Grazing and management of saltland shrubs

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Areas of bare saltland on farms need not be unproductive eyesores. Many Western Australian farmers are now successfully growing salt-tolerant or halophytic shrubs such as bluebush (Maireana brevifolia), saltbushes (Atriplex spp.) and samphires (Halosarcia spp.) on these areas.

Department of Agriculture trials and farmers’ experience indicate that if saltland is planted with recommended shrubs, it can provide two months’ valuable grazing for sheep during autumn and early winter, a time when paddock feed is scarce. Research by the Department has also identified a range of salt-tolerant shrubs suited to the various types of saltland.

Grazing trials to determine the value of salt-tolerant shrub pastures for sheep started at Wickepin and Kondut in the 1970s and the early results were reported in this Journal in 1982 (Clarke, 1982). The Kondut trial has been continued and the results from six years’ grazing are discussed here. This article also contains additional information from large grazed plots on farms and from farmers experienced in the management and use of saltland shrub pastures.

Kondut grazing trial

In September 1978, saltbush and bluebush seedlings raised in a nursery were planted on an area of virtually bare saltland on a crabhole clay flat at Kondut. Table 1 describes the soil from a crabhole depression and its bank. The soil on the bank was too salty for even the most salt-tolerant crop plants such as barley. The sub-soil beneath the depression was less saline and could grow a reasonable barley crop if the surface salinity was not as high and the area was not waterlogged in winter. Shrub types and plant spacing are shown in Table 2.

A total of 96 sheep (six per plot) grazed the 16 plots of river saltbush, wavy leaf saltbush, marsh saltbush and bluebush each autumn and early winter. Sheep were weighed at weekly intervals from the start of grazing each autumn. When either sheep body weights started to fall rapidly, or it was judged that there was no more feed in a plot, the sheep were removed from that plot. Water supplied to the sheep contained less than 300 milligrams per litre (91 milliSiemens per metre) total dissolved solids (TDS).
Table 1. Soil conditions in crabhole soil at Kondut

<table>
<thead>
<tr>
<th>Site</th>
<th>Depth (cm)</th>
<th>Texture</th>
<th>Colour</th>
<th>Presence of lime</th>
<th>pH (1:5 soil:water)</th>
<th>ECe, mS/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crabhole depression</td>
<td>0-20</td>
<td>Coarse sandy clay</td>
<td>Very dark grey</td>
<td>Yes</td>
<td>6.7</td>
<td>2,760</td>
</tr>
<tr>
<td></td>
<td>20-40</td>
<td>Medium clay sandy</td>
<td>Very dark greyish brown</td>
<td>No</td>
<td>7.3</td>
<td>1,540</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>Medium clay sandy</td>
<td>Light olive grey</td>
<td>Yes</td>
<td>8.7</td>
<td>1,410</td>
</tr>
<tr>
<td></td>
<td>60-80</td>
<td>Medium clay sandy</td>
<td>Light olive grey</td>
<td>Yes</td>
<td>9.1</td>
<td>1,320</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>Medium clay sandy</td>
<td>Light brownish grey</td>
<td>Yes</td>
<td>9.1</td>
<td>1,350</td>
</tr>
<tr>
<td>Crabhole bank</td>
<td>0-20</td>
<td>Medium clay sandy</td>
<td>Dark greyish brown</td>
<td>No</td>
<td>7.9</td>
<td>3,770</td>
</tr>
<tr>
<td></td>
<td>20-40</td>
<td>Medium clay sandy</td>
<td>Greyish brown</td>
<td>Yes</td>
<td>8.8</td>
<td>2,990</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>Medium clay sandy</td>
<td>Light brownish grey</td>
<td>Yes</td>
<td>8.8</td>
<td>2,740</td>
</tr>
<tr>
<td></td>
<td>60-80</td>
<td>Medium clay sandy</td>
<td>Light grey</td>
<td>Yes</td>
<td>9.0</td>
<td>2,570</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>Medium clay sandy</td>
<td>Light olive grey</td>
<td>Yes</td>
<td>9.1</td>
<td>2,380</td>
</tr>
</tbody>
</table>

ECe – electrical conductivity of the saturation extract in milliSiemens per metre. A measure of the salt content.

Sheep which grazed the plots in 1985 (Figure 1) initially gained weight, then levelled off and eventually lost weight as the feed became exhausted. Plots, even of the same species, varied in their carrying capacity, so that sheep were removed from each plot according to its condition. By the time sheep were removed, the plots were bare of ground cover and the shrubs had been chewed back to sticks about five millimetres thick. This represents very intense grazing.

The performance of the various shrub species after grazing over the past six years has varied markedly (Figure 2). In the first grazing (starting 18 months after planting) all species yielded well, but yield declined in the second grazing (12 months' growth). In the third year river saltbush had shown a much better ability to recover from grazing than the other species.

Marsh saltbush was so devastated by two severe grazing periods that all plots were rested in the third year. As a result excellent seedling regeneration occurred and the plots yielded well in the fourth year. Subsequent grazings killed almost all the original plantings of marsh saltbushes (2 per cent survival by 1985) and the new seedlings. In 1985, sheep in the marsh saltbush plots grazed mainly ground cover plants and shrubs of other species which had invaded the plots.

Wavy leaf saltbush survived better (54 per cent) than marsh saltbush and by 1985 new plants had established in all but one plot. Slightly less than half the bluebush plants survived because they could not cope with waterlogging in the low-lying parts of some plots. Bluebush, which usually spreads naturally in large numbers, produced few new bushes in the plots, probably because the severe autumn grazing every year prevented seedling establishment.

Table 2. Shrub types planted in Kondut grazing trial

<table>
<thead>
<tr>
<th>Common names (species in brackets)</th>
<th>Plot size (ha)</th>
<th>Number of shrubs planted</th>
<th>Spacing (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>River saltbush (Atriplex amnicola)</td>
<td>0.15</td>
<td>165</td>
<td>3 x 3</td>
</tr>
<tr>
<td>Wavy leaf saltbush (Atriplex undulata)</td>
<td>0.15</td>
<td>165</td>
<td>3 x 3</td>
</tr>
<tr>
<td>Marsh saltbush (Atriplex paludosa)</td>
<td>0.15</td>
<td>375</td>
<td>2 x 2</td>
</tr>
<tr>
<td>Bluebush (Maireana brevifolia)</td>
<td>0.15</td>
<td>375</td>
<td>2 x 2</td>
</tr>
</tbody>
</table>

There were four replications and six sheep grazed each plot.

River saltbush survived the best (94 per cent of the original bushes planted) and some river saltbush plots now have many new plants. These plots provided an average of 1488 sheep grazing days per hectare per year over the six years, and the grazing yield has increased in recent years. Grazing yield has been expressed as sheep grazing days per hectare because the shrubs are used as a forage reserve for short-term grazing. To convert to sheep per hectare per year divide by 365.

Large numbers of samphire plants established in the plots that were rested in the third year, but plots grazed hard every autumn were not strongly invaded by samphire (Figure 3). Implications for saltland management are:

- Samphire has established on some areas because of favourable grazing management rather than the site being particularly suitable for it. On these areas, samphire could be replaced with more valuable species such as river saltbush.
- Not grazing saline land for two years can encourage samphire growth if those seedlings have established well.

In 1985, we measured the amount of shrub and ground cover forage available on each
Table 3. Species composition of ground cover

<table>
<thead>
<tr>
<th>Common names (species in brackets)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand spurry (<em>Spergularia rubra</em>)</td>
<td>64</td>
</tr>
<tr>
<td>Puccinellia (<em>Puccinellia ciliata</em>)</td>
<td>76</td>
</tr>
<tr>
<td>Mediterranean (sea) barley grass (<em>Hordeum geniculatum</em>)</td>
<td>43</td>
</tr>
<tr>
<td>Slender ice plant (<em>Mesembryanthemum nodiflorum</em>)</td>
<td>55</td>
</tr>
<tr>
<td>Wimmera ryegrass (<em>Lolium rigidum</em>)</td>
<td>8</td>
</tr>
<tr>
<td>Mallee love grass (<em>Eragrostis dielsii</em>)</td>
<td>6</td>
</tr>
<tr>
<td>Curly ryegrass</td>
<td>54</td>
</tr>
</tbody>
</table>

plot (Figure 3), and determined the species composition of the ground cover. (Table 3). The amount of ground cover growing in the different shrub pasture plots was relatively constant, but there were marked differences in shrub yield.

Persistence of shrubs

River saltbush grew well, and sheep were able to graze these plots each year for six years. Marsh saltbush has almost disappeared from the plots, being replaced by dense stands of samphire. Bluebush was planted relatively far apart (2 x 2 metres) for a bush of its size. Some bluebushes have died from waterlogging.

Wavy leaf saltbush has persisted, with new self-sown plants replacing the old bushes that died. Forage yield on these plots has been augmented by invasion by bluebush and river saltbush. Wavy leaf saltbush may persist best at lower grazing rates.

Maya grazing trial

Two plots of about 0.9 ha each of wavy leaf saltbush were established by direct seeding at Maya using the Mallen Niche Seeder. The grazing value of these plots was compared with the grazing value of a stubble paddock over autumn and early winter.

Plot 1 was sown to wavy leaf saltbush in 1979 at a plant spacing of 3 x 3 metres.

Plot 2 was sown to wavy leaf saltbush in 1980 at a spacing of 2 x 1.5 metres. This plot also contained quail brush (*A. lentiformis*), which was included in the seed mixture at a rate of 1 per cent, to later provide shelter for the sheep.
The amount of feed in each plot varied because of the number of saltbush plants that were initially established.

Both plots were grazed initially in 1982, and have been grazed each year since, except for 1985 when Plot 2 was grazed and Plot 1 was rested.

The number of sheep put into each plot varied according to the amount of feed available, with 15 sheep in Plot 1 and 20 in Plot 2. Sheep were weighed at weekly intervals from the start of grazing in early May. Sheep on the stubble were only weighed at the start and finish of the trial. Waters supplied to the sheep in Plot 1 and Plot 2 in 1983 contained about 2400 and 7300 mg per litre TDS respectively (437 and 1327 mS/m). In other years the water supplied to both plots contained about 3000 mg per litre TDS (546 mS/m). All other management criteria were identical to the Kondut trial.

Sheep which grazed the wavy leaf saltbush plots in 1983 (Figure 4) initially gained weight, then levelled off and eventually lost weight as feed became limited. Summer rain during 1984 disrupted grazing and less sheep were put into the plots which were grazed for longer. Sheep grazing the stubble lost weight over the 49 days of the trial while sheep grazing the saltbush stands maintained their liveweight for a period before gradually losing weight. Their final weights were higher than those of sheep on the stubble.

The carrying capacities of the saltbush plots were calculated each year after grazing (Table 4).

Grazing the plots heavily year after year lowered their carrying capacity. This effect prompted us to investigate management options available to farmers for sheep grazing wavy leaf saltbush. Two options are:

- resting the wavy leaf saltbush from grazing during years with adequate alternative feed and
- grazing the plots at a lower average stocking rate over a number of years than was used in the initial trials. These will be tested in future trials.

Farmers' experiences

Bluebush and samphire are native to the Western Australian wheatbelt and some farmers have encouraged them to spread over extensive areas of saltland.

Mr. O. Mott of Moulyinning has grazed sheep on about 800 ha of samphire regularly since the 1950s. The samphire is grazed in conjunction with eight adjacent stubble paddocks in autumn and is a valuable feed reserve.

Farmers at Kulin, Lake Grace, Konnongorring and Ejanding regularly graze sheep on large areas of bluebush. The bluebush is grazed in summer to late autumn in conjunction with an understorey of...
pasture, or it is grazed as a supplement to adjacent paddocks of stubble or dry pasture. Farmers report that the bluebush supplement produces large-framed sheep with good wool cuts and quality. Some stud breeders have used saltbush to produce well-grown rams. In autumn 1985, Mr P. York of Tammin put 2 000 hoggets into a 24 ha paddock of morrel saltland growing bluebushes and saltbushes for several years. The bushes had been grazed in earlier years but because of a feed shortage in 1985 sheep were allowed to strip the bushes completely. The sheep went into the paddock in store condition, stayed one month, received no supplementary feed and were removed in store condition. This is equivalent to 2 510 sheep grazing days per hectare, all at a time when other feed was extremely scarce. The bushes recovered well.

Mr. K. Diamond of Maya has established 200 ha of wavy leaf saltbush over the past six years. The saltbush is grazed during crop seeding time to avoid the inconvenience of hand-feeding sheep at a busy time. As a result of having the saltbush his property can support an additional 800 sheep, (equivalent to 1 460 sheep grazing days per hectare). Mr Diamond's strategy allows him to defer grazing annual pastures early in the season, enabling them to grow and provide better grazing later.

Mr N. Jones of Ejanding has about 170 ha of bluebush. In 1984-85, 40 ewes grazed a 16 ha paddock of bluebush and another 70 ewes grazed a 28 ha paddock of bluebush. A stud ram was added to each paddock and the ewes and resulting lambs remained in the paddocks for eight months. Excellent lambs were produced.

Mr B. McGellin of Korbelka has about 150 ha of saltland growing bluebush and samphire. Each year in mid-March he puts 1 500 pregnant ewes into this area for six weeks. The lambs are marked when the sheep are removed.

These examples indicate that some farmers are using salt-tolerant shrub pastures on an extensive scale for important flocks of sheep at times of the year when other feed is scarce.

Saltland shrubs as an aid to drought relief

The growth of perennial forage shrubs can help to modulate the fluctuations in on-farm pasture feed supply because their yield is related to long-term not annual rainfall totals. On most farms, feed supply in autumn to early winter determines a property's stock carrying capacity. On farms where shrub pastures are available the limiting carrying capacity of the feed supply does not fluctuate greatly with season.

Revegetation of saltland with valuable forage shrubs will minimise the effects of drought on on-farm feed supplies.

Further reading