central Wheatbelt
Soil-Landscape Zone  258
Representative Location  Cunderdin
Mean Annual Rainfall (mm)  370

B  bare soil
cereals & pulses
P  annual pasture
S  serradella
G  perennial grasses
Lu  lucerne
OM  oil mallees
S  salt bush

Areas can be input as:  1. Percentages of the farm or catchment
2. Hectares
3. Acres

Please select option 1, 2 or 3  3

Calculate area of trees from length & number of rows
Total farm or catchment area (acres) 7,425
Length of alleys (km)  15
Number of rows  3
Row spacing (m)  4
Area of trees (acres)  445

<table>
<thead>
<tr>
<th>Land Management Unit</th>
<th>Typical % Area</th>
<th>LMU x Rotation - Areas input in acres</th>
<th>Actual % Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>Poor sands</td>
<td>16.2</td>
<td>650.0</td>
<td>600.0</td>
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<tr>
<td>Average sandplain</td>
<td>16.4</td>
<td>1,100.0</td>
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<tr>
<td>Good sandplain</td>
<td>11.7</td>
<td>1,250.0</td>
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<tr>
<td>Shallow duplex soil</td>
<td>13.9</td>
<td>250.0</td>
<td>150.0</td>
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<tr>
<td>Medium heavy</td>
<td>12.5</td>
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<tr>
<td>Heavy valley floors</td>
<td>17.6</td>
<td>800.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Sandy surfaced valleys</td>
<td>8.5</td>
<td>100.0</td>
<td>210.0</td>
</tr>
<tr>
<td>Deep duplex soil</td>
<td>3.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Grand Total  7,425 acres

Lucerne – Is it for me?
Guide for Facilitators  Page 53
## Appendix 1c. Leakage Calculator Output Screen

### Central Wheatbelt
- **Soil-Landscape Zone**: 258
- **Representative Location**: Cunderdin
- **Mean Annual Rainfall (mm)**: 370

### Rotations
- **B**: bare soil
- **C**: cereals & pulses
- **P**: annual pasture
- **Se**: serpulidella
- **G**: perennial grasses
- **Lu**: lucerne
- **OM**: oil mallees
- **S**: salt bush

### Leakage Calculator
- **Blue-on-blue boxes can be edited**
- **Turquoise boxes contain results of calculations**
- **Orange boxes contain information to use as a guide**
- **Leakage is colour coded**

---

### Input the volume of an average farm dam
- **2,000 cubic yards**

### Option 3 - Areas input in acres

<table>
<thead>
<tr>
<th>Land Management Unit</th>
<th>Actual % Area</th>
<th>LMU x Rotation - Leakage Volumes (cubic yards)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Poor sands</td>
<td>16.8</td>
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<td>Good sandplain</td>
<td>16.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Shallow duplex soil</td>
<td>13.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Medium heavy</td>
<td>10.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Heavy valley floors</td>
<td>18.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Sandy surfaced valleys</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Deep duplex soil</td>
<td>2.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Total Leakage
- **680,600 cubic yards**
- **Equivalent to 340 2000 cubic yard dams**
Appendix 1d. WAR pictorial summary

Winter Activity Rating (WAR)

1-2: Winter-dormant

3-5: Semi winter-dormant

6-8: Winter-active

8-10: Highly winter-active

Source: Success with Lucerne Manual
### Appendix 1e. WAR Summary Table

<table>
<thead>
<tr>
<th>WAR</th>
<th>Dormancy</th>
<th>Persistence</th>
<th>Production</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Winter-dormant</td>
<td>High</td>
<td>Low</td>
<td>Jindera</td>
</tr>
<tr>
<td>3-5</td>
<td></td>
<td></td>
<td></td>
<td>Hunter River</td>
</tr>
<tr>
<td>6-8</td>
<td></td>
<td></td>
<td></td>
<td>Genesis</td>
</tr>
<tr>
<td>8-10</td>
<td>Winter-active</td>
<td>Low</td>
<td>High</td>
<td>Pioneer L69</td>
</tr>
</tbody>
</table>
Appendix 1f. Landscape locations

Landscape locations

Figure 3.2: Situation 2 – Hills, slopes and low lying areas.

Suitable for lucerne
Questionable for lucerne
Consider all soil-water factors
Definitely unsuitable
Low permeability

Water movement
Salt movement
Groundwater

Recharge zone
Discharge zone

Under crops and pasture
Fresh groundwater
Historical salt
Saline seepage
Salt scald

Low permeability

Situation 2
Represents varying soil and groundwater conditions. Lucerne will be suitable where its roots can grow deep into the soil profile without exposure to salt and or prolonged waterlogging. Access to fresh groundwater will improve prospects of summer–autumn growth.

Source: Success with Lucerne Manual
## Dryland lucerne development budget

**Dollars per hectare**

<table>
<thead>
<tr>
<th>Year</th>
<th>Prep'n</th>
<th>Estab't</th>
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<th>Second</th>
<th>Third</th>
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## Appendix 1h. Lucerne variety table 2004

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<td>HR HR HR</td>
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</tbody>
</table>


HR – Highly Resistant, R – Resistant, MR – Moderately Resistant, S Susceptible.

These ratings are based on the number of seedlings that survive pests and diseases in glasshouse tests. The reaction of established plants may differ (e.g. to BGA). A variety rated as resistant to a pest may still require control measures to avoid yield loss. Note that high resistance does not mean the variety is immune to the pest or disease, as a proportion of the plants may still be susceptible or show some symptoms.
### Table 3.1: Pre-sowing weed control program.

<table>
<thead>
<tr>
<th>Year</th>
<th>No Cropping</th>
<th>Cropping</th>
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</thead>
</table>
| Year 1 | Stop weed seed set:  
- heavily graze in spring  
- mechanically top  
- spray-top in the spring.  
Use selective herbicides in winter for problem weeds (especially perennials and other weeds which cannot be controlled selectively in lucerne). | Target problem weeds within crop (check lucerne plant-back periods for residual herbicides, especially *sulphonylureas)*. |
| Year 2 | *Hayfreeze* with *glyphosate or paraquat* in the spring to stop seedset. | *Use selective herbicides in crop especially for perennials and other weeds which cannot be controlled selectively in lucerne.* |
| Year 3 | Knockdown herbicides for pre-sowing weed control.  
Sow lucerne using soil-incorporated herbicides (e.g. *trifluralin*).  
Post emergent weed control:  
- Grass – cover crop removed with selective grass herbicide.  
- Broadleaf weed control with selective herbicides. | |

*Source: Success with Lucerne Manual*
## Target plant densities summary table

<table>
<thead>
<tr>
<th>Plants/m²</th>
<th>Value</th>
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<tbody>
<tr>
<td>&lt;5</td>
<td>Poor stand, low production and nitrogen fixation</td>
</tr>
<tr>
<td>5–10</td>
<td>Reasonable stand, productive in wet years</td>
</tr>
<tr>
<td>10–15</td>
<td>Minimum target stand for &lt;400 mm zone, productive all year and competitive with summer weeds</td>
</tr>
<tr>
<td>&gt;15</td>
<td>Excellent stand for &lt;400 mm zone, highly productive and very competitive with summer weeds</td>
</tr>
</tbody>
</table>
### Western Australian Lucerne Growers (WALG) contacts

#### Lucerne Assistance Package
- Tom Bailey 08 9821 3263
- Daniel Renshaw 08 9690 2155

#### Agronomy, pests, varieties, other perennials
- Kira Buttler 08 9083 1126
- Kathi Davies 08 9821 3253
- Perry Dolling 08 9821 3261
- Diana Fedoreenko 08 9690 2228
- Anita Lyons 08 9083 1111
- Soheila Mokhtari 08 9368 3314
Appendix 2. Lucerne Site Selection Check

Lucerne Site Selection Check

<table>
<thead>
<tr>
<th>Name:</th>
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<th>Date:</th>
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<td>0-10 cm</td>
<td>10-30 cm</td>
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<td>pH</td>
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<tr>
<td>Phosphorus</td>
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<td>Potassium</td>
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<td>Trace elements</td>
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**Barriers to root growth**

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**Watertable**

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**Site suitability**

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<th>Will this site reduce recharge to groundwater?</th>
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<tr>
<td>Will this site intercept water flows to discharge areas?</td>
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</table>
Draw plan of proposed lucerne area and placement of recharge/discharge areas

Draw cross-section showing placement in landscape
# Lucerne Establishment Costs

## PA599TA 2 Lucerne Establishment Costs

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<th>Product</th>
<th>Rate</th>
<th>Unit Cost</th>
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</tr>
<tr>
<td>- fungicide</td>
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<tr>
<td>- inoculum</td>
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<tr>
<td><strong>Fertiliser</strong></td>
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<tr>
<td>- pre-sowing</td>
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<tr>
<td>- at sowing</td>
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<tr>
<td>- post-sowing</td>
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<tr>
<td><strong>Herbicides</strong></td>
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<tr>
<td><strong>Total</strong></td>
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Lucerne – Is it for me?
Guide for Facilitators  Page 65
Lucerne Development Budget (can use cost per hectare or total costs in this table)

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<thead>
<tr>
<th>Year</th>
<th>Expenses ¹</th>
<th>Paddock Preparation</th>
<th>Est. Costs</th>
<th>Maintenance</th>
<th>Enterprise costs</th>
<th>Interest</th>
<th>Income ²</th>
<th>Balance ³</th>
<th>Cumulative balance ⁴</th>
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</thead>
</table>

1. This includes costs of paddock preparation in the year/s leading up to establishment, cost at the time of establishment, and ongoing maintenance costs of the lucerne pasture (nutrition, weed and pest control), costs of the enterprise utilising the lucerne, and the interest or opportunity cost of the money invested in the lucerne enterprise.

2. Income should include any income earned in the preparation, establishment and from the established lucerne stand.

3. Income less expenditure.

4. Total of the yearly balances.
## Appendix 4. Lucerne Establishment Plan

### Lucerne Establishment Plan

<table>
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### Soil amelioration

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<th>How to apply</th>
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### Nutrition

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<td>At seeding fertiliser</td>
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<td>Post-seeding fertiliser</td>
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### Weed management

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<th>Control options</th>
<th>Herbicide selected and when to apply</th>
<th>Herbicide rate</th>
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### Pest management

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<th>Control options</th>
<th>Pesticide options and when to apply</th>
<th>Pesticide rate</th>
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<td>Operation</td>
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<td>Cover crop</td>
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<td>Machinery</td>
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<td>Other notes</td>
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<td>Weeds</td>
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<td>Removal Date</td>
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<th><strong>Lucerne Plant Survival</strong></th>
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<td>Spring post-sowing</td>
<td>Autumn of following year</td>
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<td>Target Plant Numbers (plant/m²)</td>
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Appendix 5. Checklist for Establishing Dryland Lucerne

When trying lucerne it is best to select well-drained soils that are suitable for growing wheat. The best message is to look at lucerne growing in your area and follow the recommended package.

**Select the right soil type**
- Lucerne requires a free draining soil with pH greater than 4.8 (CaCl$_2$).
- Apply lime where soil pH is between 4.8 and 5.2.
- Lucerne will not tolerate waterlogged or saline soils.

**Weed control**
- New lucerne is a poor competitor, plan ahead to control weeds the season before.
- Delay seeding until after a good weed germination, apply a knockdown herbicide.
- Control grass weeds with a grass selective herbicide.
- For herbicide resistant ryegrass use trifluralin or Yield® (suppresses silvergrass).
- For late sowing use trifluralin for wireweed control.
- Broadleaf weeds can be controlled using Jaguar®, bromoxynil or Broadstrike®

**Insect control**
- Seedling lucerne is extremely vulnerable to redlegged earth mite and lucerne flea.
- Apply a bare-earth insecticide treatment (e.g. methidathion - Supracide 400®).
- Check for aphids during spring and spray if signs of damage.
- Check compatibility before adding insecticide to a grass selective/broadleaf herbicide mix.

**Varieties**
- Use winter-active varieties for short-term lucerne stands (3-4 years).
- There are numerous winter active varieties including Eureka, Trifecta, Genesis, Sceptre, Aquarius, Pioneer L69 & L90, to name a few.

**Sowing recommendations**
- Seeding depth is critical - sow seed at 0.5-1 cm into moist soil from May to August.
- Recommended seeding rate is 2-3 kg/ha, use only 2 kg for precision seeders.
- Fertiliser - apply 10-12 kg/ha P, apply Cu, Zn and molybdenum.
- Potash - topdress 15-20 kg/ha K if needed, do not apply down the tube with seed (toxic).
- Inoculate seed with group AL inoculant and lime pellet (4 kg lime/25 kg seed).
- Don't apply too much lime if sowing seed on its own, the lime reduces the flow.
- Best results are when lucerne is sown as a monoculture, not under-sown.

**Alternate row sowing**
- Sowing alternate rows of barley and lucerne has had some success.
- The method will recover most of the costs if more than 1 t/ha of grain is harvested.
- Sow barley at 40 kg/ha and lucerne at 2 kg/ha.
- For weeds and insects use triflualin, a bare-earth insecticide, and Jaguar®
- SU's such as Glean®, Logran®, Ally® should not be used.
- Topdress sub-clover or balansa on the second year to provide pasture between the rows.

**Grazing**
- Graze for short periods (2-3 weeks), be careful not to overgraze.
- Established lucerne can stand longer grazing but should be rested during the summer period.

**Farming tools**
- Farmnote 135/2000 'Lucerne in pasture-crop rotations: establishment and management'
- Farmnote 36/2001 'Grazing sheep and cattle on dryland lucerne'
Appendix 6. Further References

**Success with Lucerne Manual** 2002 Stanley M., Britton R. & Christinat R. PIRSA/ TOPCROP


Note: The above products are available through Groundcover Direct (GRDC communication service)
Free Phone: 1800 11 00 44
Free Fax: 1800 00 99 98
PO Box 7456, Canberra, ACT 2610
Email: ground-cover-direct@canprint.com.au


**Dryland Lucerne Information Booklet** 2001. Devenish K. DAWA


**Farmnote No. 135/2000** 'Lucerne in pasture-crop rotations: establishment and management'. Latta R., Devenish K. and Bailey T. DAWA

**Farmnote 36/2001** 'Grazing sheep and cattle on dryland lucerne'. Devenish K., Lacey T. and Latta R. DAWA

Note: Contact the Department of Agriculture South Perth 08 9368 3333 for the availability of these publications or try [www.agric.wa.gov.au](http://www.agric.wa.gov.au)

**Lucerne-based pasture for the central wheatbelt region of Western Australia – a whole-farm economic analysis.** Flugge F., Abadi A. and Dolling P., 2004. Website: www1.crcsalinity.com

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