

Shrub species for use in recharge areas in northern New South Wales

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Dryland salinity is becoming increasingly common in northern NSW. To date the primary indicator of the problem is water quality. For example, in 1998, the average monthly water salinity levels of the Namoi River at Boggabri exceeded 800 EC (the World Health Organisation limit for drinking water) 20% of the time. This has been predicted to increase to 63% by 2100. Similarly the critical threshold of 1500 EC (World Health Organisation limit for irrigation water) was exceeded 6% of the time in 1998 and is predicted to increase to 27% by 2100 unless action is taken (MDBMC 1999).

With the current concerns about soil water draining below the root zone and the effect on water quality, there is a need to consider options which may correct or reduce deep drainage. Agricultural land on the North-West Slopes is predominantly permanent pasture, dominated by summer-growing native perennial grasses. These native pastures typically have roots to about 1.2 m (Lodge and Murphy 2002). Deep drainage below these pastures has been estimated to range from 0-200 mm/year, occurring mostly during wet winters (Lodge *et al.* 2002). Species with an active rooting depth >2 m will provide greater soil water storage capacity for wet periods, thereby reducing deep drainage. In northern NSW, lucerne is the most widely sown perennial legume, and often proposed as the solution to deep drainage. However in a native pastures, lucerne, or any sown perennial pasture can be difficult to establish and even more difficult to maintain. Shrubs can be transplanted into widely spaced rows in native pastures, potentially providing several advantages other than increasing the extent of the active root zone. These may include animal health gains such as shade and shelter for grazing animals, an alternative feed source, and nitrogen (if the shrub is a legume) to increase native pasture production.

This paper reports a preliminary study of a range of shrub species and lucerne sown in a recharge area

in northern NSW to investigate their suitability to the environment and the effects of different cutting regimes on their persistence. This study was part of a national field evaluation program within the Cooperative Research Centre for Plant-based Management of Dryland Salinity (CRC PMDS).

Materials and methods

Individual plants of 8 shrub species (Table 1) and lucerne (*Medicago sativa* L.) were grown in jiffy pots in a shade house for 3 months before being transplanted into the field in June 2003. The recharge site was located on a Brown Vertosol about 12 km west of Manilla, NSW (30.74°S 150.61°E, 400 m elevation, 650 mm AAR) in the Namoi catchment, on the North-West Slopes of NSW. Each species was sown in 3 rows; 1 m between plants within a row and 2 m between rows, with each row consisting of 5 plants. Plants were watered 3 times during the July following transplanting.

One row of each species was cut to a height of 30 cm above ground level in autumn 2004 and a second row in spring 2004 to simulate seasonal grazing. Cattle were allowed to graze the study site seasonally from August 2004. Plant losses (% of original plants) were recorded in February 2004, August 2004 and February 2005 and the extent of grazing by stock was scored on a scale from 1 (not grazed) to 5 (heavily grazed) in February 2005.

Results and discussion

Despite below average rainfall in 2003 (Fig. 1), the 9 species established well after supplementary watering. First plant losses were recorded in February 2004 and by February 2005 all plants of *S. frutescens* and *D. rectum* had died (Table 1). Cutting and season of cutting did not appear to have any substantial effect on persistence and so values were meaned for all treatments.

Table 1. Mean plant losses (% of original) of 8 shrub species and lucerne in February 2004, August 2004 and February 2005 together with mean scores to indicate the extent of grazing (1=not grazed; 5=heavily grazed) by cattle in February 2005

Species	Common name	Plant losses (%)			Grazed score
		Feb. 04	Aug. 04	Feb. 05	
<i>Sutherlandia frutescens</i> (L.) R.Br.	Balloon pea	6	41	100	^
<i>Dorycnium rectum</i> (L.) Ser.	Erect canary clover	28	44	100	^
<i>Medicago arborea</i> L.	Tree medic or moon trefoil	0	0	17	4.5
<i>Coronilla valentina</i> Lam.	Crown vetch	0	17	17	1.5
<i>Maireana brevifolia</i> R.Br. PG Wilson	Yanga bush	6	6	11	4
<i>Atriplex nummularia</i> Lindl.	Old man saltbush	0	0	0	4.5
<i>Atriplex cinerea</i> Poir.	Grey saltbush (prostrate)	0	0	0	3
<i>Atriplex amnicola</i> PG Wilson	River saltbush	0	6	11	3
<i>Medicago sativa</i> L.	Lucerne	11	11	33	5

^All plants dead

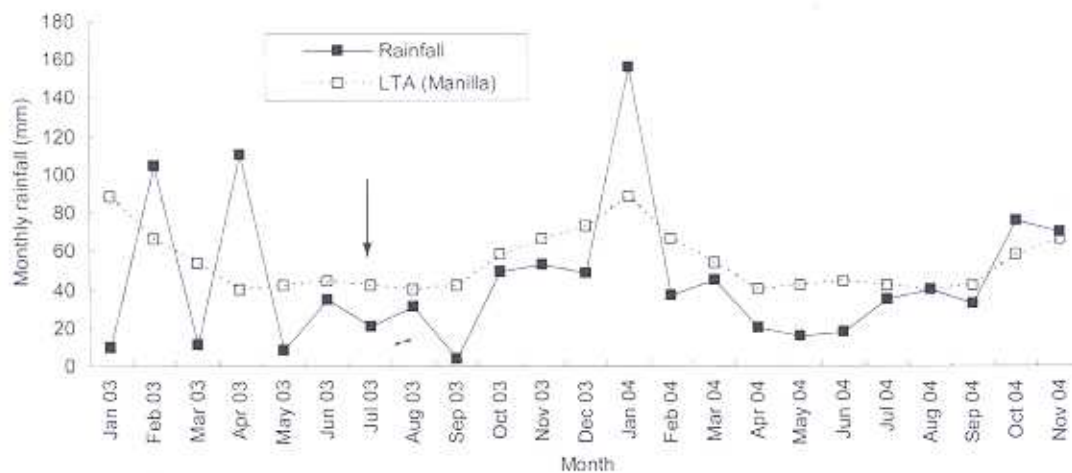


Figure 1. Monthly and long term average (LTA) rainfall (mm) at the Manilla recharge site, 2003- 2004. The arrow indicates time of transplanting into the field.

The poor persistence of *S. frutescens* plants was surprising since it was considered to be reasonably drought tolerant and suited to a wide range of soils. Plants of *D. rectum* were initially leafy and grazed by cattle, only becoming stressed during winter 2004 and dying in summer 2004-05. Their lack of persistence may have been associated with low soil moisture since plants growing at a discharge site prone to waterlogging continued to persist, producing green leafy growth which is heavily grazed by sheep each season.

Of the species grown *A. nummularis* and *A. cinerea* were the most persistent with no plant losses (Table 1). *A. nummularia* and the 2 *Medicago* spp. were the most heavily grazed by cattle (Table 1).

The extent of grazing of *A. nummularia* plants was surprising, since the cattle used had not previously grazed saltbush, which is reputed to be an acquired taste, and the stock appeared to actively seek the plants.

M. arborea is a legume that is widely reported to be preferred by grazing animals. Plants have responded well to both cutting and grazing and have remained green throughout the study, except for some leaf drop observed at the hottest and driest times of the year. Plants of this species are attractive to insects, but no major damage has been observed to date.

A prostrate type of *A. cinerea* was used in this study that tended to root from nodes, resulting in

some cases in independent plants being developed, which may be an advantage in persistence. Plants of this species also responded well to cutting and were moderately grazed by cattle. *A. amnicola* and *C. valentina* also had good persistence, but did not appear to be as readily grazed by cattle. In particular, the legume species *C. valentina* never grew higher than 40 cm and only a few stems were grazed.

M. brevifolia was moderately grazed by cattle, responding well to both cutting and grazing and has had good persistence. Plants produced large quantities of seed which readily germinated on the soil surface, but the seedlings failed to persist, probably because of their high density.

This study highlighted the variability in palatability and persistence of a range of browse shrub species. A further study will commence in autumn 2005 to more fully investigate the effects of time of cutting on the persistence, herbage mass production and quality of a range of shrub species.

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