CASE STUDY

of success with saltland pastures #3

Government of South Australia

Department of Water, Land and Biodiversity Conservation

LandWater & Wool

Shaping the future

Australian Government Land & Water Australia

another australian wool innovation limited

sustainable grazing on saline lands

productive and sustainable ways to use saltland

PULLING THE PLUG ON SALT

David Liddicoat, Ungarra, Eyre Peninsula

The salinity issue

During the 1980s and 1990s, salinity was hitting hard on the Ungarra property of Dean, Lorraine and son David Liddicoat. When the property was bought in the early 1970s, salt was expanding from the creek lines at a rate of 1½ hectares per year. Previously productive land was succumbing to invading samphires and patches of scalded ground. At its worst, salinity had claimed around 140 ha of land, mostly in low lying creek flats.

The Liddicoat's farm is located at a drainage bottleneck, where five creeks join into two. And it appears that farming practices throughout the entire upstream catchment, carried out over long periods of time, probably contributed to the salinity problem. Past levels of high vegetation clearance (occurring from the late 1800s to the 1920s) and tillage practices prior to the early 1980s had made the soils prone to eroding. Meanwhile the clearance of native vegetation had disturbed both surface and groundwater flows. This meant that over time the farm was hit with a double whammy: higher watertables from clearing, and silted up creeks which restricted the natural drainage of water and salts. Locals recall that the big wet of 1956 kick-started the saltland on the property. The drought of the mid to late 1970s followed by high rainfall events in the early 1980s made the salinity worse.

David discusses his saltbush system at a recent farm walk.

Fast facts

Farmer name	David Liddicoat
Farm location	Ungarra, Eyre Peninsula
Enterprise mix	Cropping (cereals, legumes, canola) and sheep wool and meat
Saltland pastures	Saltbush, puccinellia, medics, clovers, lucerne
Rainfall pattern	400mm average, winter dominant with occasional heavy falls in summer
Catchment clearing date(s)	Late 1800's to 1920's
Salinity appearance	Expanding from silted-up creek lines
Original vegetation	Mallee, gums, Melaleucas
Saltland soils	141 ha of clayey and sandy creek flats
pH range (water)*	6.3-9.1
EC(1:5) range*	0.26-3.08 dS/m
[*From testing of SGSL trial site July 2004]	
Depth to watertable	
At worst	300mm below ground level
After drainage	800mm – 1.2m below ground level
Baseflow EC**	~ 20 dS/m (12,000 ppm)
[**From testing August 2006]	
Motivations for taking action	Reclaim productive land Stop the spread of salinity Add value to the property

Looking for answers

Dean and Lorraine started the work to combat salinity with tree planting along the creek lines. Between 1985 and 2002, 8,500 trees were planted. Areas of salt tolerant pasture such as tall wheat grass were also sown. When David took over the property around 2000 he was looking for further ways to tackle the salt problem.

Talking with Primary Industries SA staff one day, the salt problem was described as being similar to the groundwater filling up like a bath. David asked, “how do you empty the bath?”

In this groundwater system, flows occur in fractured basement rocks and sedimentary valley fill over intermediate (5-50 km flow paths) and local (<5 km) scales. And the valley soils were thought to be quite clayey and restrictive to groundwater flows. At the time, tree planting to “mop up” the groundwater was seen as the appropriate solution, while drainage wasn’t expected to be very useful.

But David was taken by the bath analogy and was confident that he could see the answer. “You don’t throw in 35 towels (to absorb the water), you pull the plug!”

Planting perennials (including lucerne) to ‘turn off the tap’ was part of the solution, but David’s first concern was all the water that had already ‘filled up the bathtub’.

David figured that fixing the salt problem was a sequential thing. His instincts told him that he had to start at the bottom of the system, to let the water get away, rather than planting more trees at the top. He was confident that drains would work and after consulting the downstream neighbours, he took a gamble and contructed the drains.

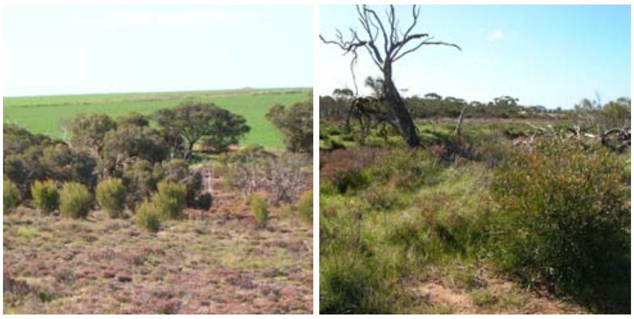
Drainage worked

The drains worked. In hindsight, the clayey materials in the creek flats were not as extensive as others had thought.

Groundwater fills the drain during construction.

From 2000 to 2004, 9½ km of drains were cut to de-silt and unblock landlocked water, mostly within creeklines and adjoining areas, and the results were remarkable.

“The water ran for 9 months,” exclaimed David. Perhaps this was an appropriate period of transition, for it seemed that a new landscape was being born. Adjacent to the creeklines, young Melaleucas and Eucalypts are emerging next to dead relatives which stand as mute testimony to a



Following drainage, species that had been killed by the salt are starting to regenerate.

salt-affected past. And grazing paddocks on the lower creek flats that had become invaded by samphire now support more productive, salt-sensitive species. As yet, David hasn’t needed to fence off the regenerating trees. “The sheep are leaving them alone, with plenty of tucker out in the paddocks,” he says. Some sheep are presently doing so well on his previously salt affected land, David jokingly refers to them as “whales”.

> ***Important note for landholders considering drainage:***
>
> *Drainage can be a sticky issue when problems are shifted downstream! Before drains are constructed it is important that impacts on downstream landholders and biodiversity are considered. Stakeholders need to be consulted. It is best to consult with authorities first, rather than risk unnecessary problems later.*

Reclaiming the saltland

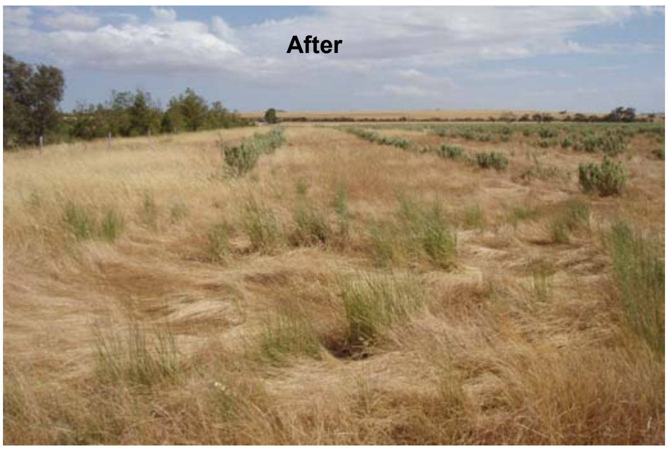
Further salinity management actions included the establishment of saltland pastures including 18 ha of old man saltbush. And with assistance from the ‘Sustainable Grazing on Saline Lands’ Project, David has been trialling the establishment of puccinellia and balansa clover understorey between the saltbush rows. But following drainage, the soils of the creek flat grazing areas have

David’s “whales” grazing on productive pastures (including lucerne, volunteer sub-clovers and medics). This is one example of the areas that have been reclaimed from the salt.

dramatically improved. Throughout these flats, volunteer pastures of ryegrass, sub-clovers and burr medic now emerge. Reductions in salinity levels have allowed 42 ha of lucerne and clovers to be sown. And within the puccinellia establishment trial paddocks, volunteer ryegrass and medics now dominates the understorey, between saltbush rows. In fighting off the once-invading samphire, David has found that cultivation between the saltbush rows was particularly useful in recycling valuable organic matter and encouraging the emergence of more productive species such as ryegrass. In the lucerne paddocks, oats are now being sown to help increase feed value.

David recalls the dramatic turnaround of parts of the land, particularly within one lucerne paddock. “In the middle, this was a bare scald which I deep ripped into 1 m cubes. With the drains working, we cut 400 small square bales off this 4 ha paddock.”

Cropping areas have also improved with a reduction in salinity impacts. The most noticeable changes have been previous areas of swamp in winter (and scald in summer) between converging creeklines that are now cropped to canola and barley, with some barley crops going 9½ bags to the acre in the first year.



In 2001 (‘before’) samphire was invading this paddock. In 2005 (‘after’), following drainage, saltbush establishment and some drier years, volunteer ryegrass and medics now dominate the understorey pasture.

The system

A number of factors (including markets, farming trends, generational change and salinity issues) have influenced the enterprise mix and productivity of the farm. From the 1970s to the 1990s, 1600 sheep per annum were run across the property year in year out. In the 1990s continual cropping occurred over the bulk of the farm, while 150 sheep per annum were run across the poorly performing salt-affected ground (with stocking rates of 0-1.5 DSE/ha). Following drainage and pasture improvements, the reclaimed saline areas now run 700 sheep (350 adults and 350 lambs), with stocking rates of between 6-10 DSE/ha.

The grazing of improved saltland pastures integrates well with the rest of the farming operation. Saltbush stands with dried understorey of puccinellia, volunteer ryegrass and medics are grazed by reduced stock numbers over April to May when feed on the rest of the farm is low. When the rains come the sheep are grazed on winter-active Salado lucerne, volunteer clovers, sub-clovers and ryegrass on other parts of the once salt-affected creek flats. Given time to recover, the saltbush and now green understorey pastures also provide valuable winter-spring grazing. In summer the sheep are turned onto the crop stubbles. Returning to autumn, some stock are sold off prior to grazing the saltbush and dried understorey. When supplementary feed (hay and lupins) is required this is usually fed out onto the more salt-affected patches, providing additional cover and mulch to help reduce soil salinity levels.

Of the 141 ha once lost to salinity only 27 ha remains non productive and this is mostly concentrated along creek lines. Over 100 ha has been reclaimed, which now comprises good cropping and grazing land. And David still has another 9 ha of previously salt-affected land to plant to saltbush before he will be happy.

Economics

The economic benefits from tackling salinity have been manifold. Drainage has reclaimed productivity from areas of grazing land as well as areas of cropping land. This means more productive crop and pasture species can be grown. Also there is now more control over paddock use. The increased productivity from the grazing land has reduced the requirement for hay production (for supplementary feed) from 30 ha to 15 ha on good cropping land. The same number of sheep can be run but hay production costs are reduced, while 15 ha of grain or canola production has been gained.

Weed control on the property has also improved. Higher numbers of sheep running on the stubbles provides better summer weed control. And greater year-round feed on the farm reduces the levels of de-stocking over summer-autumn. This reduces the weed seed load on stock brought back on to the property when levels of feed improve. Also weed control benefits have been obtained through reduced requirements for hay production. Oats are traditionally grown for hay but there are less selective herbicides available to control ryegrass in oats, particularly the escapees after the hay is cut.

Reducing the requirement to produce hay on cropping land, and instead growing more productive crops such as wheat, barley or canola reduces the weed seed bank, while increasing gross margins and farm profitability.

For landholders considering similar activities, some example economic figures are provided for establishing saltbush with an understorey of puccinellia and clovers/ medics.

Where saltland pasture establishment can improve the productivity of saltland, greater profits are expected if greater numbers of stock are grazed on the extra feed produced, rather than increasing production from existing animals.

Example costs and benefits expected from pasture establishment (see Table 1) were fed into a profitability calculator (developed by PIRSA economist Graham Trengove).

The measures of economic performance shown in Table 2 are:

- 'net present value (10%)' [ie. the total future profit from pasture development in today's dollars assuming a 10% discounting rate], and
- the minimum pasture life to break even.

Previously saline depressions now grow bumper barley crops.

Table 1. Example costs and benefits for pasture establishment (saltbush & puccinellia/ clover/ medic understorey).

Pasture establishment		
Cultivation		$30/ha
Saltbush	~1400/ha seedlings (planted) x $0.25/seedling	$350/ha
Seed	Pucci (6kg/ha x $5/kg) + clover/ medic (3kg/ha x $6/kg) = 30+18 =	$48/ha
Fertiliser	100kg/ha urea x $500/t + 80kg/ha 18:20 DAP x $475/t =	$88/ha
Pest control	100ml/ha 'LEMAT' (for red legged earth mite) x $25/L =	$2.50/ha
Drainage	9.5km drain x $1500/km, to improve 141ha =	$101/ha
Fencing	18km fencing x $1600/km, to develop 141ha =	$204/ha
Water	3.5km poly pipe x $0.80/m + 9 water troughs x $135/trough, to develop 114ha	$35/ha
Pasture maintenance		
Fertiliser	100kg/ha Urea x $500/t =	$50/ha
Water consumption	Based on estimate of water use, considering salt in diet and total property water use*	$4.50/ha
Other factors		
Previous grazing potential of the land		0.5 DSE/ha
Grazing potential after development		9-10 DSE/ha
Capital invested to purchase additional livestock (once off)		$35/DSE
Estimated life of the pasture		20 yr
Profitability of the livestock (annual gross margin)		$25-35/DSE

*Normal water consumption for sheep grazing grasses is around 400-500L/year. Sheep grazing saltbush can consume 2-3 times this amount, and more during drought. Mixed grazing (saltbush & grasses) will be somewhere in between. Water pricing for primary production involves a tiered system: 47c/kL up to 125kL/year, and $1.09/kL thereafter (SA Water).

Table 2. Profitability of the saltbush and puccinellia/ clover/ medic pasture, based on a 20 year pasture life, under different stocking rates and livestock gross margins.

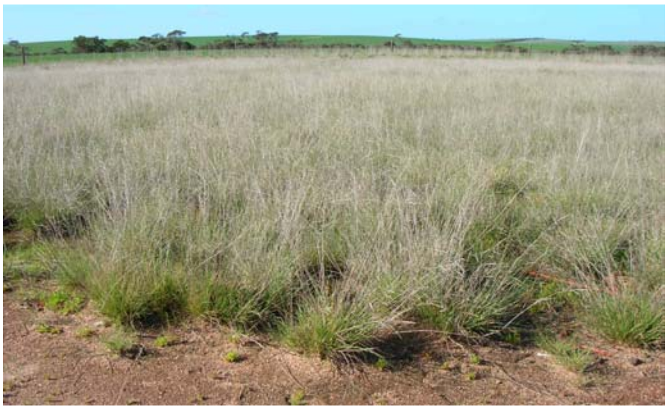
Values are: *NPV (10%) – the total future profit (per hectare) in today's dollars over the life of the pasture; and **minimum pasture life to break even.

Total stock run following pasture development	Profitability of livestock (annual gross margin)		
(DSE/ha)	$25/DSE	$30/DSE	$35/DSE
7	Not profitable over 20 years	Not profitable over 20 years	$*224 / **12 yr
8	Not profitable over 20 years	$184 / 13 yr	$446 / 9 yr
9	$73 / 16 yr	$370 / 10 yr	$667 / 7 yr
10	$225 / 12 yr	$557 / 8 yr	$889 / 6 yr

For example, assuming a gross margin of $30/DSE and a stocking rate of 9 DSE/ha is maintained over the 20 year life of the pasture, the total future profit arising from pasture development, in today's dollars (assuming a discounting rate of 10%) would be $370/ha. To start returning a profit the pasture needs to last at least 10 years.

If the saltland pasture (with these establishment costs) can only support 7-8 DSE/ha, then the investment will only return a profit if high sheep gross margins can be obtained, and the pasture lasts longer than 12-13 years.

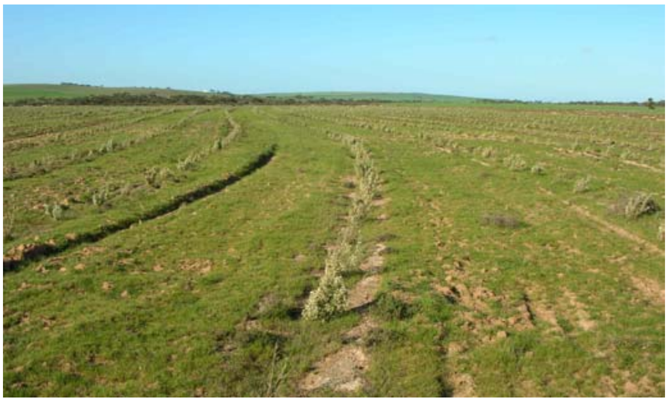
This analysis does not include gains in cropping production achieved through reduced requirements for hay production (supplementary feed). However, it does include large costs associated with fencing and drainage that may not be applicable to other development scenarios.



Puccinellia offers valuable feed in remaining saline patches.

The estimated pasture life in this analysis (20 years) is conservative. Some producers report saltbush and puccinellia pastures lasting at least 25 years.

David estimates that his increased production outcomes have paid for the establishment of his saltbush system within 5 years. This is likely to be due to a combination of increased stocking rates, gains in cropping production and reduced expenses on supplementary feed and weed control.



Cultivation between saltbush rows has helped volunteer ryegrass flourish where invading samphire previously dominated.

Prepared by: Craig Liddicoat, Rural Solutions SA. May 2007