

Establishing perennial shrubs for mixed farming systems on Eyre Peninsula

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RESEARCH

Searching for answers



Location:

Minnipa Ag Centre

Rainfall

Av. Annual: 325 mm

Av. GSR: 241 mm

2012 Total: 253 mm

2012 GSR: 185 mm

Soil Type

Red sandy loam

Plot Size

46 m x 68 m with 1.5 m between rows

Environmental impacts

Soil health

Soil structure: Stable

Compaction risk: Nil

Ground cover or plants/m²: Forage shrubs

Perennial or annual plants:

Perennial

Water use

Runoff potential: Low

Resource efficiency

Energy/fuel use: Standard

Greenhouse gas emissions (CO₂,

NO₂, methane): Nil

Social/Practice

Time (hrs): Site establishment time

Clash with other farming operations:

Standard practice

Labour requirements: Nil

Economic

Infrastructure/operating inputs:

Establishments costs

Cost of adoption risk: Low

stocking rates and reducing supplementary feeding, capturing out-of-season rainfall, reducing soil erosion and salinity and providing shade, shelter and feed for livestock.

- A greater understanding of perennial shrub germination, establishment and productive qualities is required to increase survival percentage through the direct seeding method.
- Success rates need to be increased before this sowing technique can become profitable through improved shrub establishment and longevity.

Why do the trial?

Current challenges facing farming systems in Australia, and on the Eyre Peninsula, including seasonal variability, alternative competing industries and technological advances, are the drivers for change from a reliance on annual legumes and grasses towards more sustainable perennial options. Out-of-season summer rainfall has also emphasised the need to utilise perennial plants that can better cope with an increasingly variable climate and provide green feed at the time of year when producers often have to supplement feed livestock.

Due to changing farming systems, some areas of land that were once productive have become or are becoming unsuitable for profitable grain production, consequently increasing the risk of soil degradation, erosion and salinity, which has supported the idea that perennials have the potential to be an essential component of modern mixed farming systems. Incorporating perennials, including perennial fodder shrubs, into farming systems across Eyre Peninsula opens

up new opportunities to provide a profitable and sustainable enterprise for future generations.

For perennial species to be of commercial value, they need to persist and remain productive. Difficulty in establishing perennial shrubs has been a major barrier to adoption with the main hurdles of establishment being cost and labour for landholders. Direct seeding fodder shrubs offers a method of overcoming these issues and subsequently provides a productive and practical solution to the autumn feed gap in low to medium rainfall areas. Sowing marginal farming land to perennial shrubs also delivers a means of drought-proofing the farm and capturing out-of-season rainfall, with added benefits of maintaining stocking rates over summer with reduced cost and time spent supplementary feeding, reducing soil erosion and salinity and providing shade, shelter and feed to livestock.

How was it done?

A trial to explore the process of establishing a perennial shrub feed base using a direct seeding method was established on the Minnipa Agricultural Centre in 2011 with the shrub species selected as the best performed for survival, growth, biomass and palatability following grazing of the Enrich™ forage shrub trial in the same year (EPFS Summary 2010, pp 138-9 and EPFS Summary 2011, pp 135-8). The focus of the trial was to determine a more labour and cost efficient method to establish a perennial shrub feed base in order to make the system attractive to farmers.

Key messages

- Difficulty in establishing perennial fodder shrubs, cost and labour are the major barriers to adoption.
- Direct seeding offers a method of overcoming these issues and provides a profitable and sustainable enterprise for future generations with added benefits of maintaining

The 46m x 68m site was established on 1 June 2011 with 4 replicates x 6 species, making a total 64 plots. Weeds were eradicated from the site after herbicide application in late July. Replicates 1, 2 and 3 were sown with a No-till plot seeder to have 3 rows x 9 m with a 1.5 m gap between rows using a mixture of treated purchased and collected seed. Seeding rate was determined by seed weight, viability and establishment percentage (Table 1). Replicate 4 was planted with 18 plants per plot on the site as tube stock (established in a greenhouse on 13 July using the same seed) on 22 August for comparison with the direct seeding method. These plants were watered with 200 ml/plant/day for 5 days after sowing due to dry conditions.

The success or failure of plant establishment and survival were

observed and measured over 2011 and 2012 in anticipation that the site may be grazed once shrubs were established and biomass was sufficient for grazing in following years.

What happened?

Table 1 shows that all of the perennial shrubs established well after some good rain in August and September after sowing, however the germination of spring weeds over many of the plots caused issues as some shrubs were out-competed, reducing plant numbers towards the end of 2011. Shrubs emerged in high density in the direct seeding replicate, however not all survived which allowed improved growth and greater biomass in the living shrubs. The tube stock shrubs were more established than the direct seeded shrubs at time of sowing and had a greater growth

before the end of 2011, however were less dense and therefore had similar biomass to the other plots. The successful species included *E. tomentosa*, *A. semibaccata* and *R. preissii* which established well and have grown significantly since sowing. *A. ligulata* also established well but was unsuccessful because of poor survival. Due to lack of shrubs emerging, it was determined that higher seeding rates were required for *A. nummularia* and *A. amnicola* to improve shrub numbers.

Plant size differed between shrub species at the end of 2012 with some species established well enough to graze in 2013; however grazing will have to be delayed until 2014 due to shrub variation over the site. After a particularly dry spring in 2012, *A. semibaccata* has browned off and has ceased growing, however other species are surviving well.

Table 1 Names, seed treatment, sowing rate and survival numbers of perennial shrub species at the Minnipa site

Perennial shrub species	Pre-sowing seed treatment	Sowing rate (grams)		Shrub count (number)*		
		Per placement	Per row	Oct 2011	Nov 2011	Oct 2012
<i>Atriplex nummularia</i> (old man saltbush)	Soak then leach	0.43	2.59	60 (15)	33 (13)	22 (11)
<i>Atriplex amnicola</i> (swamp saltbush)	Soak then leach	0.18	1.10	54 (17)	34 (15)	18 (9)
<i>Enchylaena tomentosa</i> (ruby saltbush)	Leach	0.48	2.88	377 (67)	228 (67)	119 (16)
<i>Rhagodia preissii</i> (mallee saltbush)	Soak then leach	0.27	1.65	662 (82)	352 (82)	71 (15)
<i>Atriplex semibaccata</i> (creeping saltbush)	Soak then leach	0.25	1.53	637 (142)	251 (18)	97 (18)
<i>Atriplex ligulata</i> (sandhill wattle)	Soak in boiling water	0.74	4.49	283 (96)	81 (60)	18 (12)

*figures in brackets for the shrub count describe the number of shrubs surviving out of the total number recorded in replicate 4 (established from tube stock)

What does this mean?

Perennial shrubs are a valuable addition to the pasture system, giving farming systems a more predictable feed option during the autumn period, developing unproductive land and complementing rather than competing with the existing feedbase, as a result contributing to whole-farm profitability and sustainability. Establishing perennial shrubs can be quite challenging with many factors affecting success rates including incorrect sowing depth, poor seed quality, seed dormancy mechanisms, weed control and slow germination. Other elements that need to be taken into consideration include site selection (soil quality), seeding rates and timing of sowing, which are issues that need to be trialled before definite outcomes can be produced. Ongoing

measurements in autumn and spring will monitor plant survival, growth, plant health, flowering/fruiting, recruitment, edible biomass, as well as defoliation (palatability) and recovery after the first grazing period.

A better understanding of perennial shrub germination, establishment and productive qualities is required to increase survival percentage through the direct seeding method. Cost and labour efficiency is increased through utilisation of direct seeding as opposed to planting seedlings or using other direct niche-seeding techniques, however success rates need to be increased before this practice can become profitable through improved shrub establishment and longevity.

Another trial site will be sown for the next stage of the Eyre Peninsula

Grain and Graze 2 research into using direct seeding as a method of establishment in order to make forage shrub grazing systems more broad-acre friendly. Both sites will be evaluated to determine the success of direct seeding of selected native forage shrubs, including the ease of establishment of a cost and labour efficient shrub based grazing system on Eyre Peninsula.

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