Dryland Salinity Management

Recommendations 2019

Information adapted from Coorong & Districts Soil Conservation Board,
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This section discusses the accepted best land management practices over the last several decades to reduce recharge, address dryland salinity, and establish salt tolerant plants. All of these practices are still very relevant.

The management of dryland salinity can be divided into two sections
1) Attacking the cause
2) Treating the effects

Attacking the cause of dryland salinity

The main management strategy is attacking the causes of salinity is to make better use of water where it falls, in order to prevent this water from entering the groundwater system (as recharge).

This was confirmed in research undertaken by CSIRO Land and Water over the 1990's and early 2000's. The relationship was modeled between different crops and pastures and the "water balance" on a farm, presenting a breakthrough in the management of dryland salinity. The research confirmed that growing lucerne for a minimum of two years in rotation with other crops had a measurable effect in combating salinity. The researchers used huge underground "flower pots", called lysimeters, to accurately measure plant water use.

Lysimeters are steel containers 2 metres deep and 1.6 metres square, sitting on scales and were buried in the middle of the test farms. The researchers measured the weight of the container at various times to calculate the amount of water falling on and being used by the crops.

They found that planting lucerne in rotation with canola, wheat and triticale crops used more water, as did native vegetation. The study also found that other options for minimising salinity includes developing crop varieties that use more water during the growing season, and introducing companion crops into the farming system. http://www.abc.net.au/science/articles/2001/08/14/345557.htm

The recommended strategies to achieve this are:

1. **Establish Perennial Pastures**

- Perennial pastures have the advantage of being able to respond quickly to rain whenever it falls. They are also often able to make use of spring and summer rains, where annuals cannot. The deep rooted systems of perennials are able to then use more water from deep in the profile for longer periods during the year. Deep rooted perennial pastures can use up to double the water used by annual plants.
- Lucerne is a deep rooted, summer active, high water using perennial species which has productive and economic value when grown on recharge areas.

2. **Consider higher water use or longer season cropping alternatives**

A key recommendation of this report will be to improve our local understanding of cropping alternatives to improve plant water use under cropping rotations. Options that could be more carefully analysed include;

- Pasture Cropping, use of cover crops over Lucerne, use of Lucerne in cropping rotations,
- Increased use of summer crops such as Sorghum and Millett,

- Long season cereal varieties,
- Cereal varieties that use more water.

3. **Increase crop and pasture water use**

- Increase the health and productivity of crops and pastures so they are growing at their optimum production levels ensures that they are using the maximum amount of water.

4. **Improve soil health by identifying soil constraints and ameliorating them. This improves the capacity of healthy plants to use rainfall where it falls.**

- Treating non wetting sands with clay spreading and spading
- Treating soil acidity through spreading lime
- Improving soil fertility through targeted application of nutrients, trace elements, or biological treatments
- Treatment of hard pans, or nutrient poor layers in the soil through ripping, Yeomans Plough or other mechanical techniques

5. **Establish trees and shrubs**

- Trees (particularly eucalypts) and shrubs have an annual evaporation rate of up to seven times that of surrounding annual pastures. This is due to the evergreen canopy, large leaf area and the fact that they may have their roots directly into the groundwater. Annual crops and pastures lack these features.
- The density of trees and/or shrubs required to minimise groundwater recharge will depend on species, age and health of trees, climate, soil and position in the landscape.
- There are a number of ways that trees and shrubs can be incorporated viably into farming systems.
- Farm Forestry is a productive option to reduce recharge, provide stock shelter, valuable windbreak and have the potential for an economic return when harvested.

6. **Fodder Shrubs**

- Fodder shrubs such as saltbush or tagasaste are also productive options that reduce recharge, provide shelter as well as being valuable stock feed, particularly in times of drought.
- Perennial forage plantings that include native shrubs can extend ground cover to consolidate fragile, easily eroded soils. The use of forage shrubs for many livestock producers coupled with unfamiliarity of their advantages and short comings can limit the productivity of these plants, their effective use by grazing livestock and their contribution to soil protection. Skilled management of these plants and grazing livestock can buffer feed shortages and protect the environment
- Experimental work carried out by the CSIRO in the Cooke Plains region demonstrated that these strategies need to be carried out over a large scale to be effective. A reduction in recharge of at least 50% and preferably 90% is needed over thousands of hectares
  http://www.coorong.sa.gov.au/foddershrubs

Treating the effects of dryland salinity

The second approach to the dryland salinity problem is to tackle directly the salt affected soils that result from rising water tables. Following are some strategies for rehabilitating, or at least preventing the spread of these salt affected areas.

1. **Understand your Soil**

- How saline is your soil? Ensure that your soil is tested. This is the first step to understanding what your options are.

2. **Management of Cropping Land** (land with low to moderate salinity)

- Use salt tolerant crops such as barley or canola.
- Sow salt tolerant pasture cultivars, e.g. Balansa Clover or Puccinellia.

- Grow high yielding crops and pastures to maximise plant water use.
- Aim to overcome other limiting factors ie. low fertility, disease control, weed control and seed bed preparation.
- Maintain crop and pasture residues to ensure the soil surface is covered at all times.
- Stay abreast of developments in salt tolerant cereal alternatives.

3. Management Strategies for Saline Land (land which is too saline for broad acre crops)

Salt Tolerant Pastures

- Fence off to enable the control of grazing pressure. Where possible keep this separate from annual crop and pasture land.
- Establish salt tolerant perennial pastures e.g. Puccinellia, Tall Wheat Grass, Saltbush, salt tolerant legumes.
- Encourage and maintain surface cover at all times to reduce evaporation and prevent salt from concentrating at the soil surface.
- Graze perennial pastures in Spring and Autumn and allow them to set seed on a regular basis to maintain stand density.

Left:

Second year Puccinellia & Messina pasture on moderately saline ground at Meningie East

Right:

Direct Seeded Native Revegetation

Revegetation

Establish salt tolerant native trees and shrubs around the edge of salt affected sites to increase water use and halt or slow down the rate of spread.

Bare Patches

- Rip area with single tyne ripper to roughen up the soil to promote the leaching of salt.
- Where possible, cover any bare patches with hay, straw, or similar material to;
  - Reduce salt concentration at the surface due to evaporation,
  - Encourage natural regeneration,
  - Reduce risk of topsoil loss.

On Farm Desalination

High SA Water mains prices are a challenge in the project area for livestock producers wholly dependent on mains water for stock. On Farm Desalination Plants are becoming more common in the project area. If technology becomes available to desalinate high salinity water economically on a small scale. It would be interesting to test if this could provide a localised draw down effect on the unconfined aquifer.

Factoring in rainfall and climatic variability

Consideration must be given to variability in rainfall and climate. Success of the plant based options discussed above is based on the assumption that there will be sufficient growing season rainfall, and in the case of summer based perennial pastures, at least some rainfall over the spring and summer.

Long dry periods such as the millennium drought, 2015-16 drought, and 2018-19 drought would have significantly impaired the health, vigour, density and water use potential of perennial pastures on both saline and non saline land. In particular the summer active perennial pasture base that prevails in this region of dryland lucerne, perennial veldt grass and primrose. When rainfall did return after these dry periods, these pastures would have not been in optimum condition to 'use the rain where it fell', and hence reduce recharge to groundwater.

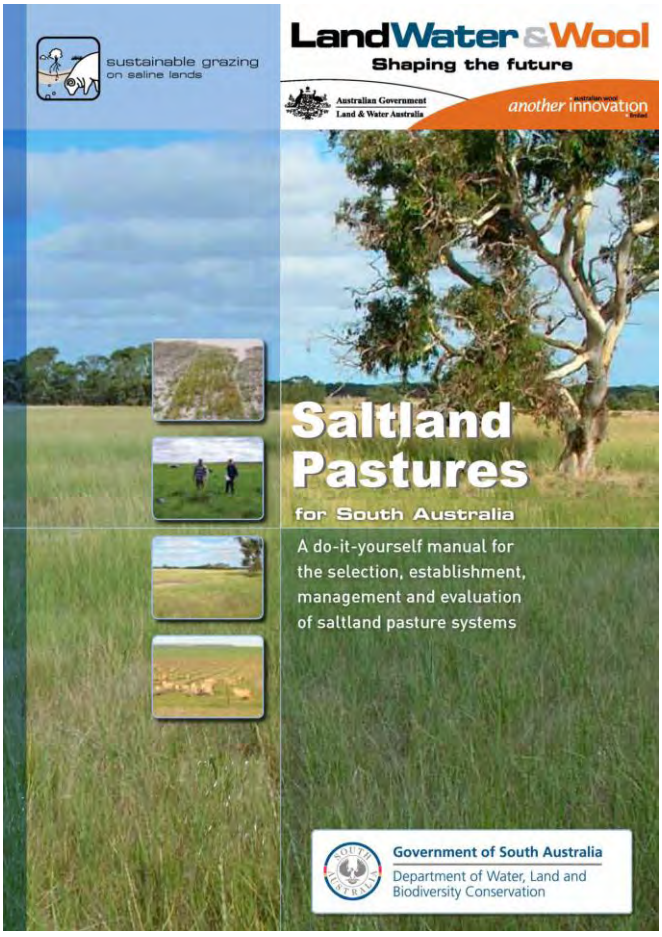
Dryland Salinity Management Resources

Over the 1980's through to the early 2000's there was a wealth of salinity management resources produced on; soil and water testing, perennial pastures, saltbush, and more.

Links to many of these resources that are relevant to this region have been compiled at;
www.coorong.sa.gov.au/salinity
www.coorong.sa.gov.au/saltlandpastures

Recent findings from the Saltland Pasture Redemption Project can be accessed at www.coorong.sa.gov.au/saltlandredemption A focus of this project has included exploring how the salt tolerant legume Neptune Messina grows in local conditions.

An excellent resource that is is still extremely relevant is the 'Saltland Pastures for South Australia Manual'. A summary of the contents of this document can be found at **Appendix 6**, or at http://www.coorong.sa.gov.au/webdata/resources/files/salt-land-pastures-SA-manual_%20(2).pdf



Current Projects

Information on the **Saltland Pasture Redemption Projects** can be accessed at www.coorong.sa.gov.au/saltlandredemption A focus of this project has included exploring how the salt tolerant legume Neptune Messina grows in local Coorong District conditions, and use of mulching to reduce evapo-concentration of salts at the soil surface.

A series of **Mallee Seeps Projects** have and are being delivered in the Mallee to better understand this landscape phenomena. More information and access to Mallee Seeps resources can be found at https://www.naturalresources.sa.gov.au/samurraydarlingbasin/land-and-farming/soils/mallee-seeps

Coorong Tatiara Local Action Plan will be delivering a National Landcare Program 2 project developing new dryland salinity resources for land managers over 2019-2021.