CASE STUDY

of success with saltland pastures #1

Government of South Australia
Department of Water, Land and Biodiversity Conservation

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sustainable grazing on saline lands
productive and sustainable ways to use saltland

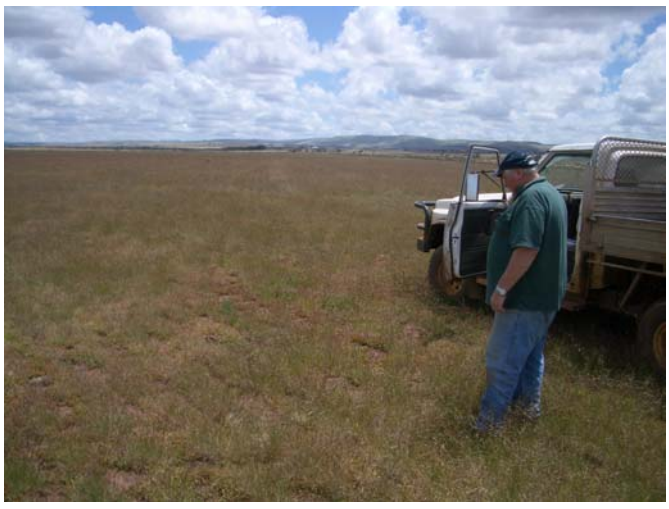
RECLAIMING PRODUCTIVITY WITH PUCCINELLIA

Geoff and John Kroemer, Tumby Bay, Eyre Peninsula

The salinity issue

Farming on the saline coastal flats south of Tumby Bay, in the rain shadow of the Koppio Hills has provided Geoff Kroemer with plenty of motivation for tackling salinity. "When you have 250 ha of salt-affected land, two thirds of which only grows samphire, you have to take it seriously," says Geoff, who runs a mixed enterprise (cereal cropping, pigs and sheep) farm in partnership with his brother John.

Natural salinity would have been present on the coastal creek flats, but Geoff has seen it spread and intensify throughout the property in recent decades. Clearing in the catchment, which extends from the Koppio Hills to the east coast of Eyre Peninsula, took place mostly in the 1930s to 1940s. And the heavy, hard-setting clays of the coastal creek flats were struggling to cope with all the extra groundwater, and salt, moving through the system. "As more of our land was colonised by samphire we realised we had a real problem," recalls Geoff. "The samphire would just keep the sheep alive, then when it was grazed out we were left with bare soil that would blow. We realised this land would be given no value by a potential buyer, so clearly our asset was eroding away."



Geoff inspects some recently sown puccinellia on his coastal creek flats, with the Koppio hills in the background

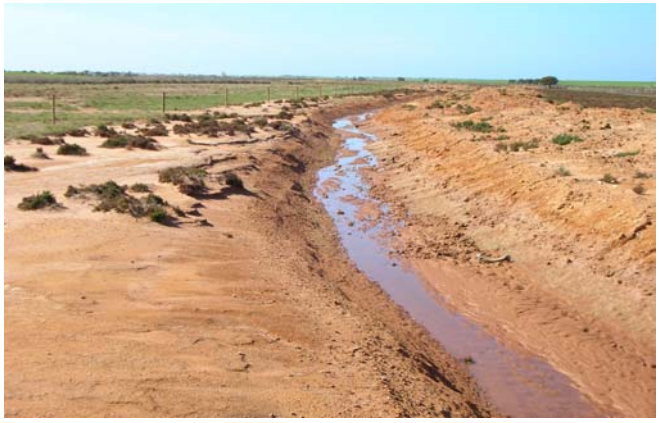
Fast facts

Farmer name	Geoff Kroemer
Farm location	Tumby Bay, Eyre Peninsula
Enterprise mix	Cereal cropping (wheat and barley), peas, sheep wool and meat, grow out pig unit
Saltland pastures	Puccinellia, saltbush
Rainfall pattern	340 mm average, winter dominant
Catchment clearing date(s)	1930s to 1950s
Salinity appearance	Creek flats have always been saline, but have increased in severity over the past few decades
Original vegetation	Melaleuca (tea tree), broom bush, gums, mallees
Saltland soils	250 ha of heavy, hard setting clays on coastal creek flats. High sodicity and high boron.
pH range (water)*	7.7-9.0
EC(1:5) range*	1.47-6.13 dS/m
[*From testing of SGSL trial site June 2004]	
Depth to watertable	Within 1m of the surface
Motivations for taking action	Stop the spread of salinity. Get cover on bare areas. Make land more profitable.

Coming home from Urrbrae Agricultural High School in 1973, Geoff began fixing up little bits of saline ground by planting salt tolerant trees around them. He had planted small areas to tall wheat grass, but the ewes and lambs found it unpalatable, particularly when it became tall and rank. But the biggest salinity problem for the farm was the large area of low productivity, mostly samphire-dominated, grazing land on the creek flats. In hindsight, as it turns out, this land also provided the biggest opportunity.

Work begins

The work to combat salinity started in earnest around 5 years ago. Since then Geoff has been fencing off the saline areas as well as fencing paddocks for rotational grazing. Over the past 4 years saltland pastures of puccinellia, saltbush, clovers and medics have been sown. And in the past 3 years a groundwater drain was constructed from one side of the property to the other. While the clayey (low permeability) creek flat soils may not be ideal for groundwater drainage, Geoff has noticed some of his wetter paddocks are now easier to get across in the ute. Also the 1-1.5 m deep drain helps to move surface water along which would otherwise pond or recharge to the watertable.



Drainage helps move surface water and groundwater across the low-lying coastal creek flats.

While Geoff had experimented with puccinellia previously, an opportunity arose through the 'Sustainable Grazing on Saline Lands' (SGSL) project (taken on by the Tumby Bay Agricultural Bureau) for Geoff to trial some puccinellia pastures with technical support from Rural Solutions SA. In 2003, 15 ha were sown, having cultivated roughly and spread seed with a 12 V clover/ snail bait spreader. But this was a disaster due to non-viable seed. Geoff is keen for others to learn from his disappointment, "Lesson number one: always do a germination test!"

Geoff's never-give-up attitude, saw the trial repeated in 2004. This time, the puccinellia seed was sourced from new contacts in the Upper South East. "We had very good germination and a remarkable response to fertiliser." Further pasture establishment in 2005 had even greater success with a better break to the season.

With puccinellia responding well to fertiliser, Geoff saw the opportunity to put the nutrient-rich biosolids coming from his farm piggery to good use. "Waste effluent has become a valuable resource," being spread on the puccinellia for fertiliser. Geoff is also mindful of minimising any offsite impacts. The combination of low gradients, low rainfall, rejuvenated wetlands located at the bottom of the property (which act as a filter) and careful attention to the timing of effluent spreading, all minimise the risk of nutrient transport off the paddocks and towards the estuary.

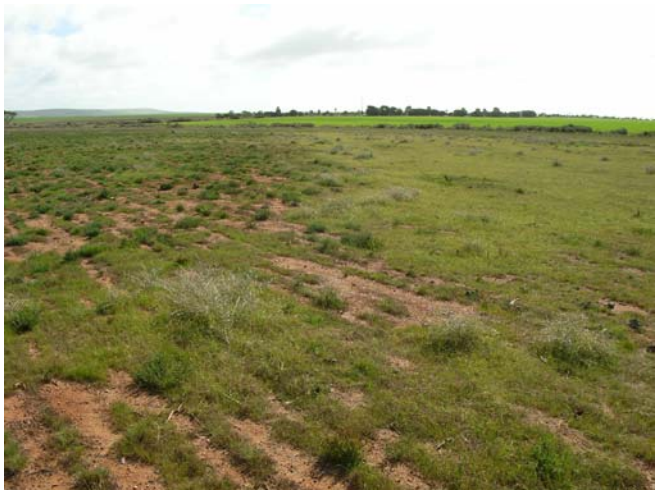
Production benefits

The improvement in productivity from previously samphire-dominated grazing land to puccinellia pastures is plain to see. Salinity varies across the flats, and the puccinellia grows alongside clovers and medics in some areas, and alongside samphires elsewhere. Of the companion legumes sown on the low-moderate salinity ground, Jester medic has persisted while balansa clover and Cavalier medic have not.

Feed tests on the puccinellia show its value as a pasture plant (see Table 1). This is supported by Geoff's observation that 2.5 score lambs went on to puccinellia pasture in September last year when there was no other good quality feed on the property, and four weeks later they came off at 3 score.

Table 1. Feed value of puccinellia on the Kroemer property.

Feed tests	*Green (winter-spring)*	*Dry (summer-autumn)*
Protein (%)	20	3.4
Metabolisable Energy (%)	10.4	7.2
Digestibility (%)	66	50



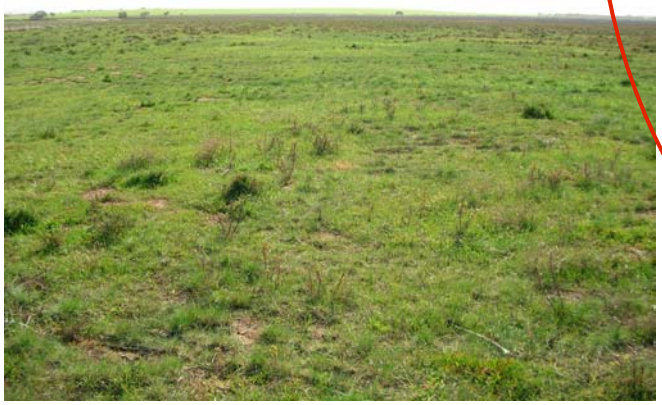
Higher salinities affect the performance of puccinellia and its companion pasture species.

On some of the better drained (but still salty) country, Geoff has been planting saltbush, now reaching some 15,000 plants in all. Geoff is planting a relatively new variety called 'Eyres Green' saltbush (derived from old man saltbush and selected by the Topline Plant Company), and he swears by its feed value for sheep (see Table 2). A taste test soon

confirmed the superior palatability (to humans) of the Eyres Green saltbush leaves, in comparison to the more widely planted old man saltbush. “You could put that in your salad,” Geoff says proudly.

Table 2. Feed value of Eyres Green Saltbush on the Kroemer property (sample collected Oct 2004).

Feed tests	
Protein (%)	15.2
Metabolisable Energy (%)	8.6
Digestibility (%)	69.5



On the moderately saline ground, puccinellia grows in a mix with clovers, medics and volunteer species.

Of the 250 ha of saline creek flats, previously classed as somewhere between ‘low productivity’ and ‘useless’ grazing land, 100ha has so far been planted to puccinellia. The improvements in pasture quality equate to a jump in grazing potential from less than 1 DSE/ha to 5-8 DSE/ha. This success can be largely attributed to persistence in getting pastures established and fertilising to boost production.

The system

Currently across the property (also including non saline areas), the Kroemers run 1,000 ewes plus lambs plus hogget ewe replacements, but these numbers are expected to increase with further development.

The grazing of saltland fits in well with the other aspects of the farm enterprise. As mentioned, the farm piggery provides valuable fertiliser for puccinellia pastures. Crop stubbles provide good summer feed, while sheep provide summer weed control. Puccinellia and saltbush pastures (with and without clovers/ medics) provide nearly year-round rotational feed and all-important autumn fodder for when the stubble is finished. And because of the new sources of feed, they are able to take the sheep out of the stubble paddocks before they start to do damage there.

Future work

Geoff is expanding on the 100 ha of puccinellia at a rate of 15-30 ha per year, but wishes he’d put in a whole lot more last time round with a good season boosting pasture establishment.

Encouraged by their success with saltland pastures, the brothers are now keen to invest their own money on rehabilitating other parts of their property. They have fenced off the drain and three wetlands allowing native vegetation to regenerate. Despite previous failed attempts with direct seeding of trees they are keen to try this again as salts are leached and soil conditions improve.

Economics

Turning apparently useless grazing land into good productive pasture has yielded significant economic benefits for the Kroemers. For landholders considering similar activities, some example economic figures are provided below.

Greater profits are expected if greater numbers of stock are grazed on the extra feed produced, rather than increasing production from existing animals.

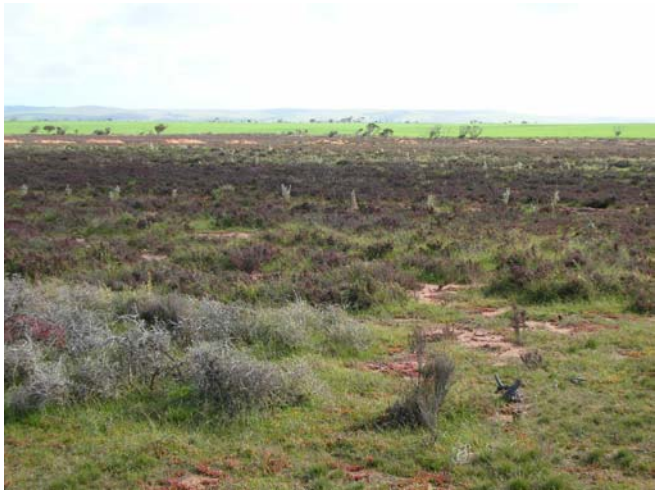
Puccinellia can boost production even in country that has been invaded by samphire.

Example costs and benefits expected from pasture establishment (see Table 3) were fed into a profitability calculator (developed by PIRSA economist Graham Trengove).

The estimated pasture life (15 years) is conservative. Some puccinellia pastures in the Upper South East are over 20 years old.

The measures of economic performance shown in Table 4 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.



Eyres Green saltbush plantings add to the feed on offer in these previously low value grazing areas.

Table 3. Example costs and benefits for puccinellia and medic pasture establishment.

Pasture establishment		
Cultivation		$20/ha
Seed	Pucci (10 kg/ha x $5/kg) + medic (4 kg/ha x $6/kg) = 50+24 =	$74/ha
Fertiliser	70 kg/ha 18:20 DAP x $510/t (incl freight) =	$36/ha
Drainage	7 km drain x $1500/km, to improve 240 ha =	$44/ha
Fencing	20 km fencing x $1600/km, to develop 100 ha	$320/ha
Water	Poly pipe and water troughs (estimated)	$35/ha
Pasture maintenance		
Fertiliser	Fertiliser: 7 kg/ha 18:20 DAP x $510/t (incl freight) + 40 kg/ha Urea x $470/t (incl freight) = 3.6 +18.8 =	$22/ha
	Piggery waste effluent (assume application costs are less than costs for disposal as waste)	No cost
Water costs	Based on estimate of water use, considering salt in diet and total property water use*	$5/ha
Other factors		
Previous grazing potential of the land		0.5 DSE/ha
Grazing potential after development		6-8 DSE/ha
Capital invested to purchase additional livestock (once off)		$35/DSE
Estimated life of the pasture		15 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 (saline and non-saline pastures) will be somewhere in between. Water pricing for primary production involves a two-tiered system: 47c/kL up to 125kL/year, and $1.09/kL thereafter (SA Water).

Table 4. Profitability of puccinellia and medic establishment based on a 15 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.

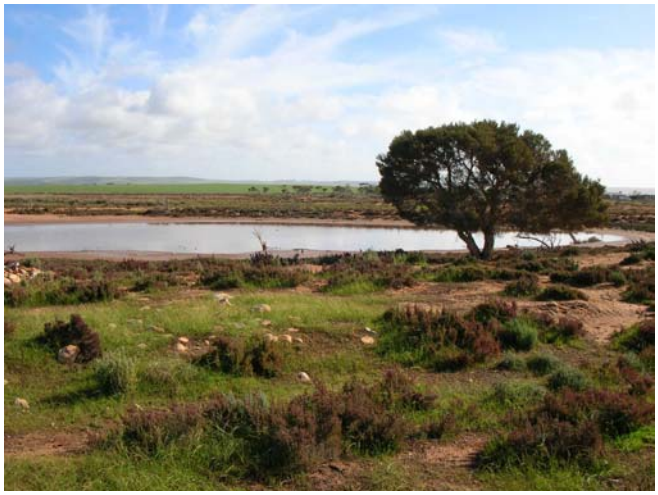
Total stock run following pasture development	Profitability of livestock (annual gross margin)		
(DSE/ha)	$25/DSE	$30/DSE	$35/DSE
5	Not profitable over 15 years	*$70 / **12 yr	$209 / 9 yr
6	$65 / 12 yr	$236 / 8 yr	$407 / 6 yr
7	$201 / 9 yr	$403 / 6 yr	$605 / 5 yr
8	$336 / 7 yr	$569 / 5 yr	$803 / 4 yr

For example, assuming a gross margin of $30/DSE and a stocking rate of 6 DSE/ha (extra 5.5 DSE/ha) is maintained over the 15 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 $236/ha. To start returning a profit the pasture needs to last at least 8 years.

Further benefits not taken into account in this analysis include:

- the ability to utilise a previous waste problem (piggery effluent) as a resource (fertiliser),
- better control of paddock use – eg. on good cropping land, saltland pasture development has freed up requirements for supplementary hay production, hence allowing more crop production.
- less damage to cropping land (than previously) because the sheep can be taken off stubbles sooner and put onto the valuable summer-autumn feed in the saltland pasture.

Geoff shows off some newly established puccinellia.



Saline wetlands will be protected to benefit local biodiversity.

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

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