

Building drought resilience of vulnerable soils in low rainfall cropping and grazing systems

CASE STUDY

Monitoring the long-term performance
of a diverse forage shrub/pasture mix at
Murrayville in the southern VIC Mallee





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Farmer Name: Excel Farms
Location: Murrayville, VIC
Rainfall: 300mm
Demo Focus: Long term survival data and productivity of diverse forage shrubs in the southern Mallee.

Growing perennial shrubs on mixed farms can reduce farm business risk and improve predictability of farm feed supply. Shrubs can also improve the feed base by allowing more feed to be produced on less productive land, allow delayed grazing of pastures to increase autumn pasture bulk, and contribute better feed utilisation. Environmental benefits include improved biodiversity, better water use in the landscape (reducing salinity risks) and reduced grazing pressure elsewhere on the farm.

To date, most shrub plantations in the Mallee have been based on Old Man saltbush, with limited other species or pastures grown. While these plantings are highly drought resilient, palatability and feed intake can be low due to the high salt content. Growing a mix of shrub species increases the range of nutrients and minerals available in feed, increases feed intake, and reduces the chance of plants being lost to pests and diseases. However, diverse forage shrubs plantings are not yet widely adopted in the Victorian Mallee.

Key Messages

- This case study looks at the long-term persistence and productivity of a diverse forage shrubs and pasture demonstration site established at Murrayville in 2015.
- Shrubs species established over the 10 ha site included Old Man saltbush, Silver saltbush, Ruby saltbush, Tar bush, River saltbush and Rhagodia.
- Nine years after planting, Silver saltbush and Old Man saltbush had persisted the best, with survival at 66% and 49% respectively; survival of River saltbush, Tar bush, Ruby saltbush and Rhagodia was lower at approx. 30-40%.
- Based on pasture testing and previously measured forage shrub productivity and quality, this diverse shrubs/pasture mix planting could feed around 500 grown sheep a high quality ration for 1 month, once or twice each year.
- With material costs around \$8,000 for a 10 ha site, costs could be recovered after 3 years of improved grazing. Additional benefits are likely to include reduced erosion risks, better water balance, improved biodiversity and better drought resilience.
- Taking into account survival and previously reported quality, vigour and palatability, mixed stands of Silver and Old Man saltbush appear the best bet for the Mallee environment.



Figure 1. Farmers visiting the Murrayville demonstration site to see different forage species grown in Mallee conditions.

Demonstration Details

This site was originally planted as part of an earlier project titled “Alternative fodder crops for dryland grazing systems – winning the war on erosion.” The site was sown on a 4,000 ha farm owned by Kevin and Peter Willersdorf, who already had approximately 45 ha of Old Man saltbush growing on non-arable land on their farm. In 2015, 5 native shrub species were sown at a density of 125 plants/ha. Rows were 20 m apart. Species planted were:

- Old Man saltbush (*Atriplex nummularia*)
- Ruby saltbush (*Enchylaena tomentosa*)
- Tar bush (*Eremophila glabra*)
- River saltbush (*Atriplex amnicola*)
- Rhagodia/Mallee saltbush (*Rhagodia preissii*)
- Silver saltbush (*Atriplex rhagodioides*)

Within rows, saltbush shrubs were spaced 5 m apart, while the smaller species were planted every 3 m.

Between 2016 and 2021, the site was regularly grazed by the Willersdorfs. There were three very dry years during that period: 2018 (172 mm), 2019 (215 mm) and 2021 (211 mm). Most other sites planted at the same time died out between 2018 and 2021, but this Murrayville site survived largely intact. The property

changed hands in 2021, but was refenced in 2022 under the management of the new owners, Excel Farms. Even though Excel Farms does not run livestock at Murrayville, the Murrayville site now provides a great opportunity to study survival rates of different forage shrubs in the Victorian Mallee, and the potential productivity of shrubs/pasture plantations.

Results

Plant survival at the demonstration site is shown in Table 1. Key findings were that Silver saltbush had the highest survival rate at 66%, with Old Man Saltbush the second most persistent at 49%. River saltbush was next best at 40% followed by Tar bush, Ruby saltbush and Rhagodia.

Due to the change in farm management, it was not possible to graze this forage shrubs site during 2023/24, and it was therefore not possible to assess grazing preferences or biomass regrowth following grazing. However, palatability, vigour and quality of each species has been assessed accurately before across multiple sites. Diverse plantings of the type established here were shown to yield approximately one tonne of high quality forage per hectare per year.

Table 1. Shrub survival data from the Murrayville demonstration site

Shrub Type	Numbers planted	No plants surviving	Survival %	Palatability*	Vigour*
Silver saltbush (<i>Atriplex rhagodioides</i>)	200	132	66	Low	High
Old Man saltbush (<i>Atriplex nummularia</i>)	280	136	49	Low	High
River Saltbush (<i>Atriplex amnicola</i>)	40	16	40	Moderate	High
Tar bush (<i>Eremophila glabra</i>)	240	83	35	High	Low
Ruby saltbush (<i>Enchylaena tomentosa</i>)	378	131	35	Moderate	Low
Rhagodia/Mallee saltbush (<i>Rhagodia preissii</i>)	160	44	28	Low	Moderate
Total	1298	542			

*Palatability and vigour data from the Enrich project¹

Pasture was assessed for quantity and quality twice in 2023-24 (Table 2). In autumn 2023, dry pasture was present at 2.1 t/ha and was of low quality (5.2% crude protein, energy at 5.1 MJ/kg DM) and 5.1Mj/kg DM. By mid- September 2023, there was 1.9 t/ha of pasture present with 7.5% crude protein and energy at 9.0 MJ/kg DM.

Table 2. Pasture quantity and quality in the inter-row space of the shrubs/pasture planting site

Sampling time	Biomass (t/ha)	Crude Protein (%)	Metabolisable energy (MJ/kg DM)
March 2023	2.1	5.2	5.1
September 2023	1.9	7.5	9.0

Learnings from the site

Old Man saltbush and Silver saltbush were the most resilient of the species trialled here. This resilience may arise from the excellent vigour of the plants, as these two shrub species have been shown before to be amongst the most vigorous shrub species tested¹. These species also have relatively low palatability, which may have helped them survive when the site was grazed in 2018 to 2020.

Other shrub types at the site did not persist as well, likely due to their lower vigour and generally higher palatability. According to Kevin Willersdorf, the initial grazings at this site occurred with mobs of around 250 ewes given access to the site for about 6 weeks in the winters of 2018-2020. Kevin noticed that some of the shrubs were being targeted by sheep, and considers that the grazing could have reduced survival of these species.



Table 2. Photos from the Murrayville site, 2023.

Based on observations from this site, Silver saltbush and Old Man saltbush appear to be the best option for a mixed planting in the Victorian Mallee. In combination, the two species would provide a better quality diet than either species alone, and the lower salt content of Silver saltbush would allow stock to consume more shrub than when browsing Old Man saltbush alone. The growing of Tar Bush and Ruby saltbush could only be recommended at shrubs sites that have low weed pressures and are fenced into multiple cells, allowing sites to be grazed for very short periods at high stocking densities. With high weed pressures or other grazing regimes, these two species are likely to produce little biomass and persist poorly.

Previous work has shown that once forage shrubs are well established, they are likely to yield approx. 1 t/ha of 'extra' biomass (additional to pasture) each year, with shrub forage higher in protein and mineral content than other available feeds¹. Based on the findings of this demonstration, around 2 t/ha of complementary pasture can also be produced across the 10 ha site, so total feed produced may be 3 t/ha, or 30 t across the 10 ha site.

As an example of how this would complement whole farm feed production, 500 ewes eating 500 g of shrub and 600 g of pasture/day would be able to graze this for 30 days before shrubs were largely defoliated, and pastures largely depleted, assuming 50% pasture utilisation ($500 \times 1.1 \text{ kg/day} \times 30 = 16.5 \text{ t}$). On farms with sheep, this could be used for lambing, helping fill an autumn feed gap, or provide grazing for stock in spring before stubbles become available.

Further Reading

1. Perennial forage shrubs providing profitable and sustainable grazing – Key practical findings from the Enrich project (https://cdn.environment.sa.gov.au/environment/docs/Enrich_Booklet.pdf).
2. Perennial forage shrubs – from principles to practice for Australian farms (<https://cdn.environment.sa.gov.au/environment/docs/Enrich-booklet-companion.pdf>).

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Estimated costs and benefits

Approx. costs for materials and seedlings for a 10 ha site in 2024 (excluding site preparation and labour associated with planting) are:

- 1250 plants and tree guards (125 plants/ha across 10 ha) @ \$2 each \$2500
- Fencing (1.5 km) approx. \$4000 (materials only)

Thus, a 10 ha site may cost around \$8,000, depending on labour requirements and cost of providing water.

As at 2024, feeding ewes a maintenance ration in containment costs approx. \$1.70/ewe/week (excluding labour), so the grazing value of 30 days for 500 sheep is approx. \$3600.

Thus, it may only take around 3 grazings to recover set-up costs. Additional benefits of shrubs include shelter for stock in extreme weather, increased biodiversity, and increased water use, reducing salinity issues in areas with high water tables.

Conclusions

Silver and Old Man saltbush appear the best option to provide a resilient, complementary feed source on farms in the Victorian Mallee.

A 10 ha planting should support around 500 grown sheep for 30 days each autumn, delivering sufficient feed value to recover set up costs in around 3 years.

Survival of smaller, less vigorous and more palatable species was low, probably due to low intensity grazing at the site during 2018- 2020, and possibly weed pressures. The growing of these species should only be considered at sites where multiple small paddocks are set up to allow high intensity/short duration grazing, and where weed pressures are low.