CASE STUDY

of success with saltland pastures #5

Government of South Australia

Department of Water, Land and Biodiversity Conservation

LandWater&Wool

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sustainable grazing on saline lands

productive and sustainable ways to use saltland

GETTING THE MOST OUT OF PUCCINELLIA & TALL WHEAT GRASS

Malcolm Schaefer, Murray Lagoon, Kangaroo Island

The salinity issue

Farming near Murray Lagoon on Kangaroo Island at the bottom of a large, land-locked groundwater system, in the middle of an ancient lake bed, Malcolm Schaefer has had to learn to live productively with saltland. While salinity and waterlogging were naturally present (evidenced by the tea-tree which previously dominated the low-lying ground), these issues have worsened following clearing. The altered water balance of the landscape was highlighted to Malcolm when his saltland spread dramatically following the wet years of 1984 and 1992.

One third of his 1600 ha farm is salt-affected, another third is non-wetting sand, while the remainder is good cropping land. Over the years, Malcolm has built up his knowledge to make the most of his saline ground, while boosting water use and productivity on his higher recharge areas.

Looking for answers

After the wet year of 1984 Malcolm started a small program of planting salt-tolerant grasses and trees on affected areas. "In those days, with not much experience to fall back on, it took several years to thicken up the grasses and most of the trees which cost $2 each were eaten by kangaroos." Malcolm saw the opportunities for direct seeding of native vegetation after attending a local Landcare conference in 1994. This enabled him to sow large areas quickly and the kangaroos didn't seem to find them as attractive as the tubestock.

In 1995 Malcolm visited the Upper South East to learn more about clay spreading to overcome non-wetting sands. While he was there Malcolm saw the dramatic benefits of fertiliser on salt-tolerant pastures. "Their swards were much more productive than I was used to, and by sowing tall wheat grass and puccinellia separately they were also able to reap their own seed," recalls Malcolm.

After a number of small trials and having seen the results in the Upper South East, Malcolm has developed his own system for establishing puccinellia and tall wheat grass:

Fast facts

Farmer names	Malcolm Schaefer
Farm location	Between Murray Lagoon and Lake Ada, 10 km from the south coast of Kangaroo Island
Enterprise mix	Wool, prime lambs, oats and vetch
Saltland pastures	Puccinellia & tall wheat grass
Rainfall pattern	550 mm, winter dominant
Catchment clearing date(s)	1900 to 1950
Salinity appearance	Natural salinity and waterlogging on low-lying flats has been exacerbated by clearing. Wet years intensify the problem.
Original vegetation	Melaleucas (tea-tree)
Saltland soils	Sands/ loams over clay, with calcrete at 0.5-1 m depth
pH range (water)*	6.3 – 9.3
EC(1:5) range*	0.05 – 1.75 dS/m
[*From testing of SGSL trial site Nov 2005]	
Depth to watertable	0.5-1 m
Motivations for taking action	Live productively from saltland. Protect the good land.

Photo: B Munday

Malcolm explains the results of some SGSL trial work.

- Spray top in spring the year prior to sowing to remove sea barley grass.
- Three weeks after the opening rain, apply a knockdown herbicide.
- Scarify, then sow pasture seed at 4 kg/ha puccinellia and 8-10 kg/ha tall wheat grass through a combine, just dropping the seed on the surface and covering with combine harrows.
- Fertilise with 60 kg/ha plain super and spray for red legged earth mite.
- Lightly roll, mainly to prepare the paddock for seed harvesting.
- In late August, apply urea at 40-50 kg/ha.

Malcolm uses the newer variety of tall wheat grass, Dundas, which has been selected for improved leafiness, palatability and feed value. “Dundas seems to have a much better growth habit, is far less ‘clumpy’ and even appears to push into slightly higher salinity zones than the traditional variety Tyrell,” says Malcolm.

Seasonally inundated, saline/ waterlogged land (top) is sown to a mix of puccinellia and tall wheat grass. Puccinellia grows on the lower-lying saltier ground (brown patch in centre of bottom photo) while tall wheat grass colonises slightly higher ground.

In March both puccinellia and tall wheat grass can be reapt, making Malcolm pretty well self-sufficient in seed as he has expanded his planting.

Refining the system

While Malcolm has developed a proven system he is always looking for improvements. The puccinellia and tall wheat grass pastures have become a valuable part of his grazing system, providing good summer feed and good early feed at the break of the season. Malcolm also opportunistically grazes his saltland through the year, moving sheep from other non-saline pastures on the farm. But now Malcolm is keen to find out whether or not rotational or set stocked grazing will enable his sheep to graze the saltland pastures for 12 months of the year. “If the system works, it will not only increase our productivity, but will also increase water use which will benefit the saltlands,” says Malcolm.

Other areas of interest for Malcolm are how different types and rates of nitrogen fertiliser and the timing of fertiliser application will influence the growth of saltland pastures.

Over the past three years Malcolm has been actively looking into these grazing and fertiliser management questions with the support of Land, Water and Wool’s ‘Sustainable Grazing on Saline Lands’ (SGSL) program. This innovative program enabled the two-way flow of information between producers undertaking trials and a larger network of saltland farmers, researchers and extension providers.

Malcolm’s dedication to the trials was plain to see, evidenced by the amount and quality of the data he collected.

Set stocking versus rotational cells

Contrary to expectation, the set stocked paddock performed better than the rotational grazed cells. The set stocked area was grazed more heavily (8.6 DSE/ha/yr) in the 2nd year and still outperformed the rotational cells on a per head basis, in terms of animal liveweights, fat scores and wool cuts.

The intensity of grazing in the rotational cells led to a decline in favourable pasture species (puccinellia and tall wheat grass) and shorter pasture heights compared to the set stocked paddock. The low pasture heights meant that worms had a major effect on animal performance in the rotational cells.

Malcolm’s grazing trial demonstrates the need for rotational grazing systems to be finely tuned. Careful attention and a bit of trial and error is often needed to balance stocking rates and the number and size of cells for optimum production.

In late summer, tall wheat grass still provides green feed.

Nitrogen fertiliser trials

Malcolm applied a range of different types and rates of nitrogen fertiliser to established pasture plots in mid winter. He found little difference in pasture growth between the better performing treatments and therefore concluded that, “the cheapest form should be used, urea at 40 kg/ha.”

He found a reduced response to fertiliser in the higher salinity areas, and at very high salinities the fertiliser “made the plants look healthier but they did not produce much more feed.” Responses indicated spreading urea on sea barley grass country (where sea barley grass could grow but has been replaced by saltland pasture) was justified but spreading on poorer type country may not be economic.

Looking into the timing of fertiliser application on established pastures, all plots showed increased plant growth when the application coincided with warmer temperatures. Malcolm is keen to undertake future trial work looking into earlier application dates, to see if plants perform better if given the chance to increase leaf area prior to the onset of cooler temperatures and/or waterlogging (another factor that will greatly diminish responses to fertiliser). This thinking matches up with trials in the Upper South East that have consistently shown autumn/ winter applications (applied soon after the autumn break but well before waterlogging becomes a problem) have provided the best annual response for single fertiliser applications.

Integrated salinity management

Malcolm hasn’t just looked at his saltland to manage salinity issues. Non-wetting sandy rises have been treated with clay and mostly sown with either lucerne or serradella (a very acid-tolerant legume). This has boosted water use and production, while reducing recharge and erosion. Shallow surface drains have been put in on his salt-affected flats to minimise waterlogging.

Malcolm also wants to protect his surface water resources. To control saline baseflows discharging into his dams, Malcolm fences off a couple of hundred metres leading into the dam for planting with trees and shrubs. This has kept localised salt inputs down. A dam which registered 13,000 mg/L at the end of summer before planting now has a salinity of 8,500 mg/L at the same time of the year.

To boost water use (and biodiversity values) in high recharge areas, Malcolm has set up his own ute and trailer mounted direct seeder for planting trees and shrubs.

A non-wetting sandy rise treated with clay.

Malcolm’s ute and trailer mounted tree direct seeder.

Economics

For landholders considering establishing similar saltland pastures, some example economic figures are provided below. Example costs and benefits expected from pasture establishment (see Table 1) were fed into a profitability calculator (developed by PIRSA economist Graham Trengove).

In their undeveloped state, Malcolm’s salt-affected flats would be expected to support stocking rates of only 1.5 DSE/ha/yr, compared to 5-9 DSE/ha/yr following pasture establishment. Greater profits are expected if greater numbers of stock are grazed on the extra feed produced, rather than increasing production from existing animals.

The estimated pasture life (15 years) is conservative. Some puccinellia pastures in the Upper South East are at least 25 years old. For tall wheat grass the question is often 'how to get rid of poorly managed stands,' rather than 'how long will it last?' To prevent tall wheat grass becoming a weed issue, it is recommended that stands be well buffered from sensitive biodiversity areas and managed to prevent seed set. Studies from the Victoria indicate that production and feed quality are optimised if tall wheat grass pastures are kept below 20 cm in height.

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.

Table 1. Example costs and benefits for puccinellia and tall wheat grass establishment.

Pasture establishment		
Cultivation		$20/ha
Seed	Pucci (4 kg/ha x $4/kg) + tall wheat grass (8 kg/ha x $9/kg)	$88/ha
Fertiliser	Super (60 kg/ha x $300/t) + urea (40 kg/ha x $500/t)	$38/ha
Weed & pest control	Spray-top in spring prior to sowing plus knockdown at break of season; & RLEM control.	$20/ha
Other capital costs		
	Fencing & water (estimate only)	$50/ha
Annual maintenance costs		
Fertiliser	Urea (40 kg/ha x $500/t)	$20/ha
Other factors		
Previous grazing potential of the land		1.5 DSE/ha/yr
Period of grazing foregone during pasture establishment		1 yr
Grazing potential after development		5-9 DSE/ha/yr
Capital invested to purchase additional livestock (once off)		$45/DSE
Estimated life of the pasture		15 yr
Profitability of the livestock (annual gross margin)		$25-35/DSE

Table 2. Profitability estimates for puccinellia and tall wheat grass 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	*$85 / **9 yr	$189 / 6 yr	$293 / 5 yr
7	$343 / 4 yr	$510 / 3 yr	$676 / 3 yr
9	$601 / 3 yr	$830 / 2 yr	$1,060 / 2 yr

For example, assuming a gross margin of $25/DSE and a stocking rate of 7 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 around $343/ha. To start returning a profit the pasture needs to last at least 4 years.

Further benefits not taken into account in this analysis include:

- Better control of paddock use, freeing up the need for supplementary hay production on good cropping land.
- Less damage to cropping land because sheep can be taken off stubbles sooner and put onto the valuable summer-autumn feed in the saltland pasture.

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Acknowledgements: Bruce Munday, Clear Connections