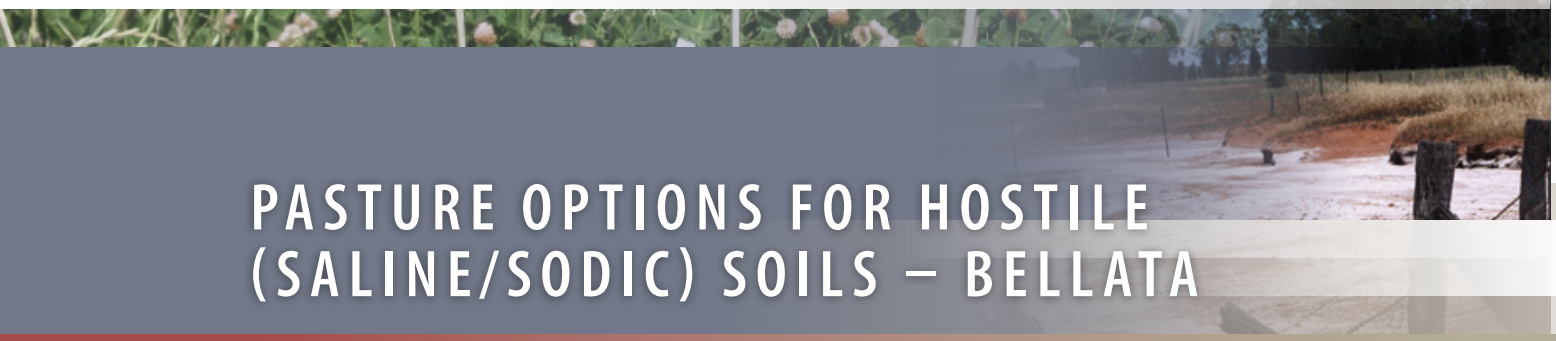


PASTURE OPTIONS FOR HOSTILE (SALINE/SODIC) SOILS – BELLATA

SUSTAINABLE GRAZING ON SALINE LANDS

Case study — Bellata

FARMER: GEOFF O'NEILL, EDGEROI, NEAR BELLATA, NSW
CONSULTANT: DREW PENBERTHY, PENAGCON, BELLATA

QUICK FACTS

Area of site: 45 ha

Soil type: alluvial grey cracking clay soil; low structural stability; variable high exchangeable sodium at surface and in subsoil; variable high chloride at surface and in subsoil

Rainfall average: about 620 mm.

Enterprise mix: summer and winter cropping, and cattle production

Salt profile (EC_e): Quite uniformly fresh in the top 0–10 cm (0.5 dS/m), getting saltier down the profile to 50 cm (4–11 dS/m), staying salty at 100 cm (4–21 dS/m) and still salty at 150 cm (4–11 dS/m)

Soil pH (water): 7–9.5

Watertable: unknown but expected to be quite deep

Pastures: tropical grasses with legumes

The problem

Large areas of the northern NSW alluvial plains are affected by subsoil constraints to crop and pasture production. The site in question is situated south-west of Bellata, between Narrabri and Moree. At the site, high soil chloride levels – along with surface crusting due to sodicity – have, in the past, severely limited production.

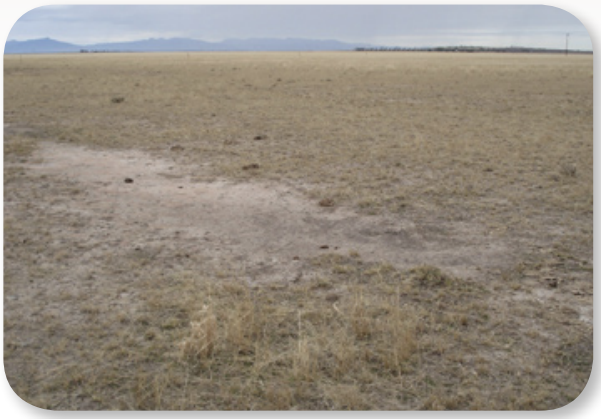
This trial at a property west of Edgeroi and near Bellata looked at finding a perennial pasture alternative for managing hostile subsoils and surface crusting. The site was chosen for the trial because it had been continuously grazed for many years at a constant stocking rate. This practice, in combination with high sodium levels and low organic matter, has led to poor soil structure. The country was therefore left with very little feed, which was also of limited quality. Infiltration rates were also low where moisture was restricted by the sealed ground surface. A large proportion of annual rainfall was lost to either run-off or evaporation.

The soil across the site is an alluvial grey clay. Inherent salinity is encountered across the site, and chloride salts affect the growth and productivity of vegetation. Previous attempts at cropping had been met with limited success on these soils. Elevated soil chloride levels are a natural feature of this landscape. The salinity is related to inherent salts stored in the soil rather than to a rising watertable.

Actions taken

The paddock was ripped in January 2003. The site was then trash-worked twice over the next 12 months, and the pasture was then spray fallowed. Gypsum was spread (2.5 t/ha) before permanent pasture was planted.

The first planting in April 2004 was a failure, because there was marginal moisture in the soil profile and extreme weather after planting (almost 3 months without significant rain). The block was therefore sprayed out and a chemical fallow was undertaken until replanting.



Lachlan Rowling

Before: *The original, unimproved native pasture was severely degraded because of continuous grazing and soil limitations such as surface sodicity and subsoil salinity.*

Lachlan Rowling

After: *The improved tropical grass stand, pictured after establishment in late 2005. Located in a summer-dominant rainfall zone, these pastures are ideally suited to converting warm-season rainfall into rapid and vigorous pasture growth.*

Case study — Bellata

The pastures were re-sown in mid October 2005, with good rains forecast for the following week. A banana precision planter and Gyral® planter with a small-seeds box were used. The mix was:

- 1.65 kg/ha Katambora Rhodes grass
- 1.1 kg/ha Bambatsi panic
- 1.1 kg/ha Gatton Panic
- 0.8 kg/ha lucerne
- 0.8 kg/ha burgundy bean/medic mix (snail/barrel).

In order to contrast with the results from the sown tropical pasture, an adjacent 45 ha block of naturalised pasture was used as a control treatment.

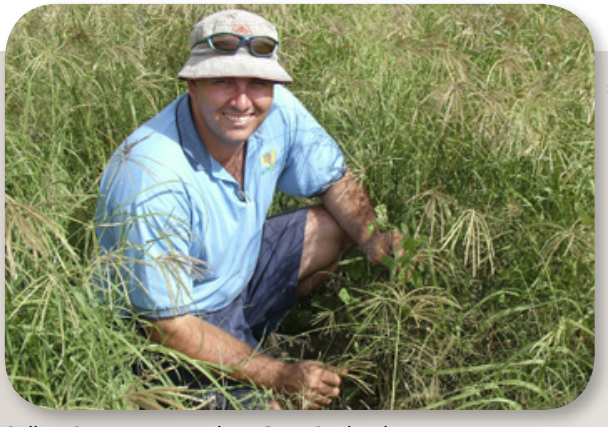
Results

(from Drew Penberthy)

When critical pasture dry matter thresholds were reached (in April 2006), the 45 ha of improved tropical grass pasture was divided into five 9 ha cells and grazed over a 17-day period by 173 cows with calves and 20 steers. This section of paddock yielded 1780 kg/ha dry matter. Ten kilograms ingested of this quality pasture is needed to produce 1 kg of beef.

Drew Penberthy

Comparing treatments. The original degraded naturalised pasture (control) is visible on the left of the fence line. The improved tropical grass pasture is visible on the right of the fence line. Rhodes grass has dominated this pasture.



Geoff O'Neill

Bellata Penagcon consultant Drew Penberthy prepares to assess the productivity of the tropical grass pasture at Llano. The highly productive pasture is dominated by Rhodes grass, Bambatsi panic and burgundy bean.

The 45 ha of degraded naturalised pasture was grazed in five 9 ha cells by the same amount of cattle, but the feed lasted only 6 days. This section of paddock yielded 605 kg/ha dry matter. However, ingestion of 14 kg of this quality pasture is needed to produce 1 kg of beef.

This improvement speaks for itself.

Conclusions from Industry & Investment NSW

In the northern cropping zone, permanent pastures may be a viable alternative to cropping on soils dominated by significant levels of chloride salts and soils that set hard because of sodicity.

Tropical grasses help improve the soil health of degraded paddocks. They contribute organic matter through high production, cycle soil nutrients via a deep fibrous root system, and provide excellent ground cover and litter. Tropical grasses form a favourable environment for other pasture and legume species to grow in. High loads of plant litter help to conserve soil moisture, buffer soil temperature extremes, and limit soil dispersion.

An initial application of gypsum (before sowing) proved beneficial in breaking up the surface crust and improving soil conditions for plant germination.

The establishment of tropical grass pastures is a major challenge, as they require plenty of moisture during germination and seedling growth. Try to plant when the soil moisture reserves are good and when warm-season rains are most likely to fall.

It is essential to include legume species in a tropical grass pasture mix. Legumes, including medics and clovers, will improve the value of the pasture and reduce reliance on fertiliser inputs.

The soil environment at this site quickly turned around in terms of moisture retention, increased organic matter and improved soil structure as a result of the permanent pasture.

Final comments from the landholder

Despite some hurdles with establishment, now that the tropical grass pasture was thriving Geoff could see the advantages in high production and the benefits of improved soil health and moisture retention.

It's a large open site with a heavy grey clay. These areas are like self-mulching concrete, and we have always struggled to get enough growth off the site …We hope this area is going to mean all round feed at a much higher productivity. Our cuts and our first grazing have shown it will be something like three or four times more productive than the original pasture. The success of this pasture has us now assessing the rest of the farm and what's been our traditional thinking there. *Geoff O'Neill*

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

Note: A video about this project can be viewed on the *Saltland Genie* website www.saltlandgenie.org.au/my-region/nsw.htm

Acknowledgments

NSW Salt Teams.

Lachlan Rowling

Geoff O'Neill and Drew Penberthy.

APPENDIX

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

Good patch[B]	Bad patch[B]	Bulk[A]
pH at surface ($CaCl_2$)		
5.9	6.1	5.8
Salinity, late summer (est. EC_e, dS/m)		
0.4	0.7	0.5
Organic carbon %		
0.51	0.59	0.72
Sulfate sulfur (KCl) mg/kg		
7.2	11	6.5
Phosphorus (Colwell) mg/kg		
10	12	7.8
CEC meq/100 g		
18.3	21.1	19.4
Ca/Mg ratio		
1.4	1.4	1.3
Sodicity, ESP %		
7.7	8.1	8.2
Soil texture		
MC	MC	MC

[A] *Samples used for measurements were taken from at least 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).*

Note that there is little variation across the site at the surface. Variation shows up more at depth, which is not unusual in parts of the western plains of NSW.

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 = 598 mm at Bellata Post Office)

	Jan	Feb	Mar	Apr	May	Jun
2004	166	101	52	57	12	7
2005	33	47	21	2	12	209
2006	64	110	21	28	0	49

	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	25	46	54	35	103	266	**924**
2005	16	21	59	64	88	52	**623**
2006	71	30	51	20	70	23	**537**

Case study — Bellata