Forage shrubs for alternative grazing systems

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Take home messages

- *Native perennial shrubs other than Old Man Saltbush are showing promise as alternative feed sources in a research trial located in the Central Victorian Mallee.*
- *Preliminary data showed that Mallee Saltbush has great promise in terms of edible biomass production, grazing preference and shrub survival in the central Mallee.*
- *Old Man, Silver and River Saltbush produced the highest amount of edible biomass.*

Background

A field trial to evaluate the performance of 16 different forage shrub species has been established at Walpeup as part of a nationally funded project called Enrich - an initiative of the Future Farm Industries CRC, with co-funding from Meat and Livestock Australia (MLA). Enrich aims to explore the use of perennial shrubs as a feed source for profitable and sustainable grazing systems in the low to medium rainfall areas of southern Australia. The major outcome of the project will be the selection of suitable shrub species for use in mixed forage systems for the Victorian Mallee region.

Selecting forage shrubs suited to the Victorian Mallee has the potential to deliver many benefits to mixed grazing systems by:

- supplementing the quantity and quality of pastures for grazing livestock
- providing a diversified feed base for livestock and reducing the cost of supplementary feeding over the summer and autumn months
- providing alternative management options for marginal and unproductive land and maintaining soil cover
- providing shade and shelter belt to lambing ewes which may increase lamb survival
- increasing rainfall use and reducing water leakage into groundwater and associated salinity
- increasing on-farm biodiversity
- providing more consistent feed supply under variable climatic conditions

Aim

To evaluate a range of forage shrubs in the Victorian Mallee environment in terms of plant survival, canopy development, health, edible biomass, seedling recruitment and performance under grazing.

Method

Sixteen species of shrubs (Table 1) were planted as tube stock in July 2008 after the site was deep ripped (30 – 50cm deep) and weeds chemically controlled. Fifteen of the 16 species were planted in monoculture; Pink Bindweed was planted in mixture with Old Man Saltbush. Each species was planted in plots of 36 seedlings, with each species replicated four times to account for soil, weed and germplasm variation across the site. Shrubs were hand watered (1 – 2L each watering) on four separate occasions over the late winter spring period in the year of establishment. The site was not grazed in 2009 in order to allow the shrubs time to establish.

In 2010, after the opening autumn rains, livestock were introduced to quantify shrub performance under grazing. Twenty Merino ewes with lambs at foot were grazed at a stocking rate of 77 sheep/ha. Low quality hay was provided *ad libitum* throughout the grazing period. Each replicate was grazed separately by the same animals in sequence, with each replicate grazed over a three to four week period. Sheep grazing preference and shrub recovery after grazing were assessed. Ongoing measurements over the life of the trial will monitor shrub survival and growth, both before and after grazing. Changes in soil water under the forage shrubs are also being monitored by means of comparison with an adjacent annual crop system.

Location:	Mallee Research Station (Walpeup)
Replicates:	4
Planting date:	14 July 2008
Row spacing:	3 x 1.5m

Table 1. Botanical and common names of the forage shrub species planted at the Walpeup Enrich field trial

Botanical name	Common name
Atriplex vesicaria	Bladder Saltbush
Atriplex amnicola	River Saltbush
Atriplex cinerea	Grey Saltbush
Atriplex nummularia	Old Man Saltbush
Atriplex nummularia / Convolvulus remotus	Old Man Saltbush / Pink Bindweed
Atriplex rhagodioides	Silver Saltbush
Atriplex semibaccata	Creeping Saltbush
Chameacytisis prolifer	Tree Lucerne
Cullen australasicum	Tall Verbine
Enchylaena tomentosa	Ruby Saltbush
Eremophila glabra	Emu Bush
Medicago strasseri	Tree Medic
Rhagodia crassifolia	Fleshy Saltbush
Rhagodia parabolica	Fragrant Saltbush
Rhagodia preissii	Mallee Saltbush
Rhagodia spinescens	Thorny Saltbush

Results

In the first autumn after planting, shrub survival was around 90% for all species, except for the Pink Bindweed and Tall Verbine (Figure 1). By autumn 2010, populations of Tall Verbine had declined further, with a mortality rate approaching 50%. Measurements in November 2010 after the site was grazed showed a continuing decline in the populations of Tall Verbine and Tree medic, but most notable was the dramatically low survival rate in the Creeping Saltbush. Recent data suggests that Creeping Saltbush is intolerant to grazing, which supports the findings of forage shrub research conducted elsewhere. Furthermore, although Grey Saltbush's survival remains high, significant structural damage was caused during grazing and its future productivity is doubtful.

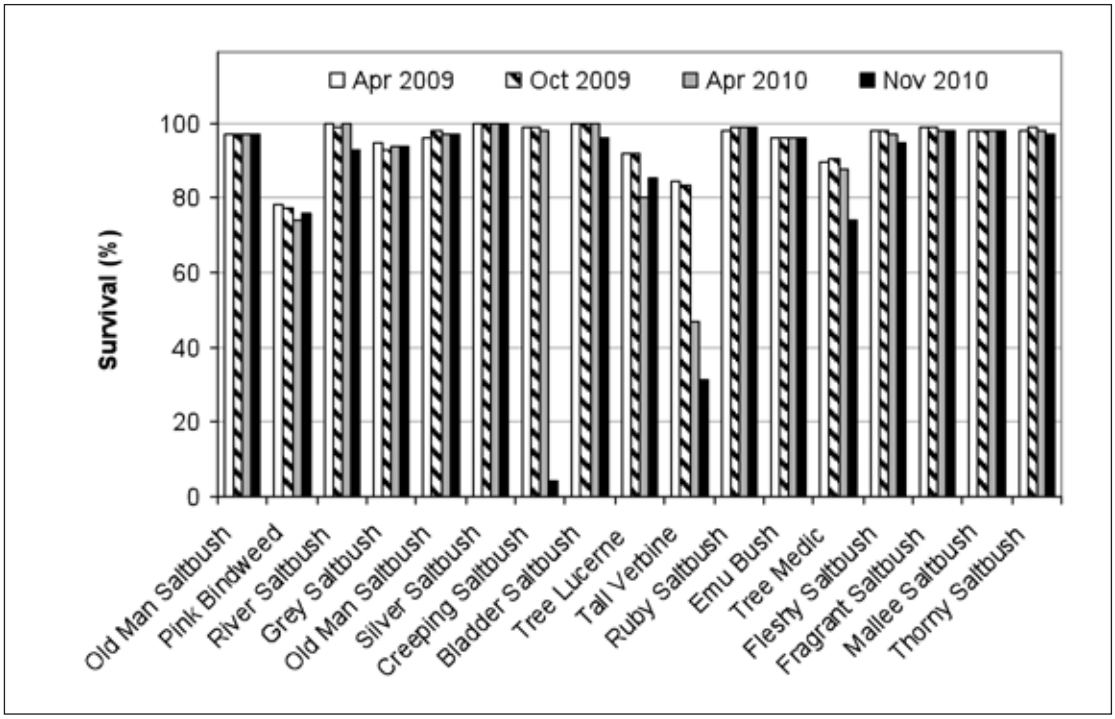

Figure 1. Mean shrub survival (%) at four samplings over the experimental period at the Walpeup Enrich trial.

Shortly before grazing the site, edible biomass was assessed for all shrub species; Old Man Saltbush produced significantly more biomass (1800g DM/plant or approximately 4t DM/ha) than all other species (Figure 2). The Silver and River saltbushes also produced over 1000g DM/plant (2.5 – 3t DM/ha). On the other end of the scale, the Tree Lucerne, Tree Medic and Tall Verbine shrubs produced less than 62g DM/plant (0.15t DM/ha).

Sheep showed a preference for grazing Tree Medic, Tree Lucerne, Emu Bush, Creeping Saltbush, Mallee Saltbush and Tall Verbine (Figure 3). However, all species with the exception of Fragrant Saltbush were well grazed by the end of the grazing period. The sheep had difficulty reaching all of the available feed on the Old Man Saltbush as it had grown out of their reach. Grazing some of the larger shrubs (Old Man Saltbush, Silver Saltbush and River Saltbush) could have occurred earlier, perhaps even during the first autumn after establishment.

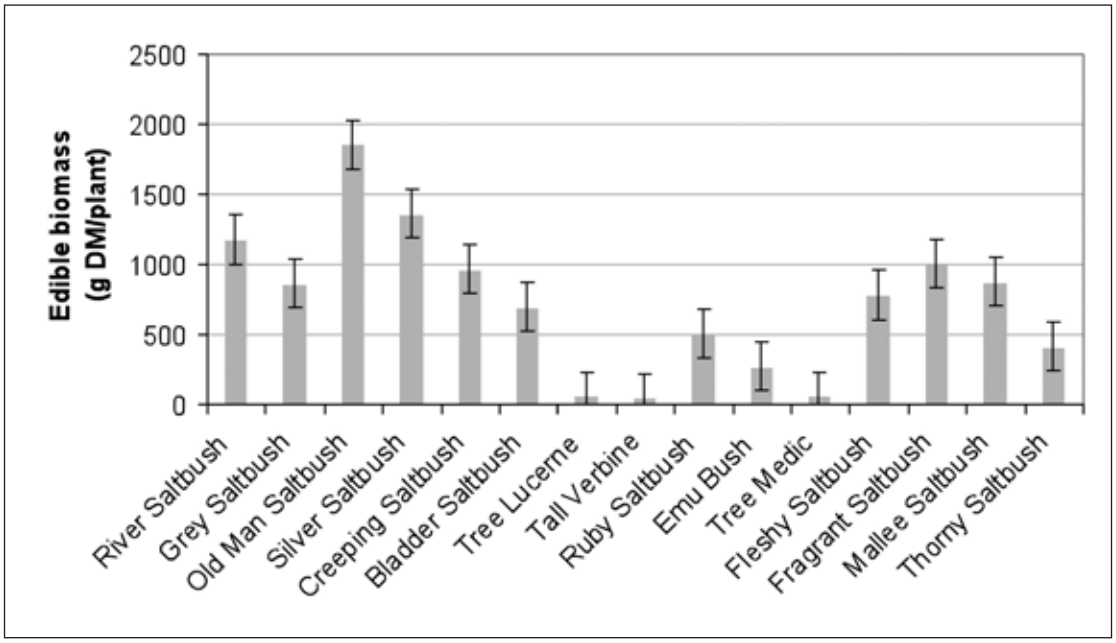

Figure 2. Mean edible biomass for the different shrubs in June 2010 expressed on a per plant basis at the Walpeup Enrich trial. Bars indicate least significant difference (P<0.001).

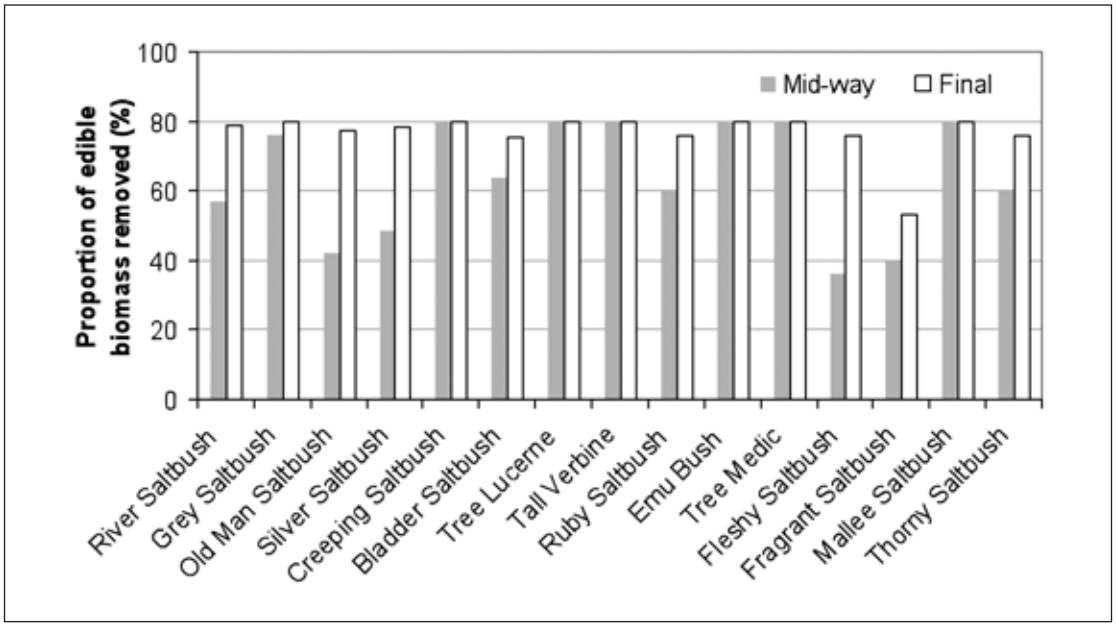

Figure 3. Mean proportion of edible biomass removed during grazing in winter 2010 at the mid-way point and at the end of each grazing at the Walpeup Enrich trial.

Changes in soil water over time at the Walpeup Enrich trial site showed that the forage shrubs are very effective at maintaining a drier soil profile in comparison with an adjacent annual cropping system. The soil profile under the shrubs began to dry in September 2009 and remained drier thereafter, compared with the annual crop system (Figure 4). The distribution of soil water down the profile changed markedly with the introduction of forage shrubs. In May 2008 before planting the shrubs, there was little difference in soil water distribution; by November 2010 a large divergence in distribution with a drier profile under the shrubs compared with the annual crop system (Figure 5) was observed.

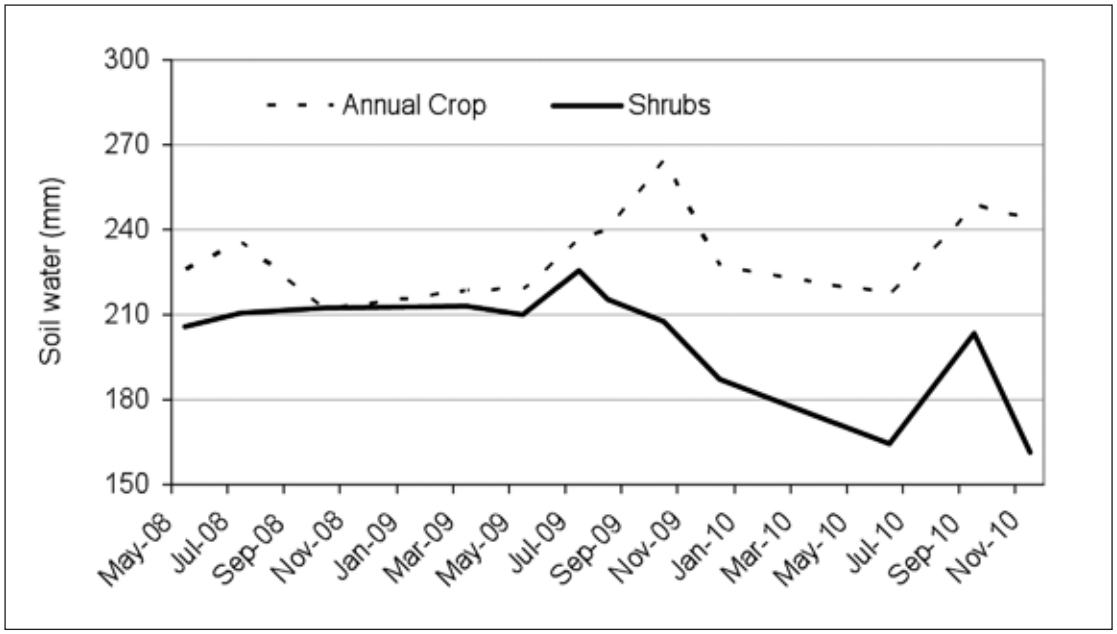

Figure 4. Changes in soil water to 1.4m depth over time under the shrubs compared with an adjacent annual crop at the Walpeup Enrich field experiment.

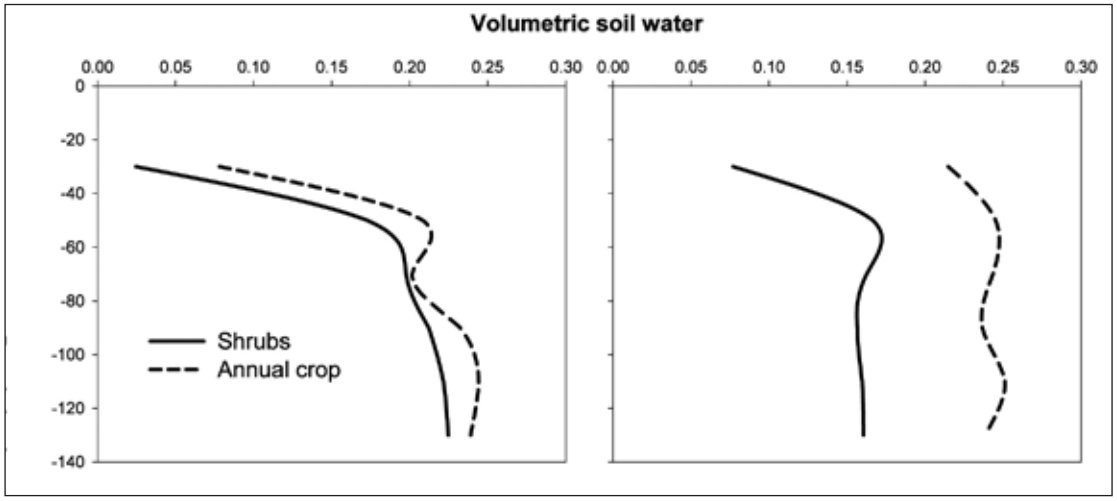

Figure 5. Distribution of volumetric soil water under the shrubs compared with an adjacent annual crop on the 27 May 2008 (left graph) and the 12 November 2010 (right graph) at the Walpeup Enrich field experiment.

Interpretation

It is worth noting that this trial was conducted on relatively fertile soil for the Victorian Mallee. The low survival rates and edible biomass production in the Tall Verbine, Pink Bindweed, Tree Lucerne and Tree Medic would suggest that these species are not likely to have a significant place in the Victorian Mallee. Of concern was the rapid decline in the survival of the Creeping Saltbush after grazing. It appears this species is intolerant of grazing.

As long as shrubs are resilient to grazing, most species in the study showed great potential for providing significant additional feed to livestock systems, especially over the autumn-winter period. Whilst the outstanding species in terms of edible biomass production and shrub survival were the Old Man, Silver and River Saltbush species, they were not particularly favoured by sheep. If one weighs up shrub survival, edible biomass production and grazing preference, then the Mallee Saltbush shows great promise. However, further measurements are required in the coming year to provide definitive answers regarding the selection of suitable shrub species for use in mixed farming systems for the Mallee region.

This work also showed that forage shrubs can maintain drier soil profiles in comparison with annual cropping systems, and therefore highlights the potential for planting shrubs in areas of high recharge for mitigating localised dryland salinity threats.

Acknowledgments

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