

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

CASE STUDY

Establishing a diverse forage
shrub/pasture mix at Patchewollock
in the Victorian Mallee





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Farmer Name:	Andrew McLean
Location:	Patchewollock, VIC
Property size:	1600 ha
Rainfall:	300mm
Enterprises:	Cropping wheat, barley, cereal rye, Merino and White Suffolk sheep
Demo Focus:	Growing a mix of different forage shrubs and pasture in the southern Mallee

Previous work has shown that growing perennial shrubs on mixed farms in the Mallee can reduce farm business risk and improve predictability of feed supplies farm.

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 pressures 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, mixed species forage shrub plantings are not yet widely used in the Victorian Mallee.

Key Messages

- This case study explores the way a forage shrubs and pasture mix is being used on Andrew McLean's farm to improve whole farm feed supply, reduce erosion risks, and improve drought resilience.
- Andrew's plantings includes a 10 year old Old Man Saltbush stand, plus Andrew is trialling 5 ha of new forage shrub options including Ruby Saltbush, Old Man Saltbush and Tar bush, with medic broadcast between rows.
- Established shrubs are being used to finish lambs in autumn, and in dry springs shrubs can also be used to hold stock before stubbles become available.
- Based on the results of this demonstration, it is estimated the new diverse shrubs/pasture mix planting will be able to feed around 250 grown sheep a high quality ration for 3 weeks, once or twice each year.
- With material costs around \$5,000 for a 5 ha site, costs are likely to be recovered after around 4 years of improved grazing.
- Additional benefits are likely to include reduced erosion across the farm, better water balance, improved biodiversity and better drought resilience.

Demonstration Details

Andrew McLean's farm is located on 1600 ha 10km SE of Patchewollock in NW Victoria, where he crops around 800 ha to wheat, barley and cereal rye, and runs 350 Merino and White Suffolk ewes joined to White Suffolk rams.

Prior to this demonstration, the property already had about 2.5 ha of planted saltbush, for use as a holding paddock and to help grow out small mobs of lambs in autumn.

In this demonstration, an additional 5 ha of diverse forage shrubs was planted with Ruby Saltbush (*Enchylaena tomentosa*), Old Man Saltbush (*Atriplex nummularia*) and Tar bush (*Eremophila glabra*).

The aims of the site were to demonstrate:

- how diverse shrubs are established in the Mallee
- survival rates of different shrubs
- establishment of novel pastures in the inter-row space
- how diverse shrubs and pastures mixes can boost the farm feedbase and improve farm drought resilience.

Establishing the shrubs mix

- The site was prepared by spraying with a knockdown herbicide (glyphosate) and deep ripping to a depth of 40-50 cm, with rows 5 m apart.
- Tubestock seedlings were planted with a 75 mm Pottipukti (hand held seedling planter) in June 2022 (Fig 1). Plants were spaced at 3 m for the smaller shrubs and 5 m for the larger shrubs (averaging 250 plants/ha).



Figure 1. Pottipukti seedling planter being used to plant a Ruby Saltbush plant.

- Seedlings were protected with biodegradable tree guards and were watered during dry periods (2 waterings per year over late summer and autumn in 2023 and 2024).
- Medic seed was spread across the site in June 2023 at 10 kg/ha to top up native pasture in the inter-row using a snail bait spreader.



Figure 2. The shrubs demonstration site in spring 2022, showing rip lines and low weed pressure.

Results

In the first spring post-sowing, weed pressures were low (Fig 2) and initial seedling establishment looked promising.

However, weed pressures did build over the summer of 2022/23 due to unseasonal rains. The site was disced between rows to reduce weed pressures in early 2023 and early 2024. In spring 2023, spraying was also carried out around plants that were struggling to compete with annual grasses.

Plant survival rates over the first 2 years of the demonstration were at around 50-70%, which is somewhat lower than the expected survival rate (Table 1). Some plants were stunted due to weeds in parts of the paddock, and there was also evidence of significant rabbit grazing pressure. Ruby saltbush showed a higher level of survival than Old Man Saltbush and Tar bush.

Some medic established successfully during the winter of 2023 (Fig 3), though annual

grasses did dominate the pasture mix during winter and spring. Pasture was assessed for quantity and quality in September 2023 and March 2024. Pasture testing showed moderate quality (8.4% crude protein and ME at 9.1 MJ/kg DM), and 19 t/ha of dry matter in spring, declining to poor quality (6.0% crude protein and ME at 5.2MJ/kg DM) in autumn, and 18 t/ha.

By autumn 2024, most shrubs were around 15-40cm high, with Old Man Saltbush shrubs larger than the other two species, which were still too small to be grazed (Figure 4). Shrubs are expected to be ready for grazing in 2026.

Table 1. Shrubs survival at the Patchewollock site

	Dec-22	Jun-23	Dec-23
Ruby saltbush	80%	73%	72%
Old Man saltbush	77%	55%	45%
Tar bush	86%	50%	43%



Figure 3. Medic established well in some areas of the shrubs/pasture mix, though annual and perennial grasses tended to dominate at the site.

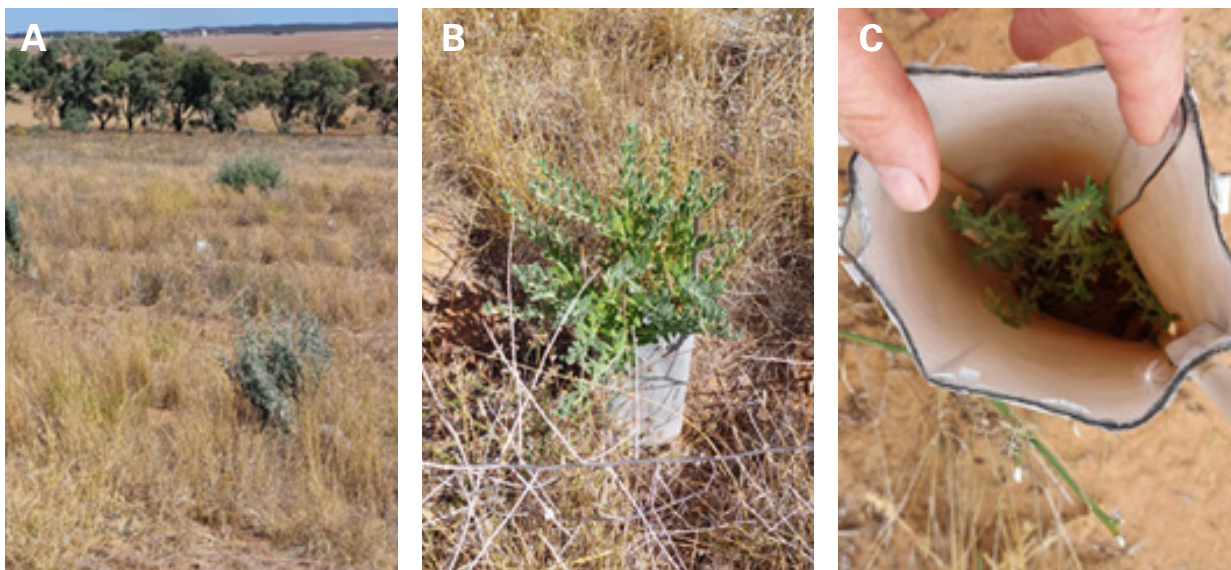


Figure 4. By autumn of 2024, some Old Man Saltbush plants were well established (A), a few Tar bush plants had grown above their tree guards (B), and many Ruby saltbush plants were still not well enough established to tolerate grazing (C).

Insights from the demonstration and next steps

By early 2024, the Old Man Saltbush plants were almost ready for grazing, but the Ruby Saltbush and Tar Bush were still too small to be grazed. Having multiple species in a forage shrubs site does delay grazing since the site cannot be grazed until all species are ready.

The stunting or loss of some plants due to weed pressures highlighted the importance of careful weed control the year before planting. Weed pressures may have been exacerbated at this site due to unseasonal rains in the early summer of both 2022 and 2023, and Ruby saltbush and Tar bush may be more susceptible to weed competition than Old Man Saltbush. Further monitoring of the site is recommended to assess shrub survival once grazing commences, and over multiple seasons.

With diverse shrubs plantings, it is particularly important to use short, intense grazings of no more than 2 weeks duration to ensure grazing is as even as possible and no one species is overgrazed.

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, which in autumn would be higher in protein and mineral content than other available feeds. (See '*Perennial forage shrubs - from principles to practice for Australian farms*').

Based on the findings of this demonstration, 19 t/ha of medium quality pasture can also be produced across the 5 ha, so total feed produced may be 2.9t/ha, or 14.5 t across 5 ha. 250 ewes eating 500 g/day of shrub and 600g pasture/day would be able to graze this for 26 days, assuming 50% pasture utilisation (250 sheep x 1.1 kg/day x 26 = 7.2 t).

This could be used for lambing, helping fill an autumn feed gap, or provide grazing for stock in spring before stubbles become available.

According to Andrew, 'Our stubbles lose quality by autumn, and having the extra 5 ha of shrubs and pasture will certainly be useful for little lots of lambs that need extra help to finish. If I had my time again, I'd probably want to spray out weeds the year before shrubs establishment too, just to get that extra knock on the weed seedbank.'

Estimated costs and benefits

Approx. costs of a 5 ha site as at 2024 for materials and seedlings (excluding site preparation and labour associated with planting) are:

- 2000 plants @ \$2 each = \$4000
- Fencing (1 km) approx. \$3500 (materials only).

Thus, each site may cost up to \$5,000, 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 26 days for 250 sheep is approx. \$1,300. At these rates, it may take 4 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

- Forage shrubs (Old Man Saltbush) already provide a useful, complementary feed source on Andrew McLean's farm, helping fill an autumn feed gap.
- The diverse forage shrubs and pasture established at this demonstration site will add valuable extra feed once shrubs are ready for grazing in 2026. Once mature, the planting may feed around 250 grown sheep for 3 weeks each autumn, delivering sufficient feed value to recover set up costs (approx. \$5,000) in around 4 years.
- Survival of the diverse shrubs plantings was lower than expected, at about 40-70% across the three tested species, probably due to weed pressures and rabbits. With diverse forage shrubs, extra effort should be made to control weeds prior to planting.

Further reading

- 1. Perennial forage shrubs - from principles to practice for Australian farms**
(<https://www.wool.com/globalassets/wool/land/pastures/grazing-management/accordion/perennial-forage-shrubs--from-principles-to-practice-for-australian-farms.pdf>)
- 2. Native forage shrubs for low-rainfall areas - A guide to successfully using shrub-pasture mixes for grazing livestock**
(<https://cdn.environment.sa.gov.au/environment/docs/Enrich-booklet-companion.pdf>)

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