Factors influencing perennial pasture adoption in the medium rainfall zone of the south west natural resource management region of Western Australia

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Factors influencing perennial pasture adoption in the medium rainfall zone of the South West Natural Resource Management Region of Western Australia

Ned Crossley, Stephen Tunbridge and Kathi McDonald

September 2009
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## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>1</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>3</td>
</tr>
<tr>
<td>1.1 Background to the study</td>
<td>3</td>
</tr>
<tr>
<td>1.2 Study area</td>
<td>3</td>
</tr>
<tr>
<td>1.3 Potential for perennial pastures in the project area</td>
<td>6</td>
</tr>
<tr>
<td>1.4 Research questions</td>
<td>7</td>
</tr>
<tr>
<td>2. Methodology</td>
<td>8</td>
</tr>
<tr>
<td>2.1 Target groups</td>
<td>8</td>
</tr>
<tr>
<td>2.2 Semi-structured interviews</td>
<td>8</td>
</tr>
<tr>
<td>2.3 Focus group discussions</td>
<td>9</td>
</tr>
<tr>
<td>2.4 Informal discussions</td>
<td>10</td>
</tr>
<tr>
<td>2.5 Data handling</td>
<td>10</td>
</tr>
<tr>
<td>2.6 Limitations of the qualitative investigation</td>
<td>10</td>
</tr>
<tr>
<td>3. Literature review</td>
<td>12</td>
</tr>
<tr>
<td>3.1 Factors influencing adoption of natural resource management practices</td>
<td>12</td>
</tr>
<tr>
<td>3.2 Factors influencing adoption of perennial pastures</td>
<td>13</td>
</tr>
<tr>
<td>4. Findings from interviews, focus groups and informal discussion</td>
<td>16</td>
</tr>
<tr>
<td>4.1 Perennial pasture systems currently used in the study area</td>
<td>16</td>
</tr>
<tr>
<td>4.2 Drivers</td>
<td>17</td>
</tr>
<tr>
<td>4.3 Benefits</td>
<td>18</td>
</tr>
<tr>
<td>4.4 Enablers</td>
<td>21</td>
</tr>
<tr>
<td>4.5 Barriers</td>
<td>24</td>
</tr>
<tr>
<td>4.6 Influence of soil-landscape zones and farm types on landholder perceptions</td>
<td>30</td>
</tr>
<tr>
<td>4.7 Summary of findings</td>
<td>31</td>
</tr>
<tr>
<td>5. Key learnings and recommendations</td>
<td>32</td>
</tr>
<tr>
<td>5.1 Landholders in the study area perceive perennial pastures as an unusual, unconventional and complex practice</td>
<td>32</td>
</tr>
<tr>
<td>5.2 Different audiences need to be considered in extension plans</td>
<td>32</td>
</tr>
<tr>
<td>5.3 The learning processes are as diverse as the audience</td>
<td>33</td>
</tr>
<tr>
<td>6. Conclusions</td>
<td>35</td>
</tr>
<tr>
<td>7. References</td>
<td>36</td>
</tr>
<tr>
<td>8. Appendixes</td>
<td>38</td>
</tr>
<tr>
<td>8.1 Appendix 1: Semi-structured Interview Guide</td>
<td>38</td>
</tr>
<tr>
<td>8.2 Appendix 2: Focus group discussion guide: interested farmers</td>
<td>39</td>
</tr>
<tr>
<td>8.3 Appendix 3: Focus group discussion guide: experienced farmers</td>
<td>40</td>
</tr>
</tbody>
</table>
Summary

The present rate of adoption of perennial pastures in the medium rainfall area of the South West Catchment Council (SWCC) Natural Resource Management Region is low relative to the area of land that could support these pastures. The SWCC commissioned a study to look at ways to support wider adoption of perennial pastures in this area.

Previous research into adoption of unfamiliar or new conservation and natural resource management practices we reviewed indicates that perennial pasture adoption will depend largely upon:

- how landholders perceive the relative advantage and trialability of the new practice
- how landholders’ circumstances and characteristics affect their interest in to growing perennial pastures
- the social setting and process through which learning about perennial pastures occurs.

Qualitative evaluation techniques including semi-structured interviews, focus groups and informal discussions were used to collect data from farmers and other agricultural professionals to gain an understanding of landholders' perceptions about perennials and the factors influencing perennial pasture adoption within the study area. Many drivers, benefits, barriers and enablers for perennial pasture adoption were described that will inform future projects promoting perennial pastures.

Study participants who had grown perennial pastures identified a driver that led them to adopt perennial pastures. Common drivers were the need to manage salinity and waterlogging, overcome falling productivity or improve profitability, a need to look after their land and a desire to make the most of summer rainfall to grow green feed.

Experienced perennial pasture growers identified numerous financial and non-financial benefits gained since adopting perennial pastures, including control of waterlogging and salinity, better feed and livestock performance, improved amenity, psychological and social benefits, cropping system benefits and lower management risks.

Experienced growers mentioned numerous factors that enabled them to adopt perennial pastures into their farming system, including a positive attitude about the innovation, gaining inspiration from demonstrations and peer interaction, incentive funding and access to on-site technical support.

Participants in the interviews and discussions identified numerous barriers to adopting perennial pastures. Cost, and a poor outlook for livestock markets were strong disincentives, especially for landholders who were shifting to more cropping. In addition, scarcity of seed of suitable varieties, inadequate access to pertinent technical information or credible advisors, perceived riskiness, poor and patchy establishment, fear of failure, tacit disapproval of unconventional practices and the need to alter grazing management all served to limit perennial pasture adoption.

The data collected in the qualitative evaluation showed no relationship between landholder perceptions about perennial pastures and soil landscape zones; however landholder perceptions about perennial pastures were influenced by the type of farm enterprise they operated. Landholders with a predominant focus on cropping were generally not keen to establish perennial pasture on good cropping land, though there was some interest in integrating perennial pastures onto cropping land that was prone to waterlogging and salinity.
Mixed croppers and grazers were most likely to utilise perennials to improve pasture production on marginally cropable waterlogged land and on salt affected land. Landholders with little crop were often open to growing perennial pastures in combination with annual varieties on good pasture land as well as on degraded, severely waterlogged and saline land.

It is clear from the study that many landholders still perceive perennial pastures as an unusual, unconventional and complex practice. Many landholders, particularly those shifting towards cropping and away from livestock production, consider that perennial pastures are not compatible with their farm enterprises and so would not invest in them. However, in the last 10 years a significant number of landholders have begun growing perennial pastures, though most of these growers consider they are still learning how to manage them properly and often have established them over relatively small areas of their properties. Consequently, there are few farm scale demonstrations or experienced growers to talk to about perennial pasture systems.

Findings from the study suggest that future perennial pasture development and extension for saline sites, non-cropping soils and waterlogged cropping areas in the study area should focus on four main systems:

- Saltland pastures
- Perennials with annuals in permanent pastures
- Pasture cropping with lucerne or kikuyu
- Lucerne with phased cropping.

Many participants suggested that creating more local demonstrations of these systems throughout the study area would be an effective way to encourage greater use of perennial pastures in the region.

Results from this study suggest that future projects will enhance perennial pasture adoption if they:

- Engage in participative research approaches with growers to develop, refine and promote examples and support demonstrations of the four main perennial pasture systems.
- Provide on-site technical advice and mentoring from credible experienced extension agents to enhance growers’ confidence in these systems.

Projects will need the capacity to adapt and demonstrate working models of the main perennial pasture systems across the region so farmers individually and collectively can see the benefits of perennial pastures in situations similar to their own.

Future projects are likely to be more successful if they place greater emphasis on the social context in which adoption occurs. The circumstances and characteristics of landholders are highly variable and need to be assessed in order to effectively target extension resources where they can be most effective. Projects need to be designed to take advantage of factors that maximise the influence of social norms so that perennial pastures become part of what is considered ‘normal’ good farming practice.
1. Introduction

The South West Catchment Council (SWCC) commissioned this study to document and understand the factors and conditions influencing perennial pasture adoption in areas with average annual rainfall below 600 mm within the South West Natural Resource Management region. Its findings will inform future strategic development and the extension programs needed to increase adoption of perennial pastures in the study area.

The study involved a review of selected literature followed by a qualitative investigation of landholders and other stakeholders to document the types of perennial pasture systems being used in the study area and the drivers, benefits, barriers and enablers related to adoption of perennial pastures. It also investigated how landholder perceptions and experience varied between the different soil-landscape zones in the study area.

Extension organisations will find the results from the study useful in developing better programs to support the wider adoption of perennial pastures throughout the region. Section 1 outlines the study area and reasons for the study. Section 2 describes the methodology followed in the study. Section 3 summarises a review of selected literature on adoption of NRM practices and perennial pastures in particular. Section 4 provides a narrative discussion of the drivers, benefits, enablers and barriers. These are distilled into key learnings in Section 5 and conclusions in Section 6.

1.1 Background to the study

The State Salinity Strategy (Government of Western Australia 2000) and the State of the Environment Report (Environmental Protection Authority 2006) recognised land salinisation as one of the main environmental threats to sustainability, land productivity, water resource management and biodiversity in the South West Natural Resource Management region. The State Salinity Strategy also acknowledged the significant public benefits of addressing salinity on agricultural land.

The SWCC, in its Regional Natural Resources Management Strategy (SWCC 2005), noted that greatly increasing the use of deep-rooted perennial pastures is seen as one of the principal measures by which landholders could minimise watertable rise and reduce the impact of salinity on productivity of their land and natural ecosystems (see also MacFarlane et al. 1994, Clarke et al. 2002).

1.2 Study area

The study focused on the Blackwood, Hotham-Murray and Warren-Tone catchment areas lying to the east of the 600 mm rainfall isohyet within south-west WA’s mixed farming and wool belt areas. The study area covers nineteen shires including Williams, Narrogin, Wagin, West Arthur, Katanning and Woodanilling and parts of Boddington, Wandering, Pingelly, Cuballing, Wickepin, Dumbleyung, Kojonup, Boyup Brook, Kent, Broomehill, Gnowangerup, Cranbrook and Manjimup shires.

Climate

The study area has a Mediterranean type climate with a cool wet winter and hot dry summer. The winter growing season lasts four to five months in the eastern parts of the study area and five to six months in the western parts.
The study area lies mostly within the area referred to as the ‘cold zone’ by Moore et al. (2006), in which the combination of cold, wet soils and frequent frosts limits the persistence of subtropical perennial grasses. The cold zone is roughly consistent with the area of the south-west that has August mean minimum temperatures below 5.3°C (see Figure 1).

Figure 1 The ‘cold zone’ of south-west Western Australia.

Average minimum monthly temperatures have increased by about one degree over the last 30 years across the region and the trend is predicted to continue in a number of CSIRO climate change modelling scenarios, indicating a likelihood of reduced incidence of frosts. However while average minimum temperatures may be increasing, sub-zero (°C) temperatures are still common and in recent years severe frosts during spring have often resulted in extensive crop damage.

Historically across the study area, annual rainfall averages from 350 to 600 mm and growing season rainfall averages from 280 to over 450 mm. During the last 30 years however, average annual rainfall and growing season rainfall have declined and the seasonal rainfall pattern has become patchier. May and June rainfall have declined at recording centres across the region (Miriam Lang 2009, pers. comm.) while January and November rainfall have both increased slightly in central and eastern recording centres.

Despite the apparent reduction in winter rainfall, groundwater levels have risen in most landscape positions across the study area. Evaluation of groundwater monitoring and salinity hazard mapping suggests that extensive areas of valley floor and low slope landscapes in the study area are at risk of becoming salt-affected, with lead times ranging from years to many decades (Raper et al. In prep.).

Analyses of climate scenario modelling (CSIRO 2008) show that in the study area, winter rainfall is likely to continue to decline, dry periods in mid winter may be more frequent and a greater proportion of annual rainfall is likely to occur outside the conventional growing season, particularly in the eastern and central parts of the study area (Miriam Lang 2008, pers. comm.). Intense storm events are also predicted to increase.
**Soil-landscape zones and farming enterprises**

There are five soil-landscape zones in the study area but for the purposes of the study these were modified into three zones (see Figure 2), each with quite different landforms, soils and climate. Consequently, farm businesses have evolved according to the challenges and opportunities of each zone and vary markedly in enterprise, scale and intensity across the region.

The easternmost zone, the Ancient Drainage Zone (ADZ), is a low undulating landscape with broad, flat valleys and drainage lines that flow only in very wet periods. Here farm enterprises are generally large-scale operations based around cropping and often augmented by livestock. Shallow sandy and loamy duplex valley floor soils, sometimes alkaline and sodic, are often waterlogged and salt-affected where high watertables occur. Two soil-landscape zones comprise the ADZ, the South-western and the South-eastern Zones of Ancient Drainage.

In the Rejuvenated Drainage Zone (RDZ) higher rainfall and a gently undulating landscape with low hills and incised stream channels have been conducive to a more even mix of cropping and grazing enterprises. Groundwater accumulation and restricted drainage causes waterlogging and salinity on duplex soils, at the confluence of drainage lines, where hillslopes intersect with valley floors and on hillside seepages associated with bedrock outcrops or dykes. The RDZ aligns directly to one soil-landscape zone, the Southern Zone of Rejuvenated Drainage.

The Eastern Darling Range Zone (EDRZ) covers the western margin of the project area between the 600 mm rainfall isohyet to the west and the RDZ to the east. The EDRZ is an undulating and rolling lateritic landscape deeply dissected by narrow valleys that are often incised into the underlying granite basement rock. These narrow valleys flow into broader valleys with poorly drained flats on very fine Eocene sediments. The steep slopes and infertile gravels favoured livestock enterprises over cropping until the emergence of improved
cropping techniques such as no-till seeding with knife points. Consequently the emphasis has been on livestock with some cropping for livestock fodder. Average farm size is smaller than properties to the east. Waterlogging and salinity occur in discrete areas associated with skeletal soils over bedrock or dykes and more widely along drainage lines and poorly drained sites along valley floors. The EDRZ corresponds to two soil-landscape zones: Eastern Darling Range Zone and eastern parts of the Western Darling Range Zone.

Waterlogging and salinity have reduced crop and pasture production in each zone, to the point where conventional farming is often no longer profitable on affected land.

A trend towards a drier climate may reverse hydrological trends and reduce the impact of salinity in medium to high rainfall areas, however high rainfall events will still cause winter waterlogging, raised watertables and secondary salinity. Increasingly variable seasons are likely to pose greater risks to the viability and sustainability of annual crop and pasture systems due to more frequent false breaks to the season, drier winters, lower growing season rainfall, delayed finishes to the season and more out-of-season and summer rainfall events (CSIRO 2008, Kingwell 2006). Increased use of perennial pastures in farming systems is one strategy that can make better use of summer rainfall and help growers adapt to the seasonal variability associated with continuing climate change.

1.3 Potential for perennial pastures in the project area

Perennial pastures include pasture species whose life cycle extends beyond one growing season. This project focused only on the adoption of herbaceous perennial species (including salt-tolerant species) that may be of grazing value for livestock.

Landholders began using improved pasture varieties and production practices in the 1950s and 60s and tried a number of exotic annual and perennial pasture species to increase pasture production. In particular, annual sub. clover pastures combined with the use of superphosphate, trace elements and rhizobia improved winter and spring pasture production compared to unimproved native pastures. Because they flourished under ‘set stocking’, sub. clover pastures became the basis of a simple production system, particularly for sheep.

Compared to sub. clover pastures, perennials were less suited to the range of soils, harder to establish, less vigorous and less tolerant of competition and, with continuous grazing and the prolonged dry summers typical of the region, failed to persist. Some perennial grasses, notably phalaris, lovegrass, veldt grass, puccinellia and native perennial grasses, continue to flourish throughout the study area on ungrazed sites along roadsides, riparian zones and in nature reserves.

Perennial pasture researchers and innovative farmers have demonstrated the value of deep-rooted perennials in south-western WA, particularly lucerne, for lowering groundwater tables (Dolling 2001, Latta et al. 2003, Ferdowsian 2006); preventing soil erosion (Wiley et al. 2007) and providing out-of-season grazing on a high value feed source (Devenish et al. 2003, Rogers et al. 2006). Previous perennial pasture research has been concentrated mainly in the high rainfall south coast (kikuyu and subtropical pastures) and the southern agricultural cropping regions (dryland lucerne and saltland pastures). Limited research in the wool belt areas has shown that temperate perennial grasses, lucerne and tall wheat grass, puccinellia, chicory and kikuyu can be grown successfully. A land capability study (Rogers, Crossley and Tille, in preparation) identified considerable land areas within the study area capable of growing these species.
In recent years, knowledge of these benefits and techniques to successfully establish and manage perennial pastures has spread, mainly through the efforts of innovative landholders and research and extension by the pastures group within the Department of Agriculture and Food, Western Australia ('the department'), WA Lucerne Growers (WALG) and the Evergreen Farming group. National programs including the Sustainable Grazing Systems project and the associated Sustainable Grazing of Saline Land project have contributed to the promotion of perennial pastures on saline and waterlogged land.

The increase in research and extension activity has led to the wider use of perennial pastures to restore productivity on salt-affected and waterlogged soils. The main species used on saltland sites in the study area have been puccinellia, tall wheatgrass and saltbush species. On non-saline land (depending on rainfall and growing season length) farmers have grown lucerne, chicory, tall wheat grass, phalaris, perennial ryegrass, cocksfoot, kikuyu, strawberry clover, plantain and tall fescue.

Nonetheless, despite the existence of packages for a range of species that could apply in these areas (Devenish 2001, Latta and Dawson 2001, Latta et al. 2003, Moore et al. 2006) the area sown to perennial pastures is still relatively small. For instance, Dawson et al. (2003) estimated the potential area for lucerne growing in the south-west land division at around 800 000 ha, yet only 171 000 ha had been established in 2002.

Clearly new approaches are required to increase the level of adoption of perennial pastures in the area. However before such approaches can be developed a good understanding of the appropriate perennial pasture systems for the area, as well as the drivers, barriers, benefits and enablers for adoption is required. SWCC commissioned the department to gather this information and begin to develop more effective programs to encourage perennial pasture adoption.

1.4 Research questions

The key research questions of the study were:

- What are the drivers that compel landholders to adopt perennials?
- What are the perceived benefits of adopting perennial pastures?
- What are the enablers that encourage landholders to adopt perennials?
- What are the perceived barriers to adopting perennial pastures?
- How do perceptions differ across the study area and between types of farm enterprise?
- What are the key opportunities for further development and extension of perennial pastures in the study area?
2. Methodology

A selective literature review was conducted to gather information about adoption of conservation practices in general and perennial pastures in particular. The review helped to refine the focus of questions for semi-structured interviews and informal discussions and also with planning for focus groups.

A qualitative investigation using semi-structured interviews, focus groups and informal discussions was carried out to document landholder perceptions and experience, and to gather information about the factors and conditions influencing landholders’ adoption of perennial pastures. The three different methods were used to facilitate the participation of individuals from different target groups in the study (e.g. to reduce the call on participants’ time and need to travel) and to triangulate the study.

2.1 Target groups

Three target groups were defined and surveyed separately to record their particular perceptions and experience with perennial pastures.

The three target groups were:

- **Experienced growers** (commercial agricultural producers with varying levels of experience with perennial pastures). We targeted individuals from this group for interviews and focus groups to provide information about their personal experience with perennial pastures in different parts of the study area.

- **Interested farmers** (commercial agricultural producers with positive or mixed views of the potential for perennial pastures and some interest in growing them in the future). We targeted this group to capture the views of landholders with preconceptions about perennial pastures based on what they had heard and seen and not on any experience of having grown them.

- **Agricultural professionals** (consultants, private sector agronomists, natural resource management officers and the Department of Agriculture and Food, Western Australia (DAFWA) perennial pasture research staff). We recognised that this group, as potential next users of our findings, could have a significant influence on landholders’ decisions about growing perennial pastures, so we wanted to capture their perceptions about the factors influencing adoption. This group’s views were likely to be formed from knowledge of their clients’ experiences and/or on their scientific understanding of the issues developed through research and extension. We used their data to augment and triangulate the data collected from landholders in interviews and focus groups.

2.2 Semi-structured interviews

We chose semi-structured interviews to collect information from individual perennial pasture growers because the technique allowed us to capture interviewees’ personal experiences and impressions in rich detail. We used handwritten notes and sometimes a voice recorder to record the interviews. The trigger questions were based around personal benefits (and barriers) of perennial pastures and the drivers and enablers that led them to adopt them. Semi-structured interviews provide a flexible framework to explore predetermined areas of interest while giving interviewees freedom to raise unanticipated issues and insights (Patten 2002). The interview transcripts effectively tell the interviewees’ stories in their own terms, describing a variety of applications for perennial pastures and the issues they confronted within different farming systems. The transcripts added considerable depth and detail to data collected in focus groups.
**Sampling strategy**

Interviewees were selected by stratified purposeful sampling, snowball and emergent sampling (Patten 2002). Landholders known to have grown perennial pastures were interviewed first and then other experienced perennial pasture growers identified by the interviewees were approached. A total of 25 interviews with perennial pasture growers were completed by July 2008. Two landholders, who stated they had no intention to grow perennial pastures, were also interviewed to corroborate or add to barriers identified in focus groups and semi structured interviews.

The semi-structured interview guide is included in Appendix 1.

**2.3 Focus group discussions**

We used focus groups to collect information from groups of participants from each of the landholder target groups. Focus groups were chosen because like semi structured interviews, they produce a rich description of experiences and attitudes around the topic. In addition focus groups are useful for developing a collective understanding of the issues relating to the focus topic (Krueger 1994). In this study, the focus group data contributed greatly to our understanding of the drivers, benefits, enablers and barriers of perennial pasture adoption and also provided useful triangulation of data gathered in semi-structured interviews and informal discussions with the other target groups.

**Focus group planning**

Twelve focus groups were planned to cover the three modified soil-landscape zones shown in Figure 1. We felt confident that with this number we could capture a wide range of perspectives on perennial pastures across a range of landscapes, farming enterprises and landholder personalities. We invited only commercial farmers to participate as agriculture has the greatest impact on natural resource management in the region and commercial farmers would be a major focus of future programs to support the adoption of perennial pastures.

We planned six focus group discussions with ‘experienced growers’ (whether they continued to grow perennial pastures or not) and six groups with interested landholders. Each focus group was deemed full once ten to twelve landholders had agreed to participate, however some landholders did not attend and the number of participants in the groups ranged from four to ten.

Only two of the five focus groups planned for the EDRZ were convened. The remaining two ‘interested’ and one ‘experienced’ group planned for the central part of the EDRZ were abandoned when we could not get more than four people to agree to participate in either group. In total 63 landholders participated in nine focus groups following screening of around 120 landholders.

**Selection process for participants**

We selected 'experienced grower’ group participants initially using stratified purposeful sampling (Patten 2002) by approaching known perennial pasture growers within the study area. Snowball and emergent sampling methods were used to extend the sample by asking other landholders, NRM Officers and others perennial pasture growers to, identify experienced growers we could include in the sample.

‘Interested landholder’ focus group participants were selected from a random sample of landholders from a population of around 2000 commercial agricultural producers with properties larger than 100 ha in the study area. (The data set was drawn from the DAFWA...
We chose participants who expressed interest in establishing perennial pastures (at least in principle) at some time in the future.

**Conduct of focus groups**

The focus groups were convened between October 2007 and April 2008. Focus groups were held as breakfast or dinner meetings with a meal preceding the discussion. A consultant facilitated the discussions, which were digitally recorded and transcribed into a MS Word document. The consultant did some preliminary analysis of the data. Discussion guides for experienced and interested groups are included in Appendix 1.

**2.4 Informal discussions**

We also collected data from informal discussions with landholders (in the process of choosing participants for focus groups) and with agricultural professionals with experience and knowledge in perennial pastures. The discussions were often by telephone and the data was recorded in handwritten notes.

Informal discussions with landholders were useful in refining questions asked in the focus groups. Discussions with agricultural professionals were useful to triangulate the data collected in focus groups and semi-structured interviews and placed little call on participants’ time and resources.

**2.5 Data handling**

The audio recordings of semi-structured interviews and focus group discussions were professionally transcribed and checked for errors. All notes and transcripts were stored and sorted using N-VIVO software (version 8, by QSR International) which provided a structured environment to facilitate the identification of patterns and themes in the data.

**2.6 Limitations of the qualitative investigation**

As we progressed with the study, a number of limitations in the qualitative investigation became apparent.

Our intention was to draw participants for each focus group from the same geographical area and enterprise type; however this was not always possible. In three groups (two experienced and one interested) there was some crossover of participants from neighbouring zones. However all the groups did reflect general trends—predominantly cropping enterprises in the ADZ, a balanced mix of cropping and grazing in the DRZ and predominantly grazing enterprises in the EDRZ.

Despite our efforts to screen participants to form homogenous groups of interested landholders and experienced growers for the focus groups, the amount of experience and interest varied somewhat within and across all groups.

In experienced groups, the length of experience varied between growers. Some participants in the interested groups had also had some experience with growing perennial pastures. Others in the interested groups had only moderate interest in perennials and were actually quite resistant to changing from their current practice, even though they had expressed interest in growing perennial pastures at some time in the future.

Another limitation was the bias in our sampling approach; the views of growers with little or no commitment to adopting perennial pastures were underrepresented in our study, because our sample only included landholders who were interested in perennial pastures. For
example, most farmers we spoke to in the EDRZ about attending these groups said they were not interested in growing perennial pastures or did not see any potential for them in their farming system.

The size and timing of focus groups and the timing of interviews may have had a bearing on the data content. Interviews and focus groups were spread over more than a year, so topical seasonal issues may have been given more weight in particular groups than they would have had at other times of the year. However, most factors were generally raised in more than one group discussion or interview. Fewer issues were raised in smaller groups than in larger groups and sometimes issues that could have been anticipated were not raised at all in small groups.

Lastly, key personnel were relatively inexperienced with qualitative survey methods, and conduct of focus groups. Questions were sometimes put in a way that led participants to respond to particular themes. Questions were often framed to elicit hypothetical responses and advice for landholders seeking to adopt perennial pastures, rather than eliciting experiential responses. Questions were not always put succinctly and sometimes more than one question was put at a time making it difficult for participants to respond to all the questions. Probing questions were not always used to clarify ambiguous responses or seek a fuller understanding of statements made by participants.

Despite the above limitations, sufficient data was collected to identify the range of possible factors influencing perennial pasture adoption and describe the generic perennial pasture systems being used in the study area. No new factors were raised towards the end of the study, indicating that enough focus groups and interviews had been convened.
3. Literature review

3.1 Factors influencing adoption of natural resource management practices

A selection of the literature exploring the issues around adoption of innovation in land management and agricultural practices was reviewed. In Australia a number of influential papers and reviews have explored the personal, social, cultural, historical and economic influences on the adoption of natural resource management (NRM) practices (e.g. Barr & Cary, 2000, Pannell 2001, Vanclay 1992, 2004; Stanley et al. 2005, Pannell et al. 2006, Plowman 2006), and general adoption influences are generally well understood (Pannell et al. 2006).

According to Pannell (2001), lack of awareness is unlikely to be a major factor limiting adoption of salinity management practices. More fundamental factors that limit adoption include cost, return on investment, trialability, time scale and social equity issues. Pannell notes that landholders are reticent to adopt new ideas that do not provide an obvious improvement on their current practice. They tend to respond to any innovation with uncertainty and caution. They often have preconceptions about the innovation and a healthy scepticism about upbeat claims made for it, often based on experience or knowledge of previous innovations that have turned out to be less than successful. They are commonly prejudiced in favour of their existing farming system, with which they are familiar and comfortable, and particularly cautious of innovation that is quite different from their current practice.

Pannell et al. (2006) identified three broad sets of issues that shape landholders’ subjective perceptions of a new practice and how well it might meet their goals, and therefore their likelihood of adopting it. These three areas relate to:

- the learning process, including ‘hands-on’ experience, to inform adoption decisions
- the characteristics of the practice with regard to its trialability and relative advantage over current practices
- the characteristics and circumstances of landholders within their social environment.

These elements and their component factors are detailed in Figure 3. Pannell et al. also provide a raft of suggestions on the conduct of extension processes focused on these core issues that should enhance adoption.

Devenish (2006) proposed that sound extension processes can speed up the rate of adoption, given the right environment for change. However, extension agents must be able to recognise the conditions under which change is possible and make the most of them. Firstly, they must know if their target audience is receptive to change. Secondly, they must have a good understanding of the problems that a proposed practice change seeks to address and also the implications of the prospective change on all the components of their clients’ farming system. To be considered a credible source of information extension agents must be able to explain the benefits of new practices and offer solutions to barriers to their use. They must have both technical competence and the trust of their client farmers, built up over a number of years of working with them in local districts and relevant fields.

Vanclay (2004) found that adoption of new practices or ideas is not a decision made in isolation by an individual farmer based simply on objective information but often involves deliberation on a range of issues and discussion of ideas with others. In this respect,
adoption of new practices has a social context and can be viewed as a socio-cultural process. In fact, much adoption can be seen as a consequence of an idea or practice conforming to social norms of what most others consider to be good practice.

Griskevicius et al. (2008) found that individuals commonly underestimate the power social norms have on their decision making. They found social norms to be a powerful, low cost source of persuasion that is underused by policy makers and communicators alike.

Social norms have the strongest impact on people under conditions of uncertainty, particularly when the people most like them are modelling the desired behaviour in a similar circumstance. People tend to look to see how others most like themselves are responding to the changing situation so they can make sure their response conforms to the new norms.

Therefore, policy makers and communicators need to frame and present normative messages carefully so they support the intended behavioural or practice changes rather than undermine them. Effective normative messages need to show that many similar people in a similar circumstance are adopting the appropriate behaviour (or that few are engaged in the inappropriate practice or behaviour).

3.2 Factors influencing adoption of perennial pastures

Bishop et al. (1997) identified barriers to adoption of perennial pastures in three catchment management authority areas in Victoria. They found the main barriers to be the cost of establishment, unreliability of seasons, loss of production during establishment, a lack of experience with perennial species, financial limitations, lack of appropriate equipment, inadequate paddock preparation and sowing technique, lack of experience, the wide range of soil variability, and lack of time, labour and advice. Most growers said they required higher commodity prices (stable over time), lower input costs, and a clear need to renovate existing pastures before they would increase their area of perennials.

The Victorian study classified landholders into five behavioural archetypes based on the strength of their commitment to renovating pastures with perennials: committed adopters, partial adopters, belt tighteners (landholders who invested in perennials only when livestock prices were good), sceptics and the ‘comfortable’.

Committed adopters were potential role models for other landholders and their perennial pastures could be showcased in demonstrations. Partial adopters and belt tighteners needed more technical information and support, and belt tighteners also needed information to convince them of the benefits. Bishop and his colleagues suggested that investing extension resources in these three groups was most likely to have a pay-off in enhanced adoption.

Of the remaining behaviour types, the ‘sceptics’ didn’t believe perennials gave any benefit and the ‘comfortable’ had no intention of further farm development. These two groups were unlikely to change their existing practice as a result of extension on perennial establishment and management and therefore warranted a much lower allocation of extension resources. Encouraging involvement with adopters and providing local perennial pasture examples might, however, overcome their scepticism.
Figure 3 Factors that influence decisions about adoption of perennial pastures (adapted from Pannell et al. 2006; Plowman 2006).
Jones (2006 unpublished) conducted focus groups with landholders with saline land in the Brookton, Corrigin, Pingelly and Wickepin shires on the north-east margin of the current project’s study area to identify barriers and benefits relating to saltland management (including perennial pastures on saltland). She found that stopping the spread of salinity and maintaining productivity of saltland were the greatest benefits of saltland production and that landholders valued risk management benefits of saltland options highly. Relationships that provide positive support with their peers and with extension staff encouraged adoption. The main barriers to establishing saltland pastures for many growers were that saltland areas were too small or patchy or it was too much trouble.
4. Findings from interviews, focus groups and informal discussion

4.1 Perennial pasture systems currently used in the study area

We identified four generic perennial pasture systems used in different types of farming enterprise across the study area as a result of discussion with farmers. The sample size did not allow us to determine the relative importance of these systems.

- Saltland pastures of halophytic shrub and pasture combinations. This system is best established on slightly to moderately salt-affected land and is being used across the study area in enterprises with a grazing component and significant areas of land affected by or at risk of salinity.

- Semi-permanent perennial/annual pasture combinations. This system is being used in grazing enterprises in the RDZ and EDRZ on non-saline grazing land to manage watertables and use excess soil moisture to increase pasture production. Cattle are well suited to this system because they seldom graze low enough to damage the sensitive parts at the base of pasture plants. Experienced growers considered a maximum of 15 to 30 per cent of arable area was a realistic optimum area for perennial pastures under this type of system.

- Pasture cropping into a perennial pasture. This system uses an established perennial pasture—lucerne, lucerne with chicory, and kikuyu are being tried in the study area—which is suppressed using herbicides and over-sown with a crop. With adequate growing season rainfall, the crop can grow to maturity with minimal competition from the dormant perennials. The perennial pasture regrows in spring to provide good summer feed after the crop is harvested. This system is being used in mixed cropping and grazing enterprises in the RDZ to maximise paddock performance on cropping land prone to waterlogging. One grower suggested that 20 per cent of arable land was the optimum level to allow for rotational grazing and adequate rest periods on his farm.

- Phase cropping. This system is a cycle of a cropping phase of 3–5 years alternating with a pasture phase (using lucerne) of 3–5 years. The perennial phase draws down soil moisture levels to control waterlogging, leading to improved crop yields in the cropping phase. During the cropping phase excess recharge causes the watertable to rise again. This system is being used in crop-dominant enterprises in the ADZ and RDZ to control waterlogging, lower watertables and manage the salinity risk on susceptible land. The proportion of land sown to lucerne in the two examples of this system we looked at ranged from about 7 per cent to about 50 per cent.

Most experienced growers grew perennial pasture species in combination with annuals in each of the four systems. Those who had adopted these systems to any degree acknowledged that they were still very much in a learning phase about perennial pastures—learning how they responded in different years and under different conditions—and definitely still exploring the possibilities for perennial pastures in their farming system.

Perennial pasture growers expressed varying degrees of satisfaction from their experiences; some landholders were positive about their experience and keen to continue to experiment and integrate perennials into their farming system, while others had become discouraged and reverted to their original farming system. In general, interested focus groups participants expressed more negative views about the likely performance and problems with perennial pastures than did the experienced participants in groups and interviews, suggesting that the negative concerns were not always borne out by experience.
Participants in the experienced and interested groups recognised that the persistence of the perennials in these systems depended on periodic removal of stock to allow pastures to recover. Experienced growers used rotational grazing to allow pastures to recover and set aside areas for strategic grazing to fill the summer/autumn feed gap. Rotational grazing enabled the better pasture utilisation throughout the year and allowed some growers to carry more livestock than set stocked pastures. Strategic grazing was also valuable in offsetting supplementary grain feeding or to defer grazing of other pastures at critical times of the year.

The five categories of adoption behaviours described by Bishop et al. (op. cit.) could be applied to the participants involved in this study. Growers in the experienced groups could be classed as ‘committed adopters’, ‘partial adopters’ and ‘belt tighteners’, while interested group participants were mainly would-be ‘belt tighteners’ with a few ‘comfortable’ farmers and some ‘sceptics’

Most landholders said they learned a lot by attending the focus groups. Participants in some experienced groups discussed getting together again to look at each others perennials and compare experiences.

The data gathered in the interviews and focus groups confirmed that landholders considered many factors before deciding to invest resources in a perennial pasture system. The different factors are discussed under the headings of drivers, benefits, barriers or enablers in the following sections, however our evaluation method did not allow us to determine the relative importance of the issues and their order does not reflect any priority or order of importance.

4.2 Drivers

In this study, drivers are the external social, economic or environmental pressures that set in motion a landholder’s decision to adopt perennial pastures and their associated practices. Without a driver even the provision of funding will not encourage some people to establish perennial pastures.

‘In our catchment we’ve had 100 per cent funding of perennials establishment and some people going, ‘Yeah, we’ll put some in,’ but when it’s come to actually doing it, they haven’t taken the plunge; they haven’t wanted to do it.’

The main pressures for adopting perennial pastures mentioned were:

- threats from salinity and waterlogging
- falling productivity or profitability
- the necessity to look after their land
- economic and environmental opportunities and risks associated with summer rainfall.

**Threats from salinity and waterlogging**

Most landholders were aware that the altered water balance in agricultural catchments is causing salinity and waterlogging and reducing productivity in susceptible landscapes. Most growers cited these problems as a key driver for introducing perennial pastures:

‘The water use [of perennial pastures] is absolutely crucial in replacing what the forest did originally. It’s most important that we get that balance back.’
Falling productivity or profitability

Many farmers expressed concern that salinity or waterlogging is impacting parts of their land, reducing productivity and financial returns. Many identified this as an important driver for them to adopt perennial pastures. As one grower suggested:

‘I think it is driven by economics … we want to get more out of our farms and that’s the crux of it and if we can, it might make everything else that little bit better.’

The necessity of looking after their land

There was a general acknowledgment in all groups that land conservation is now considered part of the normal land management expected by the community. Consequently, most farmers felt they were responsible for the state of their land. Wanting to leave it in a better state for the future is also a common driver:

‘Using more water and preserving the land we’ve got for whoever’s farming it after me is part of it. Most of the rest is just trying to squeeze a bit more out of the farm.’

For these landholders, good stewardship is the way to a sustainable and productive farming system, summed up in the statement:

‘Look after the land and it will look after you.’

Economic and environmental opportunities and risks associated with summer rainfall

Some growers considered the higher incidence of late spring and summer rainfall as a driver for adopting perennials because it degrades annual pastures and increases erosion risks, yet provides the opportunity to grow useful feed to offset the summer/autumn feed gap. A number considered that climate change made this driver even more compelling:

‘If climate is changing to drier winters and more summer rain then a perennials system will be the way to go.’

4.3 Benefits

Benefits are the positive outcomes participants observed as a result of adopting perennial pastures. Knowledge of benefits may encourage other landholders to want to adopt perennial pastures or make their adoption more attractive. Numerous benefits were mentioned, the most common being:

- better feed supply and quality; better livestock performance
- control of salinity and waterlogging
- improved amenity
- risk management
- psychological and social benefits
- improved crop production

Better feed supply and quality; better livestock performance

The most commonly mentioned benefits of growing perennials were related to better feed supply and quality for livestock. For experienced growers, having some perennial pastures:

- helped them manage the summer feed gap and reduce supplementary grain feeding in some years
● provided a feed reserve (e.g. as saltland pastures or lucerne on low slopes) for use in autumn to defer grazing of emerging annual pastures or put stock into so they could focus solely on seeding operations
● provided green feed earlier and later in the growing season than possible with conventional annual pastures
● improved overall pasture quality.

One interested grower reported that his feed costs had increased due to longer dry summer periods of recent years, prompting his interest in growing perennials to offset summer supplementary feeding costs. As a corollary to this, experienced growers noted that perennial pastures with access to a watertable can persist through dry spells common in our climate:

‘Tall wheat grass that we’d sown probably about four years ago we’re locking up as soon as stubbles are available [for grazing] after harvesting. And then by about April/May there’s exceptionally good feed there again. We carry a lot of sheep on it for that crucial period at the break of the season when you’re short of feed for a while.’

A number of growers identified the benefits of combining perennial and annual pasture varieties to give livestock a more consistent supply of good feed over much of the year. The annuals provide the bulk of feed in winter and spring while the perennials provide extra, high quality feed in summer and autumn. In two groups, experienced growers noted that the quality of the annual component of their pasture improved after introducing perennials:

‘The annual pasture itself was way improved after we established the [subtropical perennial grasses] because they bring up a lot of the nutrient that’s locked up further down in the soil profile; before that the paddock hadn’t done well as an annual pasture.’

Many experienced participants considered rotational grazing an essential practice associated with perennials to enable them to persist. Numerous growers commented on the value of using feed budgeting and applying intense grazing pressure with large numbers of animals for short periods. Landholders reported a number of benefits of this rotational grazing approach over conventional set stocking approaches including:

● improved overall quality of mixed pastures by preventing overgrazing of the desirable plants
● improved pasture utilisation and overall carrying capacity
● one to three weeks longer pasture growing season
● feed budgeting provides a systematic approach to work out rest periods and adjust stock numbers well in advance
● more control of livestock and paddock performance and less stress.

Experienced growers mentioned numerous significant benefits of having extra high-quality pasture feed during the summer–autumn period. These included:

● the ability to retain more sheep from one season to the next:
  ‘We’ve actually carried through stock that we’d have had to sell otherwise … in quite a few years, not just one.’
● green pastures in summer, providing adequate vitamin E, particularly important for the health of young animals and saving the cost and inconvenience of yarding and inoculating young stock.
Many growers said their livestock came through in better condition at autumn. Specific benefits they noted included:

- prime lambs and weaner cattle gained condition quickly during background feeding on perennial pastures and were finished for market a week earlier than anticipated in feedlots
- weaners finished summer in heavier condition and had higher lambing percentages as maiden ewes than ewe weaners fed on dry annual pastures
- wool cut and staple strength were increased.

**Control of salinity and waterlogging**

Most experienced growers attested that perennial pastures had dried out soil profiles and provided a range of other benefits. Some of them said perennial pastures were better than trees or shrubs for rehabilitating salt-affected areas because they got more grazing value from the area, saved on the cost of fencing and difficulty in managing small areas, and the pastures were just as effective at lowering the watertable. One experienced grower commented:

> ‘Perennials have revolutionised our farming system by enabling us to manage the watertable.’

**Improved amenity**

Many farmers expressed satisfaction that they had got something established on waterlogged or saline areas, which was at least a visual improvement and could have a positive effect on the productivity of those sites:

> ‘We just enjoy seeing that green stuff growing. We get great pleasure out of returning land to fresh and drying paddocks out. It's not just a financial thing. Farmers get upset if the land's degrading. We go for a drive in the evening and see land in good condition and it’s uplifting.’

Others cited improvements in soil health as a consequence of deeper rooting habit, larger root development and higher soil organic matter levels in perennial pastures as compared to annual pastures.

**Risk management**

Experienced landholders with perennial pastures identified risk management as an important benefit. Perennials were credited with mitigating a number of risks to profitability and sustainability, including rising watertables, salinity, waterlogging, soil erosion, increased input costs and climate change. Risk management became increasingly important as the intensity of grazing operations increased:

> ‘...In our [high-input-high-stocking rate, rotational grazing] enterprise perennials hold the system together. In adverse seasons when annual pastures perform poorly, the perennials are there to compensate to some extent.’

**Psychological and social benefits**

There were also comments on the psychological benefits of having perennials in the farming system, particularly in relation to summer rain:

> ‘It psychologically benefits farmers, it really does, if it rains in January and we’re sitting at swimming lessons, those of us with perennials can say ‘at least the perennials will be growing.’
There were social pay-offs too; meeting like-minded people helped them develop confidence and validate their own approach to perennial pastures. Many were proud of the new system they had developed and gained more satisfaction from farming:

‘I have met a lot of beaut people and we have a more hospitable landscape to live in and farm. There isn’t a lot of money in farming but this makes it more fun.’

**Improved cropping system**

Perennial pastures, particularly lucerne, provided a number of benefits to growers for whom cropping was important. Experienced growers commonly identified the following benefits to crop production:

- Control of waterlogging on susceptible cropping country resulted in improved yields of following crops:
  ‘We’ve seen country with patchy crop across the flat and after three years of lucerne we have grown [good crop] fence to fence.’

- Lucerne gave growers more strategies to control problem weeds. A number of growers reported they had over-sprayed lucerne with selective herbicides to control grasses without damaging the perennial:
  ‘I’ve got a paddock that was in cereals for 12 years and the last crop I put in was lucerne and canola and I used [a selective herbicide] so I could clean up the grasses and that’ll go back into canola this year and I guarantee you I won’t kill the lucerne but it’ll have a good crop.’

- Livestock could help to control annual weeds in perennial pastures, e.g. radish and ryegrass were grazed in preference to the lucerne in the pasture phase:
  ‘One advantage of lucerne is that [you can graze the pasture] before the radish sets seed. The sheep graze the radish in preference to the lucerne and you don’t need to spray it [for weeds].’

- One grower had established a number of crops into a lucerne and chicory pasture by using broad spectrum herbicides to remove the annual pasture component and suppress the perennials. On each occasion, the perennials had recovered fully by spring after the crop had set seed. Yields and grain quality were consistently average or above for the property.

### 4.4 Enablers

Enablers are the factors that increase growers’ confidence or help them to go on to try and potentially adopt perennial pastures, once they had acknowledged their drivers for change. We identified six groups of enablers from the focus groups and interviews:

- conviction about the value of perennial pastures
- seeing perennial pasture demonstrations and getting inspired
- peer interaction
- information and support
- learning by doing
- encouragement from success.
**Conviction about the value of perennial pastures**

Landholders who had tried and persisted with perennials were convinced that there was sufficient advantage in growing them and were determined to overcome any barriers. A number of landholders said that the first thing was to **be clear about why** they were growing perennial pastures. Once they’d acknowledged a driver and set some aspirational goals, other enablers became important.

Experienced growers all shared a **strong belief** in the potential of perennial pastures, even with an incomplete picture of how they fitted their farming system:

‘I seeded 300 acres in two paddocks. I had already seen it; I was convinced I could grow it, even though at that stage I was concerned how it was going to fit with my entire farm.’

Once on the path to adoption, a number of growers suggested that **diligence and persistence** were essential to success:

‘I think the main thing is persistence with these things. There’s no use chucking something in the soil and expecting it to grow. You’ve got to keep on with it.’

A number of experienced growers remarked that a readiness to **accept criticism** and resist ridicule from other farmers was important:

‘... you’ve got to be prepared to accept the fact that a lot of the locals will think you’re quite odd and you’ve got to regard that as rather good in a way.’

**Seeing perennial pasture demonstrations and getting inspired**

A number of perennial pasture growers related how they had been **inspired by seeing what others like them had done** in situations that that they could relate to their own property. Being able to see and ‘touch’ working demonstrations of perennial pastures and talk to the growers about establishment and associated management helped them see the potential for their own property. Sources of peer inspiration and information were neighbours and growers from other regions of WA or even interstate:

‘The chap that got me going on [kikuyu] has got big stands of it growing down [at] Borden where it gets pretty dry. And then in summertime, when all the other paddocks are bare and desolate, go to his place and it’s like driving on a footy field, it’s that green.’

‘For me a key driver was seeing what’s happening in the northern agricultural region through our Evergreen [Evergreen Farming] network—that blew me away and it’s been the catalyst for a number of people I know in the southern half of the state when we had a bus trip up there.’

‘... I looked over the fence; over next door [they] grew lots of tall wheatgrass before I did.’

**Peer interaction**

Seeing their peers growing perennials helped **legitimise the practice** in the eyes of some interested growers, making it easier for them to try perennial pastures too:

‘...the boy came home from Narrogin Ag College and he says we’re going to grow lucerne. I said ‘Oh yeah.’ [I’d] watched Peter [the neighbour] battling over there trying to grow it and I thought, ‘Oh well, if you want to do it, go ahead,’ and away he went.’
Many experienced participants said the opportunity to meet experienced growers and discuss issues about perennial pastures had given them the opportunity to learn about and understand someone else’s system and its benefits and pitfalls. Field days were useful venues for peer interaction and learning. Sometimes it took a while for confidence to reach the level where a participant could decide to proceed with perennials:

“We picked up on Jeff Bee [an experienced lucerne grower] at Jerramungup and talked to him a lot, attended his field days. So we saw a lot of him and then thought ‘Well, we would go for it.’”

A number of growers were members of groups that provided a forum for discussion of innovative ideas. Talking to other people about perennial pastures was also helpful for refining ideas in the process of developing one’s own approach:

‘Sometimes they’ll say something to you that will give you a slightly different slant on something.’

Some mentioned that seeing perennial pasture growing successfully on poorer soils or with less rain than their own situation encouraged them to believe that they could establish them too:

‘I looked at the wheatbelt areas and … they’re growing this sort of stuff [saltland pastures] all around the countryside out there, with no rain and one would think if you could establish it with just a bit of rain that it might do exceptionally well [here].’

**Information and support**

A number of experienced growers identified that gathering the necessary information to learn all they could was an important step in gaining confidence that they were doing things correctly:

‘Starting up, you have to do your homework and find out [all you can] …’

For some, reading about perennials and successful case studies was enough to provide the confidence to try perennial pastures for themselves:

‘I just read papers and books and you know, what they were doing over east and I thought I’d try it here, see how it goes.’

A number of experienced growers noted that on site advice from experienced advisors or their agronomist was particularly useful to build their confidence. Advice on setting up and establishing perennial pastures—with some ‘hand holding’ during the first year—reassured them they were on the right track:

‘The Ag Department’s Lucerne Growers Association was excellent; [their] personnel came out and ran you through the package. This is what you should do to get started. That was a good service because you weren’t sure when you started but it gave you a bit more confidence you were doing the right thing and that was good.’

A few experienced growers had received incentive funding and commented that it had been useful to offset establishment costs and to provide encouragement at the start and also to help progress projects:

‘Incentives helped, but as we went on it was the rewards, the success—it’s more than monetary reward.’
'We would have established our perennial pasture over the next 15 years [as the budget allowed], but the grant has meant we've been able to put it all in, in two years.'

**Learning by doing**

Having seen and heard enough, at some point experienced growers had to **just go ahead** and put the theory into practice. A number of growers commented that it was a process of learning by ‘trial and error’. The practical experience they got from a successful try-out became the enabler for them to continue to develop and refine their perennial pastures system:

- ‘I see no alternative to getting on with it and making mistakes and getting it right and persisting.’
- ‘… the little plots that we’re playing around with now are a bit of trial and error to see how well it’s going to work and how it’s going to fit. And if it does work then we expand it.’

Some said that reducing the loss of production associated with establishing perennials by using innovative approaches such as cover cropping, inter-row seeding or spring sowing of summer active species, allowed them to go ahead:

- ‘We inter-rowed peas and lucerne to give the lucerne a cover crop. And then we ‘plucked’ the peas out [at harvest]… and left the lucerne behind. It worked all right actually.’

**Encouragement from success**

For many growers, **success** was the enabler that helped them continue to incorporate perennial pastures. There was a sense of pride and enjoyment that encouraged them onwards:

- ‘I mean we’ve had a lot of fun with it really. I mean it’s actually provided us with a great interest … and the success we’ve had is thrilling, really.’

Some successful growers suggested that restoring productivity to unproductive country with perennial pastures encouraged them to continue with the practice:

- ‘… we’re optimistic about the future of it, there’s a lot of unproductive country that can be much more productive.’

### 4.5 Barriers

**Barriers** are the negative factors landholders perceive which leads to a choice not to adopt perennial pastures or their supporting practices or which they have to overcome in order to adopt perennials pastures.

Interested farmers, with little or no personal experience to call on, identified barriers that were often based on second-hand information and speculation. Often, they proffered barriers as reasons for not having adopted perennials, whereas experienced growers generally saw barriers as issues they’d had to deal with to get perennials to establish and persist. The main barriers identified from all groups were:

- high cost and low additional benefit
- poor market outlook for livestock
- lack of knowledge and experience
- lack of confidence and riskiness in perennial pastures
Perennial Pasture Adoption in the South West NRM Medium Rainfall Region

- social pressure to conform
- conventional stocking practice and grazing pressure
- inability to source seed
- soil constraints
- establishment problems
- potential land use conflicts.

**High cost and low additional benefit**

Cost was often one of the first barriers raised by landholders in all groups. Many experienced and interested participants noted that overall establishment costs could be significantly higher than for annual pastures. Perennial pasture seed was considerably more expensive than annual pasture varieties and first year perennial pastures often needed more inputs to manage pests and weed competition due to the low vigour of emerging seedlings.

Most growers also recognised that the value of production lost while perennial pastures got established was a significant opportunity cost and barrier to wider adoption.

> ‘The problem I see with perennials is that you nearly take out, if not a year of production, then at least probably half a year in loss of production, so that’s what’s probably hindered me.’

The extra cost of reseeding and the low returns resulting from failed or poor establishment were also identified as barriers.

In addition, many growers factored in the cost of additional infrastructure, in the form of fences and stock watering points, which provided a substantial financial barrier to shifting towards perennial pastures:

> ‘Some of it depends on the layout of your property. In our case we’ve got a whole lot of creek systems that are going saline but they’re only just narrow. And so to actually utilise them, it’s a massive fencing job to do all these little areas.’

Cost measured in time and labour was also a barrier, particularly for one-person operations:

> ‘Because I’m on my own, I don’t really need a lot of extra work in protecting it with chemicals or whatever. So … I’m looking for an easy care type perennial as well.’

Many interested growers also expressed doubt that the additional benefits associated with growing perennial pastures could offset the extra cost and inconvenience involved with establishing them.

**Poor market outlook for livestock**

Falling profitability and confidence in livestock enterprises were mentioned in most groups as important barriers to adopting perennials. Some growers commented that the increase in grain prices (and therefore the costs of feeding grain to livestock) in early 2008 had further reduced the profitability of both red meat and wool production and with it the marginal benefits of improving pastures. Many producers were also concerned by the proposed phase out of mulesing, extended periods of low wool prices and a general poor outlook for wool.
Numerous producers said they were responding to these market signals by moving to more cropping and focussing on improving sub. clover pastures to offset nitrogen and weed control costs:

‘... the main issue is actually the price we are getting for our livestock. Other opportunities are there at the moment. I’m not going to say they’re going to continue in terms of cropping but really we can’t start spending a lot of money on pastures until we see some sort of improvement in livestock values.

**Lack of knowledge and experience**

Comments from a number of participants in interested focus groups indicated that they were not confident about which varieties to use or how to establish or manage them and identified this as an important barrier to growing perennial pastures.

Many participants noted that information on perennial pastures relevant to this area was not readily available, and this was another barrier for participants in interested groups. Many of these landholders were not satisfied with information based on research from other parts of Australia, with different climate and soils:

‘I just think it’s early days for this area. I can’t think of many people who have had success or even tried perennials and I think that’s why … the information … it’s all for the south coast or it’s for the east, and it’s nothing particular to our area.’

Growers from all groups identified that there were too few local research trials and demonstrations to build the knowledge base about perennial pastures in their area. For these growers, being unable to see local, relevant perennial pasture trials and demonstrations (or access information based on them), left them with too much doubt and uncertainty to consider trying the practice. As the traditional research and extension provider in WA, DAFWA was criticised by experienced and interested growers alike for not providing staff with the opportunity to develop a first-hand knowledge of perennial pasture systems:

‘I like to learn from people who’ve been successful at doing something, not successful at sitting down reading a book and then coming to tell me what I should or shouldn’t do. They [the department] don’t have the practical experience in my opinion. That’s a polite way of putting it.’

Some growers identified that perennial pasture research was conducted in a somewhat piecemeal way that discouraged researchers from staying on to develop their knowledge and pass it on to farmers:

‘A researcher would come in to do some work on perennials … on a five-year or three-year contract [with] no guarantee of employment at the end [of their funding]. So before they finish they’re looking for another job and [then] they’re gone. Nine out of ten times all the information goes with them and [a few] years down the track if you ask what happened at the site [you’re told], “So-and-so was doing that and has gone. We haven’t continued that research.”

Many were frustrated that the department had few experienced specialists to provide good quality advice:

‘You actually need to get the advice on putting perennials in. We rang the department, we got all sorts of people and no-one knew, they just said, “Have a go.”’
Some interested participants said the distance from departmental offices restricted access to local research and extension opportunities:

‘We have [a DAFWA office] at Katanning. Because we’re a fair way from Katanning and a fair way from Narrogin … we sort of get left out a bit here because we’re in between both of them.’

Farmers were sceptical about information from experienced local growers whose farming system was viewed as impractical or not relevant to the learner’s situation:

‘I've got a neighbour who thinks that lucerne is the only thing on earth. So his farm is predominantly a lot of lucerne but then he has got to agist his sheep to Esperance because you can’t set stock your sheep on it because you’ll overgraze it and then it’s gone.’

Commercial information from seed merchants and others with a vested interest also has questionable value:

‘I find that looking for information on perennials, you’re looking through literature of people who are trying to sell you lucerne or whatever and it's all south coastal, so it's all a completely different story. They’re talking about silage and everything and you just look at it and go that's just not going to work [in] my situation.’

**Lack of confidence and riskiness of perennial pastures encourage adherence to conventional practice**

A fundamental barrier mentioned by a number of interested landholders was the inherent uncertainty and risk they feel is associated with a perennial pasture system:

‘[I need] … confidence that it's going to survive there for more than one or two seasons before I go on and throw money into it.’

For some inexperienced growers, establishing perennial pastures is not unlike gambling, and they expressed a reluctance to adopt perennial pastures while farm profit margins were tight:

‘If you want to sit at the $2 table, grow oats, barley and wheat, but if you want to sit at the $50 table, try chicory, canola, lucerne … Times have been such in the last 10 years that you can’t afford to lose your $50s. So you're only game to play with your $2s and stick to what you know.’

Landholders across the study area have a considerable history and investment in annual sub. clover and grass-based pastures. These pastures have proven to be easy to establish and manage—and sufficiently productive, profitable and resilient—over the preceding decades, so many landholders see little reason to change. Set stocking has become the norm throughout the study area. Most growers use relatively low stocking rates to graze pastures until a minimum amount of feed remains, and then move animals to another pasture paddock or feed them a maintenance ration of conserved fodder.

For landholders without a sufficiently powerful driver to use perennial pastures, opting to continue with ‘business as usual’ is a rational approach when considered against a relatively unproven and possibly uneconomic new practice. The decision is often supported by sensible advice from trusted sources, like their consultant:

‘… a lot of our goals are economically based and … consultants are very much stick to what you know works; focus on that and do it as well as you can … that’s where you make most of your money. ’When [our consultant] points out the costs, the risks and the foregone production of trying something alternative and we weigh up the risks, most of the time … it’s not worth it.’
Other risk-related barriers mentioned by some of the participants were plant toxicity problems (raised in two interested groups) and the possibility that perennials could become weeds (identified in one experienced group).

**Social pressure to conform**

Allied with the unwillingness to take on a risky practice was an unwillingness to take on a practice that others could consider a departure from normal practice. Landholders in a number of groups identified social pressure to conform to conventional practice as a barrier to adoption of perennial pastures:

‘… we’re stuck … we have to have things looking exactly as we believe they should, and we won’t allow change to occur because we’re too scared of the first changes that come.’

Some participants, mainly from interested groups, acknowledged that they don’t like to be seen trying risky new things as they feel there is a social stigma attached to undertaking unconventional practices or behaviour, especially if they go on to fail:

‘The worry is the failure, the risk of failure. It’s a new concept and because you always have your failures where everyone else can see them, people don’t like that.’

Many participants in interested groups were aware of someone who had tried perennial pastures previously and failed. The general awareness in the community that perennial pastures had been unsuccessful before was identified as a sufficient reason for many otherwise interested landholders to dismiss the practice out of hand and stay with conventional practice:

‘… it’s expensive to set up and too many people know too many other people who’ve had failures.’

A number of experienced growers who had persisted with perennials had been rubbished or criticised for trying them, particularly in the early stages. One innovator, describing his perennial pasture establishment process, added as the final step, ‘Then get ready for a ribbing from your neighbours.’

**Conventional stocking practice and grazing pressure**

Landholders were aware that most perennial pastures need a rest period to recover after they have been grazed if they are to remain productive and persist for more than a year or two. Yet overgrazing of perennials was often cited as the reason for the failure of perennial pastures to persist:

‘I’ve tried 50 to 60 ha of some lucerne on flat country. It all grows but the sheep will chew it out—you see it one year and you see it the second year then it gradually disappears and you’ve got to go back and reseed it.’

For most interested growers, changing grazing management was a significant barrier because it was too much of a departure from their current livestock and pasture management, too time and labour consuming or too much of a restriction on their lifestyle:

‘If you’re going to lead any sort of a reasonable life too, you don’t want something that’s going to tie you down to running around shifting sheep every couple of days from one paddock to the next.’
Another barrier noted by experienced growers on occasions was the impact that pest populations of feral and native grazers could have when green pastures were their preferred feed choice:

‘Rabbits are very good at getting rid of lucerne, they just hammer it until it’s gone.’

Inability to source seed

Unavailability of the right variety of seed was identified by experienced growers as an important barrier when it came to establishing a perennial pasture. Salt tolerant perennial pasture varieties (particularly tall wheat grass and puccinellia) had been in very short supply in recent years:

‘… it’s very hard to get the variety of seed you need, so you’re looking at ones that are doomed to fail.’

A number of growers suggested a barrier to the widespread adoption of perennial pastures in WA was that the available varieties were developed and sourced in the eastern states or New Zealand. Consequently they were not bred for local conditions, were too costly and were unavailable at times.

One seed merchant commented that seed shortages were exacerbated by Landcare incentive schemes because seed producers received no advanced notice that programs to encourage perennial adoption would be available and so were unable to increase supplies of perennial pasture seed to pre-empt the increased demand.

Encouraging seed production from local, on-farm pasture seed crops has been difficult because areas were mainly small and some species were difficult to harvest.

Soil constraints

Plenty of comments were recorded about the poor performance of pastures planted into inappropriate environments, for example lucerne planted on waterlogged and salt-affected country did not perform well. Constraints mentioned by experienced growers included heavy clay subsoils, low subsoil pH and high aluminium levels.

A number of growers who’d had mixed success with perennials realised that they needed to get their soil and agronomy right before trying again:

‘My strike rate with lucerne was poor … my soil was actually too acidic and the environment’s too hostile … I’m now going back and getting my soil pH into balance and removing the weed seed bank in the cropping rotation so I can move into a good establishment of perennials [without too much competition].’

Some landholders were disappointed by the poor persistence of perennials they had established on parts of the landscape that were possibly too dry:

‘Whether it was our management … it just seemed to dry the profile out. Even though the plants were there, they just didn’t do well.’

Establishment problems

For those who had tried establishing perennials and failed, poor and patchy establishment was a barrier to trying more perennials. Sometimes the reasons for poor establishment were not known, though agronomic and soil related causes were suggested.
Many experienced growers were aware that emerging perennials (particularly temperate grasses) have low vigour and are liable to be out-competed by annual species in the seedling year. Their vulnerability and the extra management requirement was considered to be a barrier for some.

A further barrier to adoption was the limited herbicide choices available when perennial species are included in a pasture. The problem is compounded when mixtures of different perennial broadleaf and grass species are used and few to no choices exist:

‘If you try and put a clover with tall wheatgrass [it’s difficult to find] a chemical to [get] rid of the weeds you want to kill, because now they are two different [pasture species] to consider. It’s a very touchy area, trying to get rid of … weeds.’

‘The idea to put a few more species in with [lucerne] only makes it more problematic and worries me more.’

**Potential land use conflicts**

In most focus groups and interviews, the high water use feature of perennial pastures was seen as a barrier to whole landscape planting because they were likely to draw down soil moisture that could reduce crop yield and water run-off into dams:

‘In our cropping situation, we [aim to] conserve moisture, [but] perennials are sucking away the moisture [that] you want to get the crop away early …’

‘So for me it’s not going to be up on top on hill—I don’t want to stop water getting to my dams—it’s going to be valley floor stuff, where I’ve got problem areas.’

A number of participants suggested that it would be wasteful to establish perennial pastures on cropping land and then have to kill them later to establish a crop, unless they were using them to dry the soil profile to improve trafficability of the paddock and crop yield on affected land:

‘If you’re in a cropping mindset, unless you’ve got a huge area of wet stuff that you want to dry up so you can get up a crop, why spend a lot of time, money and energy changing everything so that in 2–3 years time you’re going to have to plough it all up and plant a crop again.’

**4.6 Influence of soil-landscape zones and farm types on landholder perceptions**

Collating the data from experienced and interested groups by the modified soil-landscape zones suggested that farm enterprise make-up and scale does vary across the zones, however our sample size did not allow us to understand the nature of the relationships between soil-landscape zone and farm enterprises. Differences in annual rainfall and winter growing season length are also likely to be important factors. It was clear however, in both experienced and interested landholder groups, that attitudes and perceptions were related closely to the type of farming enterprise they operated.

Most landholders who operated cropping enterprises saw perennial pastures as a conflicting land use on good cropping country and were adamant that they would not grow perennial pastures on this land. However a few experienced perennial growers were successfully managing waterlogging on cropable land with lucerne; maintaining good crop yields and reducing salinity risk. Many dedicated croppers said they were not keen to grow perennial pastures because they did not want any distractions when cropping operations needed their
attention. Livestock producers with small cropping programs were more likely to use perennials in combination with annual pastures in areas with excess subsoil moisture. Most participants were interested in using perennial pastures on salt-affected and degraded land.

### 4.7 Summary of findings

Focus group discussions and interviews with landholders revealed a range of attitudes, perceptions and levels of commitment to adoption of perennial pasture. The five categories of adoption behaviours described by Bishop et al. (2007) could be recognised in the participants involved in this study. Growers in the experienced groups could be classed as ‘committed adopters’, ‘partial adopters’ and ‘belt tighteners’. The interested groups contained mainly ‘belt tighteners’ with some ‘comfortable’ and ‘sceptics’, which may be why landholders in interested groups generally expressed more negative attitudes about perennial pastures.

Data from all interview and focus group transcripts and discussion notes were categorised as drivers, benefits, enablers or barriers to perennial pastures adoption as shown in Table 1.

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Benefits</th>
<th>Enablers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Threats from salinity and waterlogging</td>
<td>• Better feed supply and livestock performance</td>
<td>• Conviction about the value of perennial pastures</td>
<td>• High cost and low additional benefit</td>
</tr>
<tr>
<td>• Falling productivity or profitability</td>
<td>• Improved amenity</td>
<td>• Seeing demonstrations—getting inspired</td>
<td>• Poor market outlook for livestock</td>
</tr>
<tr>
<td>• Necessity of looking after their land</td>
<td>• Risk management</td>
<td>• Peer interaction</td>
<td>• ‘Normal’ stocking practice and grazing pressure</td>
</tr>
<tr>
<td>• Opportunities and risks associated with summer rainfall</td>
<td>• Psychological and social benefits</td>
<td>• Information and support</td>
<td>• Lack of confidence and riskiness</td>
</tr>
<tr>
<td>• Improved cropping system</td>
<td>• Improved livestock performance</td>
<td>• Learning by doing</td>
<td>• Social pressures</td>
</tr>
<tr>
<td></td>
<td>• Conviction about the value of perennial pastures</td>
<td>• Encouragement from success</td>
<td>• Lack of knowledge and experience</td>
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<td></td>
<td>• Seeing demonstrations—getting inspired</td>
<td></td>
<td>• Inability to source seed</td>
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<td></td>
<td>• Peer interaction</td>
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<td>• Soil constraints</td>
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<td></td>
<td>• Information and support</td>
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<td>• Establishment problems</td>
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<td></td>
<td>• Learning by doing</td>
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<td>• Potential land use conflicts</td>
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5. Key learnings and recommendations

Our literature review showed that the degree of adoption of complex practices and behaviours that differ from the status quo (like adopting perennial pastures) depends on three sets of issues: how landholders perceive the relative advantage and trialability of the ‘new’ practice or behaviour, the landholder’s characteristics and circumstances, and the learning process and social setting in which learning takes place.

Future projects to support adoption of perennial pastures will need to consider these three sets of issues and understand how they interact, if they are to effectively influence their target audience’s decision making about perennial pastures.

5.1 Landholders in the study area perceive perennial pastures as an unusual, unconventional and complex practice

Landholders are unlikely to adopt perennial pastures unless they recognise a driver for change and believe that perennial pastures can be part of a system that will be economically, environmentally and/or socially better than their current farming system. Generally, landholders have invested their time, money and resources into maintaining their current farming system and for most, their present commitments make it difficult to contemplate substantial changes.

Some landholders perceive that the relative advantages of a perennial pasture system are great enough to encourage them to try using perennials and to resolve challenges and problems as they arise. For most landholders in the study area though, perennial pastures remain an unfamiliar and unconventional practice. Many inexperienced growers view perennial pasture grazing systems as complex and difficult to trial because many of the possible benefits are not observable in the short term. Examples of the practice are not yet common, so there are few demonstrations to view or experienced growers to talk to about their perennial pasture systems.

While not yet commonplace, numerous growers are showing that perennial pastures can be an effective and useful strategy to help them respond to different drivers for change and to improve their farming system. Successful growers have adapted conventional practices in order to establish perennial pastures and have followed simple rules to manage a supposedly complex rotational grazing system. The four perennial pasture systems identified in this report are still quite new to most landholders, and growers are yet to experience the performance of perennial pastures over the full range of seasons that are likely to occur in the study area.

Recommendation 1
That future SW NRM projects focus resources on developing and demonstrating saltland, phase cropping, pasture cropping and permanent perennial pasture systems in the region.

5.2 Different audiences need to be considered in extension plans

Landholder characteristics and circumstances in the area are extremely variable, as reflected in the drivers, barriers, types of benefits and varying levels of commitment to using perennial pastures recorded in the focus groups and interviews. The landholder’s characteristics—including their goals, motivations, resources, education and other circumstances, like enterprise mix and farm equity—will influence the sort of perennial pasture system (if any) they might consider incorporating on their farm. Some landholders do not have sufficient
knowledge, skills and/or resources (time, money and equipment) to be able to adopt a perennial pasture system, so not everyone will be receptive to extension messages aimed at encouraging the use of perennial pastures.

Acknowledging this diversity and segmenting the target audience on the basis of commitment and enterprise type will help to target extension resources more effectively and ensure extension planning accommodates each market segment’s specific information and support needs.

**Recommendation 2**

That future sustainable agriculture projects evaluate the characteristics and circumstance of landholders in their target audience (including their goals and management issues) to segment the audience and provide appropriate extension resources to each audience sector to support their adoption decisions about perennial pastures.

### 5.3 The learning processes are as diverse as the audience

Reflecting their diversity of characteristics and circumstances, landholders have a wide variety of preferences for learning about potential new practices like perennial pasture. Initially, learning is mainly from general and technical information in the public domain, such as press articles and Farmnotes, and attendance at field days and technical forums to hear and question experts and experienced farmers. However, as noted above, experienced growers and good perennial pasture demonstrations are few. Printed technical information on perennial pastures in the local context is not always readily available and there are few knowledgeable extension officers to disseminate this sort of information or to help landholders resolve their issues with perennial pasture systems.

Most landholders also get feedback about new ideas at this stage by discussing them informally with neighbours, family, other farmers and consultants in the course of deciding whether to try them or not.

Once landholders are confident that perennials could be beneficial, experiential learning takes over as growers try growing perennials on a small scale. At this stage many learn by trial and error and failures can be costly and stifle the enthusiasm for further learning. On-site advice and mentoring can prevent costly errors and help growers develop the skills and understanding of the agronomy and management requirements of the system they are testing. Currently there are only a few experienced and competent advisers within the department and the private sector available to provide this service within the study area.

**Recommendation 3**

That resources be allocated within the study area to provide greater access to on-site mentoring and technical support to landholders trying out perennial pastures, in order to help develop their skills and understanding of the system.

Most experienced growers consider their system to be still in development, with some degree of trialling, evaluation and refining going on. The opportunity exists for extension and research officers to work with these growers and provide technical support and assistance to refine their systems and to involve other interested growers in participative research ventures. Grower groups (Evergreen Farming, Saltland Pastures Association and WA Lucerne Growers) network grower experiences and technical information through their members, but only have limited resources to provide onsite advice, extension and support for growers developing perennial pastures.
Committed annual pasture growers will need more contact with successful perennial pasture growers in their district before they see perennials as a viable practice. Selected experienced perennial growers will need support to provide peer leadership and demonstrate the economic, environmental and social benefits of perennial pasture systems.

Close collaboration between extension agents and landholders will help to determine the landholder’s level of commitment and the problems they face. It will also help extension agents clearly define their target audience’s needs. Semi-structured conversations provide an effective method for extension agents to learn about their prospective clients’ attitudes and perceptions about perennial pastures, as well as the knowledge and skills they need to progress along the adoption pathway.

**Recommendation 4**
That a participative research approach involving experienced growers be adopted to refine examples of the four main perennial pasture systems and to develop reliable locally relevant information on agronomy and management. Extension projects should build on the knowledge and experience gained by respected landholders who are developing these new pasture systems.

Most landholders actively exchange views on new practices like perennials with one another. Because there is high degree of uncertainty about the establishment and management of perennial pasture systems, perennial pasture growers (and potential growers) are likely to look to other growers in similar circumstance to develop appropriate practices and refine their systems. Facilitating this peer interaction between landholders may help to refine norms about what they consider to be good farming practice.

**Recommendation 5**
That projects facilitate access to more working demonstrations and support peer interaction between growers interested in perennial pastures.
6. Conclusions

The study of factors influencing adoption of perennial pastures in the medium rainfall SW NRM region documented many drivers, benefits, barriers and enablers identified by perennial pasture growers and interested landholders and other agricultural professionals.

There was no direct relationship between landholder perceptions about perennial pastures and soil landscape zones; rather landholder perceptions about perennial pastures were influenced by the type of farm enterprise they operated – generally landholders were reluctant to grow perennial pasture on cropping land unless they believed perennial pasture could benefit their cropping rotation.

The successful perennial pasture growers we interviewed identified drivers that had led them to adopt perennials. Common drivers were salinity and waterlogging, falling productivity or profitability, land conservation and the option of using summer rain to grow green feed for livestock.

Both experienced growers and interested landholders identified a number of financial and non-financial benefits from adopting perennial pastures, including control of waterlogging and salinity, better pasture and livestock performance, improved amenity, psychological and social benefits, an improved cropping system and reduced management risks.

Factors that enabled experienced growers to adopt perennial pastures included a positive attitude about perennial pastures, relevant demonstrations, supportive peer interaction, incentive funding and access to on-site technical support.

Participants identified numerous barriers to adopting perennial pastures, including cost, scarcity of seed of suitable varieties, a poor outlook for livestock market, too few credible advisors, poor access to pertinent printed technical information, fear of failure, perceived riskiness, poor and patchy establishment, tacit social disapproval of unconventional practices and the need to change grazing practices.

The study identified four main perennial pasture systems suited to saline sites, non-cropping soils and waterlogged cropping areas that were worth developing and extending in the study area:

- saltland pastures
- perennials with annuals in permanent pastures
- pasture cropping with lucerne or kikuyu
- lucerne with phased cropping.

Our study showed that future projects will be more likely to enhance perennial pasture adoption if they:

- apply participative research approaches with experienced growers to develop and refine examples and support local demonstrations of the four main perennial systems
- provide on-site advice and support from experienced and credible extension agents to enhance growers’ confidence in these systems.

Our study suggests that future projects could be more successful if they emphasise the social context in which adoption occurs. Projects need to be designed to take advantage of factors that maximise the influence of social norms to ensure that perennial pastures become part of the normative concept of good farming practise.
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8. Appendixes

8.1 Appendix 1: Semi-structured Interview Guide

**Background information**

General background information on farm and enterprise.

- What is your enterprise mix?
- Total farm hectares (including area managed/leased)
- Location/average annual rainfall
- What percentage of land do you graze or is only grazing land?
- Do you have or have you had in the past any perennial pastures? If so, how many hectares; of what type?
- Do you belong to any grower or catchment groups? If so, which ones?

**Benefits, barriers and drivers**

- What are the roles for perennial pastures in your farming system? How do they fit in?
- What varieties are you growing at present? Over how many hectares? How long have they been established (roughly)?
- What has worked well and what didn’t work well in establishing and managing your perennial pastures? Please explain.
- Why did you start using perennial pastures? What do you hope to achieve? (Drivers—drill down here.)
- What or who has influenced or helped you the most in growing perennials? How has each helped? (Enablers—drill down here. Tell me more about … e.g. information, other people, demos, field days, workshops, technical support, incentives.)
- How have you gone about acquiring knowledge about perennial pastures? Where do you generally get information and advice on perennials? (Enablers, barriers)
- What new skills or techniques have you had to learn so you could introduce perennial pastures?
- What are the major benefits for your farm business from perennials? (Benefits) Are you happy with what you have? If so, why (Benefits/drivers)
- What are your future plans for using perennials? If none, why not? (Barriers)
8.2 Appendix 2: Focus group discussion guide: interested farmers

1. What constitutes a good pasture system?
   a. What are the main objectives with your pasture management?
   b. How do you feel about the current performance of your pastures (productivity and conservation):
      i. positives
      ii. negatives
      iii. across all seasons
   c. Where do you think your system falls down?

2. What sparked your interest in perennial pastures?
   a. What role could perennial pastures have in your farming system?
      i. your annual pasture system
      ii. your cropping program
   b. What would need to be in place for you with trialling perennial pastures?
   c. What would need to be in place for managing perennials at full adoption?

3. How do you hope perennial pastures will help you meet your objectives?
   a. Lifestyle
   b. Farm
   c. Community
   d. Family/personal

4. DAFWA research shows that a significant part of the region is suitable for perennial pastures, yet very little has been established so far. Can you suggest what the barriers are?

5. What would encourage you to grow perennials as a significant component of your annual pasture system?

6. What is involved in learning about adopting new practices like perennial pastures?
   a. What is your learning process?
   b. How do you handle the complexity of practices that you want to adopt?
   c. How do you simplify them in your mind?

7. How do you obtain information about pasture management? How you would like to have information about perennial pastures presented?

8. All things considered, with reference to the items covered during this discussion:
   a. What would be the one key issue that would prevent you incorporating perennial pastures into your grazing system?
   b. What would be the one thing that would give you the confidence to incorporate perennial pastures into your grazing system?

9. Do you have any further comments you would like to add?
8.3 Appendix 3: Focus group discussion guide: experienced farmers

1. What constitutes a good pasture system?
   a. What are your main objectives with pasture management on your farm?
   b. How do you feel about the current performance of your pastures? How successful have you been in achieving your objectives in terms of productivity and sustainability?
   c. What have you found to be the principal issues or difficulties with managing a good pasture system on your farm?

2. What has been your experience with establishing perennial pastures?
   a. How long since you first introduced perennial pastures to your farm?
   b. What was the reason for introducing perennials to your farm?
   c. What varieties have been introduced?
   d. How much of your farm has perennial pastures established on it?
   e. Overall, what has worked well? What has not worked?
   f. What have been the major benefits of growing perennials as a significant component of your annual pasture system?
   g. What have been the key factors that have enabled effective establishment of perennial pastures on your farm?

3. How have your perennial pastures performed in your current farming system?

4. With the inclusion of perennials, how well do your pastures meet your objectives?
   a. Lifestyle
   b. Farming practice
   c. Community
   d. Family/personal

5. Assuming no system is perfect:
   a. What were the pitfalls where maybe the system has let you down?
   b. What are the main barriers to overcome in growing perennials as a significant component of your annual pasture system?

6. Research studies show the potential area for perennials is large yet not much has been established.
   a. Can you suggest why this is?
   b. What needs to change for perennials to reach their potential?

7. These questions relate to what was involved for you in learning about establishing perennial pastures.
   a. What was your learning process?
   b. What would you say about the complexity of perennial pastures and learning how to manage them?
c. How did you simplify it in your mind?
d. How would you advise someone with no experience of perennials to proceed?

8. How do you obtain information about pasture management?
   (If not covered in Question 4)
   a. At the beginning, where did you obtain the information you needed about land and pasture management associated with perennial pastures?
   b. Where do you currently get your understanding and information in regard to land and pasture management associated with perennial pastures?
   c. How would you like to have information about perennial pastures presented?

9. All things considered, with reference to what we have discussed:
   a. What is the most important factor that would prevent you continuing to expand the use of perennial pastures in your grazing system?
   b. What is the most important factor that would enable you to continue to incorporate perennial pastures into your grazing system?

10. Do you have any further comments you would like to add?