# CASE STUDY

**of success with saltland pastures #2**

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

LandWater & Wool
Shaping the future
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another innovation
sustainable grazing on saline lands
productive and sustainable ways to use saltland

# RISING TO THE CHALLENGE

## Trevor Egel, Mt Charles, Coorong Districts

### The salinity issue

For Mt Charles farmer Trevor Egel, wife Janet and son Bradley, turning a profit from saltland is no sideline activity - it is a matter of survival. With ¾ of their 1600 ha sheep and cattle farm being salt-affected, it's just as well that Trevor has learnt a thing or two about managing saltland during his 40 plus years on the property.

Due to the nature of the landscape, the Egels are regularly confronted with challenges that would scare off the most determined of farmers. Their property is situated in a discharge zone atop a regional scale limestone aquifer. The groundwater is shallow; usually less than 1 m below the surface, while winter flooding brings the watertable above the surface. And in parts, the groundwater is saltier than the sea. For locals, wet years are often considered as 'drought years', considering the lost production that comes with up to 4 months of flooding. Of course they get proper droughts too, with the current year (2006) receiving well below average falls. In fact Trevor is looking at hand feeding his sheep earlier this year than ever before.

But Trevor knows that unpredictability is very much a part of this landscape. "You need to be very flexible. You need to be prepared to change your mind," are some of his mottos when it comes to planning farm activities. "Country can go from too dry to too wet, overnight," says Trevor, recalling occasions when rapid groundwater and surface water discharge has flooded large areas of *Gaymore*.

### Fast facts

| | |
|---|---|
| Farmer name | Trevor Egel |
| Farm location | *Gaymore*, Mt Charles, Coorong Districts |
| Enterprise mix | Sheep and cattle, seed harvesting |
| Saltland pastures | Puccinellia, clovers, lucerne, barley |
| Rainfall pattern | 450 mm average, winter dominant |
| Catchment clearing date(s) | mid 1950s to early 1970s |
| Salinity appearance | Saline interdunal flats, varying in severity between years and with surface elevation |
| Original vegetation | Melaleuca (tea tree, broom bush), samphire |
| Saltland soils | 1200 ha of sand over clay to heavy clays on interdunal flats |
| pH range (water) | 8-11 |
| EC(1:5) range | 0.3-3.5 dS/m |
| Depth to watertable | Usually within 1 m of surface (even after a sequence of dry years).<br>Above surface in wet years. |
| Motivations for taking action | Survival |

*Trevor in action during SGSL trial work at Mt Charles.*

Sometimes this flooding has occurred without a single drop of rain actually falling on the property.

Salinity was at its worst in the 1980s and 1990s; a time when Trevor was tempted to just walk off the land. A series of wet years in combination with the aphids (which decimated lucerne stands throughout the district) brought large rises in groundwater levels and frequent flooding. "Throughout the 1980s into the 1990s, 8 out of 10 years had flooding," recalls Trevor. "One of the years that it didn't flood we had the drought of '82."

Around 200 ha of the farm is naturally very highly saline, indicated by well established samphires and bare scalds, along with Melaleuca (paperbark) trees in some paddocks.

Around ¼ of the property is sandhill country, which Trevor doesn't rate very highly in terms of production. "We got 15-20 years of production from the sandhills before the organic matter largely disappeared. Now they're valuable in wet years, giving us somewhere to put the stock when the rest of the farm is under water."

*Due to losses in productivity, wet years are equivalent to 'drought' years at Mt Charles (1981 floods).*

### Making saltland work

It is the remaining interdunal flats that are the most productive and these areas provide the bulk of the income on the farm. This ground is all moderately to highly salt-affected, with the level of severity depending on seasonal conditions (influencing soil moisture and depth to watertable) and minor differences in surface elevation. And despite confronting regular obstacles, the Egels have found a production system for this ground that is sustainable. From an outsider's viewpoint, this has been achieved through the melding of a determined, 'never-say-die' attitude, intimate knowledge of their land and shrewd business sense.

With the benefit of 40 years of experience, Trevor has developed a successful approach to pasture establishment on the expansive salt-affected flats. This involves sowing a mix of pasture species, typically comprising of puccinellia, clovers, lucerne and barley. Pasture species then compete in the variable soil conditions, which change with seasons and surface elevation. Provided watertables are sufficiently low, the higher productivity lucerne and clovers will grow on the higher ground. On the lower ground (only tens of centimetres height difference) the salt-tolerant puccinellia dominates, providing useful feed where nothing else of value would grow.

*On the better ground, lucerne, clovers and volunteer pasture species outcompete the puccinellia.*

But the lucerne growing on *Gaymore* is no ordinary lucerne. Through Trevor's ongoing breeding program they have developed their own moderately salt-tolerant variety, nick-named 'Survivor' lucerne. According to Trevor, the breeding program is simple, "whatever survives is harvested and sown again." And it would come as a shock to many to see lucerne established on ground so close to zones where only puccinellia will grow. While it is moderately salt-tolerant, the harsh and changeable conditions mean that lucerne generally lasts only a few years. But Trevor's thoughts on lucerne are clear, "If you lose it, you plant it again. Lucerne is one of the best plants around."

The harvesting of seed, for resowing the following year, is undertaken for all the pasture plants in the mix. Besides enabling selection and improvement of the genetic material on the farm, this provides valuable cost savings compared to purchasing seed. In good years there is generally enough surplus, particularly in puccinellia seed, to sell through the district seed merchant. But when the pastures fail in bad years, not allowing enough seed to be harvested, Trevor buys seconds grade seed (for example burr medic that has been removed from other seed stocks). This keeps

*Lucerne establishes on slightly elevated, moderately saline ground (darker green patches in top photo) but puccinellia dominates the highly saline flats (bottom photo).*

costs down while keeping the prospects of saltland grazing alive.

Barley is a useful addition to the saltland pasture mix, being sown as a kind of 'cash crop.' It is not harvested, but instead provides grazing for the stock. This is cheaper than buying in grain for supplementary feed.

Because their saltland grazing system is relatively low input and high output, the Egels are willing to renovate their pastures more often. This also gives them the flexibility to cope with bad seasons that inevitably shorten the life of a pasture. Renovation comprises cultivation and over-sowing with the pasture mix. A couple of cultivations are often required to achieve the fine seed bed suited to puccinellia. This is easier on sandy soils but clays are harder to break up. The working up of the soil also seems to help alleviate the waterlogging and compaction that occurs with time particularly in the swampier areas. To improve seed-soil contact and moisture contact Trevor might often roll the sandier country, while not rolling the heavy country. But, "there are no set rules," and decisions will be made based on the particular seasonal conditions.

Normally the existing puccinellia plants will survive the cultivation, provided it is not a dry year. After the establishment phase of 12-18 months, the following 2-3 years generally provide good production. However Trevor has noticed that production generally drops off after this and his pastures are due for renovation on average every 5 years. Of course, in a bad year a pasture may only last 1 year. And under the conditions at *Gaymore* a long-lived pasture is thought lucky to last 10 years.

Trevor's successful production systems on saltland could be regarded as non-conventional. And this extends to his use of fertiliser, where he has found that conventional fertilisers do not perform as expected. Instead he has found success with a slow release natural mineral fertiliser, containing phosphorus, nitrogen and trace elements.

## The system

Trevor's saltland provides good sheep grazing country, being generally dust free and seed free. In an average year there is normally enough feed on the moderately salty ground to spell the really salty ground for later. Grazing is delayed on the saltier paddocks to shade the soil, preventing more salt from coming up, and also to retain feed for summer-autumn.

Generally a lot of country is also shut up for harvesting seed, after which the stock can get good grazing for a month or two. Handfeeding usually occurs in late summer-autumn to address nutritional shortfalls. But, as for any grazing enterprise, bad years will force greater levels of supplementary feeding.

A range of actions to manage the salinity and waterlogging problems on the farm have been undertaken over the last 40 years. Besides those already mentioned, these have included experimentation with a range of pasture species, clay spreading on the sandhills, fencing and management according to soil type, and construction of shallow surface

*These Mountain ducks were expecting lakes not puccinellia paddocks. A large variety of waterbirds gather to breed on the Egels' property during times of flood.*

water drains. While it hasn't been wet enough to flood the property since the drains have been completed, Trevor is interested to see how they will work. Puccinellia doesn't like being inundated for longer than 2-3 months as normally the water goes stagnant and deoxygenated after this period of time. Trevor wants to see if the puccinellia will survive long periods of inundation when the water is moving, providing more dissolved oxygen, rather than being stagnant.

*Surface water drains help alleviate flooding. Puccinellia dominates adjacent to the salt-scalded drain, while lucerne (dark green) can be seen on the slightly higher ground.*

With a highly permeable regional groundwater system beneath them, living with salt has been the only way to go on *Gaymore*. Deep groundwater drainage would in theory provide some relief, however the property is beyond the reach of the Upper South East drainage scheme. While initially supporting extension of 'the drain' into the Mt Charles district, Trevor is now happy to keep working his productive saltland.

## Leading edge research

With the aid of Land, Water and Wool's 'Sustainable grazing on saline lands' (SGSL) project, Trevor and a number of other landholders in the district have been conducting trial work to fine tune their saltland grazing systems. Trevor hosted a trial that has identified Vitamin B12 deficiencies (associated with low cobalt) in stock, and seasonal reductions in nutrient concentrations of dry puccinellia. As a result of this work appropriate supplements can be identified that will lead to productivity gains. The group found that spraying cobalt on pastures prior to grazing resulted in 4 kg/head weaning weights in merino lambs.

Another trial in the district looked at dry matter gains from different fertiliser applications to saltland pastures.

## Economics

For the Egels, success with saltland pastures is integral to farm sustainability. Their yearly activities are by necessity flexible, to match the changeable conditions on the property, but an underlying system is apparent. This involves: re-establishing pastures when conditions allow; sowing a mix of pasture species, each with their own niche, to maximise production across a changeable landscape; and wherever possible keeping costs to a minimum.

For landholders considering similar activities, some example economic figures are provided for one of the Egels' key saltland pasture systems. This is based on an average pasture life of five years and assumes the capacity to harvest and re-sow seed.

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.

*Despite a very dry year, groundwater remains less than a metre below the surface, as shown in this clay pit.*

*Table 1. Example costs and benefits for establishment of Trevor's 'saltland mix' (estimates only).*

| | | |
|---|---|---|
| **Pasture establishment* | | |
| Cultivation | | $30/ha |
| Seed | Puccinellia, balansa clover, 'Survivor' lucerne, barley (assumes seed costs are offset by self-harvesting and income from sale of surplus puccinellia seed) | $30/ha |
| Fertiliser | Natural mineral fertiliser (from 'Vicmill', containing P, N & trace elements), 100 kg/ha x $560/t = | $56/ha |
| Weed control | | $6/ha |
| Pest control | RLEM: 50 ml/ha x $25/L = | $1.25/ha |
| *Pasture maintenance* | | |
| Fertiliser | No maintenance fertiliser, due to short pasture life expectancy | |
| Water consumption | Stock water pumped from deeper confined aquifer. | $1/ha |
| Supplementary feeding | Hay and grain (for 3 months on average) | $5.60/DSE |
| *Other factors* | | |
| Previous grazing potential of the land | | 0.5 DSE/ha |
| Grazing potential after development | | 5-6 DSE/ha |
| Capital invested to purchase additional livestock (once off) | | $40/DSE |
| Estimated life of the pasture | | 5 yr |
| Profitability of the livestock (annual gross margin) | | $25-35/DSE |

*Table 4. Profitability of the 'saltland mix', based on a 5 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 |
| 4 | Not profitable over 5yr pasture life | $47 / 4 yr | $100 / 4 yr |
| 5 | $60 / 4 yr | $128 / 3 yr | $197 / 3 yr |
| 6 | $126 / 3 yr | $210 / 3 yr | $294 / 2 yr |

For example, assuming a gross margin of $30/DSE and a stocking rate of 5 DSE/ha (extra 4.5 DSE/ha) is maintained over the 5 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 $128/ha. To start returning a profit the pasture needs to last at least 3 years.

Because establishment costs are kept low, the minimum pasture life to break even (for the range of expected stocking rates) falls within the average life expectancy of the pasture mix. Bad years and runs of good years will cause variation about the average, but on balance the system is sustainable.

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