Farmers' experience with lucerne in Western Australia

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Abstract

Lucerne has been promoted in Western Australia for over 20 years to assist in controlling the spread of dryland salinity. Despite the promotion, lucerne has not been adopted extensively, occupying < 2% of the total agricultural land. However, some farmers have embraced lucerne extensively. In this study we capture the experiences of these farmers, including the different ways they used lucerne. A total of 25 experienced lucerne growers in the mixed-farming zone of Western Australia were interviewed using a semi-structured format about why, where and how they grew lucerne. The farmers grew dryland lucerne on an average of 13% of their arable land in rotation with crops. There was considerable variation (4–19%) between regions in the proportion of the farm in lucerne. Nearly all the farmers we interviewed first tried lucerne to control excess water to reduce salinity, but some of them then developed innovative ways to utilise lucerne. We give examples of the different ways lucerne was used, from a salinity management tool to an integral part of a program to increase farm productivity. By outlining the different ways lucerne was used and the variety of pathways of changing use we hope to show that lucerne gives farmers the flexibility to change their farming system or use it more simply. An understanding of the range of possibilities that lucerne provides will help both agronomists and farmers assess how lucerne might best be used in different circumstances.

Key Words

Advantages, lucerne, salinity, disadvantages

Introduction

Dryland salinity currently affects 1.1 M ha of broadacre farm land in Western Australia and may expand further, potentially affecting 1.7 to 3.4 M ha (George et al. 2008). The main cause of dryland salinity is the clearing of the perennial-based native vegetation and replacing it with shallow-rooted annual crops and pastures (George et al. 2008). Lucerne (*Medicago sativa*) is one plant-based solution that has been used to prevent or contain the further spread of salinity. Lucerne is a deep-rooted summer-active perennial that uses more water than annual crops and pastures (Latta et al. 2001). Lucerne can also provide productivity benefits as it can produce high-quality green feed in response to out-of-season rainfall events. Although the southern part of Western Australia has a Mediterranean-type climate, approximately 25 to 30% of the annual rainfall (90–120 mm) occurs out-of-season. It also has the capacity in many cases to improve farm profitability (Byrne et al. 2010)

Even though lucerne has been tried by many farmers, it has not been adopted extensively. In 2001 lucerne was estimated to be grown on 0.17 M ha (ABS 2002). The amount that has been adopted would be too low to stop the spread of salinity on a regional scale. To assist agronomists and farmers in adopting lucerne we interviewed a group of experienced lucerne growers. By studying this group we have obtained a greater understanding of where lucerne is being adopted, how it is being used and how it is being integrated into farms with crop and livestock, including the difficulties of adoption.

Methods

Twenty-five farmers with at least 5 years of experience in growing non-irrigated lucerne were interviewed in September and October 2007. The growers were selected to give as wide a geographic spread as possible within the south-west of Western Australia, to cover the more experienced lucerne growers and

the ones with the largest lucerne areas. The survey was limited to the mixed cropping and livestock zone where average annual rainfall varies from 300 to 600 mm.

The aim of the questions was to understand for each farmer why, how, when and where they grew lucerne and what changes had occurred over the time they have been growing lucerne. The questions were semi-structured and were grouped into five themes—the current status of lucerne, use of lucerne, getting into lucerne, expanding the area of lucerne and overall reflections. Similar responses were grouped and the information summarised.

Results and discussion

Lucerne area

The average farm size was 3670 ha (arable area) and an average of 50% of the farm area was cropped. The farmers indicated that on average 19% of their arable land was at risk to rising groundwater and salinity. The average area of lucerne on farms varied between regions. Farmers in the Great Southern region (Katanning to Gnowangerup) had three times the area of lucerne on average than farmers in the Northern/Central region (Buntine to Wickepin). Farmers in the South Coast region (Jerramungup to Ravensthorpe) had 75% more area in lucerne on average than the farmers in the Great Southern region (Table 1). The lucerne area for each region was related to the amount and frequency of out-of-season rain (Table 1). The data do not include the area in crop after a lucerne phase.

Most farmers had a mixed lucerne pasture, even if they sowed lucerne on its own. The mix generally consisted of annual legumes, grasses and broadleaf plants. The average length of the lucerne stand was 4 to 6 years and the average crop length after the lucerne was 3 to 4 years. What constituted a successful stand varied from farmer to farmer and there was generally a large range in tolerance. Most farmers said that between 20 and 40 plants per square metre (psm) after 6 months represented successful establishment. Most farmers still believed a pasture with a low plant density (1–3 psm) was still of value. A mixed pasture was preferred because it was easier to manage than a pure stand, productivity was often higher during winter and the annual species can compensate for low lucerne plant density.

Table 1. Average characteristics of selected farms in three regions of the Western Australian wheatbelt.

Characteristics	Units	Region			
		Northern/Central	Great Southern	South Coast	All
Farmers	No.	7	9	9	25
Annual rainfall	mm	360	403	419	397
Nov–Apr rainfall	mm	97	114	144	120
Summer rain frequency[A]	%	35	48	64	50
Lucerne area	ha	129	394	690	426

Lucerne area	% of arable	4	12	19	13

[A] Proportion of years with at least one month during November–April period with at least 50 mm of rain

Getting started and expanding

Nineteen out of 25 farmers tried lucerne for the first time because they wanted to control excess water - this includes reducing groundwater rise and decreasing waterlogging and salinity. Five farmers tried lucerne to improve pasture and crop productivity and one farmer used lucerne to control herbicide-resistant weeds.

Most farmers expanded their area of lucerne because they were happy with how lucerne grew and they developed confidence in establishing and managing lucerne. Another reason for expanding was the effectiveness of lucerne in controlling excess water and this was mentioned by 17 farmers. Some of the 17 farmers initially expanded their area of lucerne on the expectation of greater water use compared with annuals and only later did they actually observe greater water use. Other reasons stated by farmers for expanding their lucerne area included observing increased pasture production (mentioned by 14 farmers) and increased summer production (12), increased crop production following a phase of lucerne (5) and effective weed control (2 farmers).

The farmers were asked the prime reason they were currently growing lucerne (as distinct from the reason they first tried lucerne). Controlling excess water was the most common, being mentioned by 12 farmers. Given that 19 farmers had mentioned it as their prime reason for trying lucerne, seven farmers must have found that the production benefits became at least as important to them as soil water use, as they gained experience in growing lucerne. Nine farmers mentioned production increases as the reason they were growing lucerne and 4 farmers gave equal weighting to controlling excess water and increasing productivity. Production increases included greater pasture productivity and quality and cropping benefits such as increased soil fertility and weed control. The farmers who were focused on production had a larger area of lucerne (as a percentage of arable area) than those farmers who had a focus on controlling excess water. Most of the farmers that mentioned production increases as either the prime reason for growing lucerne or of equal importance to excess water control were in the South Coast region, with 8 out of 9 farmers in that region mentioning it, compared with 2 out of 7 in the Northern/Central region and 3 out of 9 farmers in the Great Southern region. The difference between regions shows the importance of out-of-season rainfall and its impact on lucerne productivity.

Uses or benefits of lucerne

The farmers were asked what they used lucerne for (as distinct from the prime reason) and they can be grouped into four broad areas: supplying feed for livestock; increased water use relative to annual crops and pastures; reduced waterlogging and salinity; and benefits for the cropping phase.

An important way lucerne supplied feed for livestock was through out-of-season grazing, and this was seen as an advantage by all farmers even though it did not occur every year (Table 2). The out-of-season production was used by the farmers to reduce the amount of supplementary feeding, to join livestock on green feed, lamb earlier, turn-off lambs and adult livestock and to grow replacement sheep (Table 2). The ability to graze early in the growing season was seen as an advantage as it allowed grazing of annual pastures to be deferred while they germinated and other paddocks to be put into crop. Production at the end of the growing season (after the annual pastures had died and before harvest of crops commenced and stubble became available) was also valued. The group of farmers who focussed on production had a greater area and more paddocks of lucerne than the group focussed on controlling water. Therefore, when an out-of-season rainfall event occurred they could benefit more from the high-quality greed feed. It gave this group of farmers more production opportunities, for example, by buying store stock and turning off finished livestock.

Table 2. Uses or benefits farmers obtained from lucerne

No. of farmers mentioning	Use or benefit of lucerne
24–25	Opportunistic out-of-season grazing, increased water use
21–22	Grazing for ewes & lambs, reduced supplementary feeding
18–20	Grazing for young stock, soil fertility, weed control
16–17	Lamb turnoff, late spring and early summer grazing
14–15	Adult stock turnoff, early autumn grazing
12–13	Increased crop yield, waterlogging control, improved soil structure
10–11	Joining, opportunistic hay/silage, feel good

Nearly all of the farmers used lucerne to increase water use (Table 2), which reduced the spread of salinity and/or lowered the level of groundwater. In addition, about one-half of the farmers used lucerne to reduce waterlogging. All of the farmers believed that after growing lucerne the problems associated with excess water had stabilised or had decreased. The farmers formed their understanding about the impact of lucerne on excess water from measurements and observations. Ten farmers out of 22 (3 farmers' thoughts were not recorded) used piezometers to measure the groundwater and had measured either stable or declining levels. Many of these farmers had also made observations about the land, dams or crop after lucerne. These included, for example, decreased area of salt scald, reduction in waterlogged areas, dams or lakes becoming less salty, and crops able to be grown after the lucerne where before they were patchy.

Most farmers also used lucerne to control weeds, especially herbicide resistant weeds (Table 2). They used lucerne to control weeds (summer weeds and growing season weeds) for 3 main reasons: because it allowed them a wider range of herbicides relative to annual pasture legumes; because the lucerne was very competitive against weeds; and because the pasture phase was longer, giving more opportunities to control weeds.

Choice of paddocks for lucerne

The paddocks chosen for growing lucerne were mostly lower in the landscape. Seventeen farmers out of 25 chose the mid to lower slopes or valley floors. Eight farmers did not grow lucerne in any specific part of the landscape. Most farmers chose the lower to mid slopes because they were focussing on controlling the groundwater or salinity, which was generally expressed in this part of the landscape. Farmers who chose paddocks lower in the landscape either grew lucerne directly around the problem areas or the paddock immediately upslope of the problem area. In some cases farmers fenced off small areas to grow lucerne adjacent to the areas of salinity or at risk of salinity. Farmers who did not grow lucerne in any specific part of the landscape chose to grow lucerne in paddocks that were coming out of crop or that had a variety of problems that could be overcome by lucerne (such as low pasture legume content, high weed content, high herbicide resistant weed content, or requiring waterlogging or ground water control). The chosen location of lucerne paddocks is important, as it distinguishes between those who use lucerne for a single benefit (generally controlling excess water) and those who hold a broader view of lucerne and use it for multiple purposes, including its productivity.

Disadvantages of lucerne

All of the farmers mentioned that lucerne had some disadvantages but felt that the advantages outweighed the disadvantages. The disadvantages included the high cost of establishment (although it was considered similar to the cost of establishing annual pasture legumes). There was also the opportunity cost of low production until the following year unless there was out-of-season rain. As a consequence, some farmers established lucerne under a cover crop, but they realized that this increased the risk of establishment failure or part failure if there was a dry spring or early summer. Most of the farmers thought that lucerne was difficult to establish, with an increased risk of establishment failure and greater intensity of management needed to achieve success. Farmers who were focussed on production and had larger areas of lucerne, were faced with greater complexity in managing lucerne profitably and successfully than those farmers who were growing lucerne in a niche role to use excess water.

Conclusions

Lucerne is known colloquially as “the king of fodders” for good reason. It is a powerful plant with transformative properties that can completely reshape the production system on a mixed farm. The substantial pasture productivity increases it can offer may not be for everyone. Some farms do not receive enough out-of-season rainfall for lucerne to offer much productivity benefit. Even where unseasonal rainfall does occur frequently, not every farmer is in a position to capture the productivity benefits of lucerne. Maintaining a continuous supply of lucerne pasture to livestock for long periods requires a large number of paddocks on a substantial area of the farm, and only a small number of farmers seem to be willing to make the substantial changes to crop rotations that a lucerne-based system requires. Many farmers in our study remained happy to use lucerne in a niche role as a tool to control excess water. All the farmers we interviewed had considerable experience growing lucerne: only a few of them had used it to transform their farming system. An understanding of the range of possibilities lucerne provides will help both agronomists and farmers assess how lucerne might be best used in different circumstances.

References

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