Compressing history — many hands bring many experiences

Charlie and Penny Bruce's property, *Boonoonar*, was quite green thanks to summer rain when Bruce Munday visited in March. However it is the large expanses of salt-affected flats throughout the district that concern the Bruces and the salt-tolerant pastures that they believe should be better performing. It was this that prompted Charlie to help form the Kingston Salinity Group.

Charlie chose not to talk about his property but wanted to highlight the experiences of this SGSL Producer Network (PN) group.

"We have about 500 hectares of salt-affected land on *Boonoonar*, mainly on the flats where the water table is within about a metre of the surface. The salinity of the groundwater varies from 1200 to 5000 ppm as you travel from east to west on the flats.

This high saline groundwater presents us with two problems. Firstly the flats quickly become waterlogged in winter, severely retarding the growth of pasture. In October the salt really kicks in. As the soil moisture evaporates the salt concentrates in the topsoil which, combined with the capillary effect from the groundwater, makes a hostile environment for plants. This makes it difficult to grow legumes on the flats, other than limited medic and strawberry clover, and severely restricts the quality and quantity of pasture.

In due course we are expecting that a groundwater drain will pass through *Boonoonar*, relieving both the waterlogging and salinity problems of the property. However, there will always be areas of saltland that the drain cannot reach.

Currently our saline flats are mainly puccinellia and tall wheatgrass, but I am not convinced that we are always getting full value from these grasses.

The problems on our property are typical of many of the properties in this region, which is why nine of us formed the Kingston SGSL PN group in 2003.

Case study: Kingston Salinity Group
Location: Upper South East of South Australia
Mean annual rainfall: 525 mm
Soils: Grey loams over calcrete, sandy rises
Enterprises: Wool, prime lambs, cattle

Photo: B Munday

Charlie Bruce — wheatgrass and puccinellia pasture in March

Key points

- Growing conditions can vary significantly across the district
- Farmer participatory research addresses local problems under local conditions
- Good technical support adds value to the farmers' data

The team factor

As farmers we get about 30 seasonal opportunities in a lifetime to try new pastures or new management approaches. Working in a group we can explore different soil conditions and evaluate different management ideas and styles all in a single year.

In this region, it is difficult to carry enough stock during winter because the flats get so wet and boggy, but by the end of spring tall wheatgrass can have bolted and be so rank nothing will eat it. Managing this so a potential resource is not wasted was something we were keen to investigate.

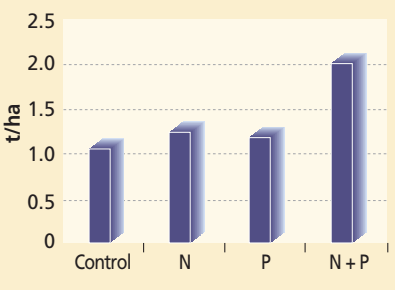
The other issue is that most of us are uncertain about the worth of adding fertiliser to what might be low value saltland pasture — what should you add, at what rate, and what are the benefits?

So, we wanted to see if we could use fertiliser and grazing management to make better use of these tall wheatgrass and puccinellia pastures.

We ran our fertiliser trials over three years in small plots on eight different properties within about 50 kilometres of Kingston. All but one of the sites showed a response to nitrogen and/or phosphorus. But more dramatic was usually the response to N and P combined, the average being an almost 100 per cent improvement during winter when feed is at a premium (Fig. 1a), provided the N is applied before the sites become waterlogged. We take this to show that it is very difficult to get a response to N when there is inadequate P.

We all knew there would be differences in soil properties from paddock to paddock and from property to property, but we were surprised to find just how strongly these seemed to influence pasture production and fertiliser response. Annual pasture cuts ranged from 3–12 t/ha, prompting us to

FIGURE 1a. Average fertiliser response (winter 05)

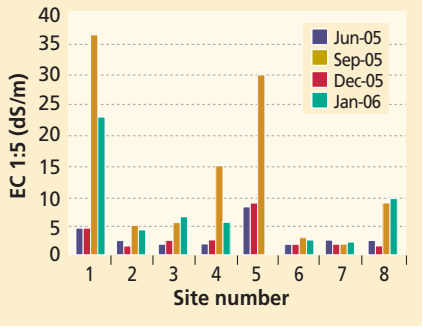


take a much more serious look at what might be causing this.

What all these soils seem to have in common is they are highly alkaline, generally with pH above 8.3. At this level, most are probably also sodic, although the saline conditions apparently offset the structural problems you usually see with sodicity. Where they differ significantly is in soil depth, ranging from 250 to 650 mm before reaching calcrete, and also in the level of salinity.

The salinity varies not only from site to site but quite dramatically from season to season, the top 100 mm being not particularly saline in winter and early spring, but increasing markedly in late spring (Fig 1b). The least saline sites supported a legume component in the pasture, and these, as expected, grew far more dry matter than the straight grass plots and showed least response to applied N.

FIGURE 1b. Soil salinity – top 10 cm



It was only when we sat down and looked at all of these factors that we could get some sense of how each contributed to the overall productivity of the sites.

It is one thing to grow a pasture, but will it grow an animal? The feed tests showed little difference between the fertiliser treatments but did show that by November the quality of the feed had deteriorated significantly. These results will all be presented in our final report on the project.

These trials showed us that while you can learn a lot of general principles from a single trial, no two sites are exactly the same and the differences can be very important in guiding decisions on how to manage a situation.

A real feature of this trial was that everyone in the group had the opportunity to take part in the planning and in the measurements and we all came together at the end for a barbeque and discussion of the results. We had excellent technical support from Glenn Bailey (Rural Solutions SA) who did a great job collating data and teaching us a lot more about the soil our pasture roots grow in."

Photo: C Bruce

The Kingston group taking seasonal pasture cuts

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The science behind the story

By Andy Craig

The Kingston Group's research highlights the importance of testing our more general knowledge of pastures against local conditions.

Research by the CRC Salinity at Mt Charles in the Upper South East of SA has shown that large variations in soil salinity occur even within a paddock. Variations in topsoil salinity of up to ten-fold have frequently been measured within only a few metres with quite dramatic impacts on pasture growth and survival.

Legumes are generally the driving force behind productive and nutritious pastures, providing much needed nitrogen to the grass component of pastures. But because they are generally more salt sensitive, it is a significant challenge to find a legume that is well adapted to these conditions.

Balansa clover is the 'benchmark' pasture legume for saline environments. It is often referred to as salt-tolerant, but our studies show it is only tolerant of low levels of salinity, with its most significant virtue being its excellent waterlogging tolerance.

Research has shown that high levels of salinity inhibit both the germination of balansa clover in autumn and seed set in spring so the species often dies out of a pasture within a year or two.

An early flowering variety such as Frontier can partially overcome this by setting seed before salinity reaches too high a level during spring.

Our research at Mt Charles has shown that Scimitar burr medic is actually more salt tolerant than balansa and might prove to be a useful option on some of the better-drained salt-affected land, however other possibilities are also being explored.

The on-farm research conducted by the CRC Salinity has enabled my research team to obtain an excellent understanding of how salinity impacts on pasture plants in the 'real world'. This knowledge allows us to select the right plants with the necessary attributes to succeed in these tough environments.

Further research into a number of new species of *Melilotus* by the CRC Salinity (Focus on Salt #35) is showing considerable progress.

• *Andy Craig is a Senior Research Scientist with SARDI and leads the South Australian component of the CRC Salinity's* National Field Evaluation *project.*

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