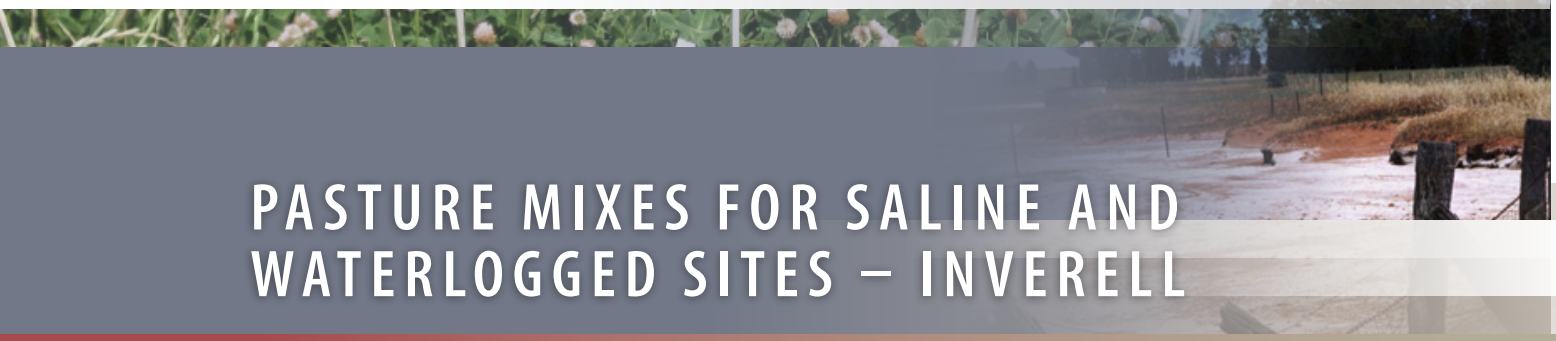

PASTURE MIXES FOR SALINE AND WATERLOGGED SITES – INVERELL

Case study – Inverell

FARMER: NEIL KAUTER, 'FOREST HILL', BANNOCKBURN, NEAR INVERELL, NSW

QUICK FACTS

Area of site: 5 ha

Soil type: Black basalt-derived clay

Soil salinity (EC_e): 1.4–21.4 dS/m in top 0–10 cm (highly variable)

Rainfall average: Approximately 740 mm

Enterprise mix: summer and winter cropping, sheep and cattle production

Soil pH (in $CaCl_2$): 5.4–7

The problem

The focus of the trial at Bannockburn was to increase community awareness of pasture management in saltland areas. Signs of salinity were observed in this landscape in the late 1960s. During this time, wheat yields declined and barley became the only suitable crop for production. Through the years, many attempts to revegetate the site had met with limited success until the establishment of this saltland pasture trial.

The saltland area occurs at the bottom end of a hill-slope, directly above a sealed road. Compaction created by this road may act as a constriction to surface and groundwater flows.

The discharge site is characterised by light to medium clay soil. Soil texture becomes progressively heavier towards the lower end of the landscape.

Groundwater comprises a combination of shallow aquifers and deep pressurised aquifers within fractured basalt rock.

The discharge site is also the result of groundwater moving along a contact zone between overlying fractured basalt and less porous underlying granite. This results in groundwater perching beneath the site, similar to a 'bath tub'.

Over time the site has suffered badly from sheet erosion. This has resulted in the loss of topsoil and the exposure of dispersive (sodic) soil layers.

Actions taken at the site

The site is over 5 ha in area and has a long history of cropping.

A line of salt-tolerant trees was planted directly above the site in the late 1980s in an attempt to intercept excess groundwater before it reached the saltland (discharge) area.

Lachlan Rowling

Before: *The Bannockburn site before establishment of the saltland pasture. Bare saline scalds are clearly visible and have remained so for many years.*

Luke Beange

Before: *Landholder Neil Kauter inspects the saltland area in June 2004 before the establishment of a salt-tolerant pasture. A mulch is about to be applied to the scalded, bare soil areas in an attempt to reduce the evaporative concentration of salt at the soil surface.*

Case study — Inverell

In 1991, monitoring bores were installed across the site to determine trends in groundwater movement and quality.

The pasture was sown (direct drilled) first in July 2004 with the following mix:

- Tall fescue (Quantum MaxP® at 10 kg/ha), chickory (Puna at 1 kg/ha), plantain (Tonic at 1 kg/ha), lucerne (Aurora at 0.5 kg/ha) and strawberry clover (Onward at 1 kg/ha). The legume component was lime pelleted and inoculated. No fertiliser was applied. This initial attempt to establish pasture failed.

On the second attempt the area was deep ripped before fertilising and then sown. Sowing was done in March 2005 during a dry autumn (but with rain expected) using the following mix:

- Tall wheatgrass (Dundas at 5 kg/ha) and paspalum (5 kg/ha)

In July 2006 during topdressing the following species were spread and then rolled:

- White clover (Haifa at 5 kg/ha), Namoi vetch (1.5 kg/ha) and tall wheatgrass (Dundas at 2.5 kg/ha and Tyrell at 8 kg/ha).

A few of the pasture species selected were not regarded as salt tolerant but were chosen to fill in some of the better, non-saline areas of the paddock.

Mulch was applied at the initial sowing of pasture and again at the second attempt, as well as following each topdressing of the site. The mulch was supplied by the landholder and consisted of forage sorghum stubble and native grass hay.

The area was topdressed in December 2005 and again in July 2006.

Granulock 15® fertiliser was applied at a rate of approximately 25 kg/ha at the second sowing and the first topdressing. This was expected to meet the nutrient requirements of nitrogen, phosphorus, potassium and sulfur across the site. The second sowing also included an application of organic-based fertiliser at a rate of 150 kg/ha.

Pasture establishment was more successful at the second attempt. This was probably due to deep ripping before sowing.

Sowing was completed by broadcasting seed through a super spreader and then rolling.

At the end of 2006 an irrigation system was set up. The aim was to irrigate the site during dry seasons with fresh groundwater pumped from a nearby aquifer. It was hoped that this process would leach salts down the soil profile and supply adequate moisture to the pasture.

The paddock was to be used as a rotational grazing block for a large flock of Merino ewes.

Results

Some pasture species performed better in certain areas than in others. This was a result of the high variability in salinity readings across the site. To account for this soil variation a 'shotgun mix' of saltland pasture species was chosen.

Tall wheatgrass and Rhodes grass tended to dominate the more saline areas. Tall fescue survived within the rip lines.

Lachlan Rowling

After: *The site in spring 2006. A corridor of salt-tolerant trees was planted above the site in the 1980s as an attempt to increase water use and reduce groundwater discharge within the lower landscape.*

Lachlan Rowling

After: *Saltland pasture in December 2006. Some species, including Rhodes grass and Melilotus, have naturalised across the site as a result of previous attempts to revegetate the area. Sowing a 'shotgun mix' of species has enabled some plants to find their own niches in suitable areas.*

Fencing was the first step and the key to the rehabilitation of this site. Fencing saltland areas as a separate entity helps to promote natural revegetation of sites by reducing grazing pressure.

Deep ripping assisted pasture establishment by providing a more favourable environment for plant germination. The presence of the rip lines helped to trap moisture and organic matter, forming protected niches in which seed could germinate.

Applying a mulch of forage sorghum and native grass stubble to scalded, bare areas greatly improved the growing conditions for pasture species. Mulch significantly reduced the evaporative concentration of salt at the soil surface and helped form a better seed bed for germination.

Tall fescue now dominates the low-lying, waterlogged areas of the paddock. It has also performed best where the soil was cultivated before sowing. This may have leached some of the salt from the surface and reduced competition from weed species.

Now that the pasture is established the area will be rotationally grazed using large numbers of stock for short periods of time. Crash-grazing will promote plant water use and ensure that the more palatable species are not lost as a result of selective grazing.

Conclusions from Industry & Investment NSW

This site has been subject to extensive soil erosion and salt mobilisation. Management strategies now focus on increasing ground cover and stabilising the soil.

The saltland pasture will now be managed as a productive green feed gap or drought reserve, making use of any excess surface and groundwater moisture.

Final comments from the landholder

I am very pleased with the results of the SGSL project. After many years and plenty of attempts to manage the salt scald it is great to now see a productive pasture stand. I have plans to make this one of the more productive areas of the farm.

Neil Kauter, 'Forest Hill'

Prepared by Lachlan Rowling, Advisory Officer, Industry & Investment NSW, Tamworth

Acknowledgments

NSW Salt Teams.

APPENDIX

Surface soil data (0–10 cm, late summer 2004)

Good patch[B]	Bad patch[B]	Bulk[A]
pH at surface ($CaCl_2$)		
6.1	6.7	6.8
Salinity, late summer (est. EC_e dS/m)		
1.4	21.4	8.8
Organic carbon %		
0.46	0.55	0.88
Sulfate sulfur (KCl) mg/kg		
38	42	36
Phosphorus (Colwell) mg/kg		
12	12	6.6
CEC meq/100 g		
34.5	45.5	39.4
Ca/Mg ratio		
0.48	1.0	0.71
Sodicity ESP %		
7.3	9.6	8.1
Soil texture		
MC	MC	MC

[A] *Samples used for measurements were taken from six holes (0–10 cm deep) made in locations with a range of salinity symptoms (visually assessed).*

[B] *Samples used for measurements were taken from one hole (0–10 cm deep) made in a location with no salinity symptoms and one in a location with extreme salinity symptoms (visually assessed).*

Notes:

CEC, cation exchange capacity

ESP, exchangeable sodium percentage

MC, medium clay

Salinity: Non-saline 0 to <1.5 dS/m; saline >1.5 dS/m.

Sodicity: Non-sodic, ESP <6%; sodic 6%–14%; strongly sodic >14%.

For further information, see the *Glove Box Guide to Salinity* (NSW DPI) for your part of NSW, on the page headed 'Soil testing for salinity and sodicity'.

Rainfall during trial (mm) (Average annual rainfall = 797 mm at Inverell)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	180	80	21	34	23	15	34	42	80	60	94	219	**881**
2005	82	39	35	3	12	143	21	27	84	60	93	108	**709**
2006	160	90	39	21	3	83	51	21	41	18	76	44	**647**

Case study – Inverell