CONTENTS

Neptune messina

An annual pasture legume for saline and waterlogging prone soils

Key features

- Higher combined tolerance to salinity and waterlogging than all other current pasture legumes.
- Best suited to winter-wet saltland areas of southern Australia with ≥ 375 mm annual rainfall and soil pH($CaCl_2$) ≥ 5.5.
- Recommended for grazing in combination with other pasture species.
- Supplies nitrogen to N-deficient soils, provided it is inoculated with a specially developed salt-tolerant messina rhizobia.

Neptune three years after sowing on a saline valley floor at Woodanilling, WA.

Plant description and soil requirements

- Messina *(Melilotus siculus)* is native to the Mediterranean basin. It was identified in trials by DAFWA and SARDI as the only pasture legume tested able to persist on highly saline, waterlogged soils and Neptune was subsequently selected as the most productive and persistent messina variety.
- Neptune is an aerial-seeding annual legume that grows up to 0.8 m tall.
- Neptune is adapted to winter waterlogged areas where summer-early autumn topsoil (0–10 cm) salinity levels are 8–30 dS/m ECe (moderate-high salinity).
- Neptune requires soil pH($CaCl_2$) ≥ 5.5 or pH(water) ≥ 6.0, which is important as messina nodulation is sensitive to soil acidity (liming may be required).
- Neptune is suited to a range of soil textures from sands to heavy clays.

(a) Leaf, showing typical early season red-orange flecking
(b) Flowers (c) Developing pods (d) Mature pods and seed

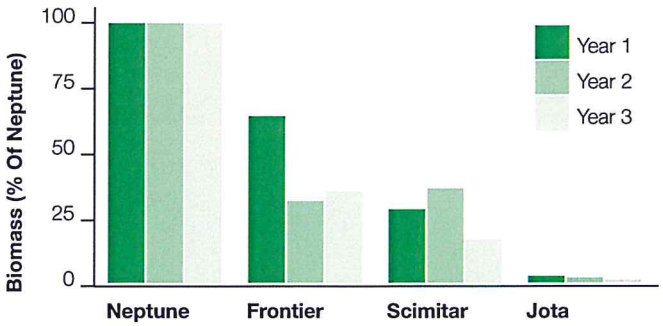
Neptune messina

Dormancy and maturity

- Neptune is moderately hard-seeded. A study in South Perth WA in 2010-11 found 26% of Neptune seeds remained hard in June, compared to only 6% for Frontier balansa clover. This provides a reserve seed source for germination in future years and results in staggered germination to cope with fluctuating salt levels and avoiding false breaks
- Neptune starts flowering around 98 days in Perth (WA) and 121 days in Keith (SA) from an early June sowing, 3-5 days later than Frontier balansa clover.

Biomass production

Neptune messina produced considerably more biomass than Frontier balansa clover, Scimitar burr medic and Jota white melilot at five saline, waterlogged trial sites in WA and SA in 2010 and 2011.

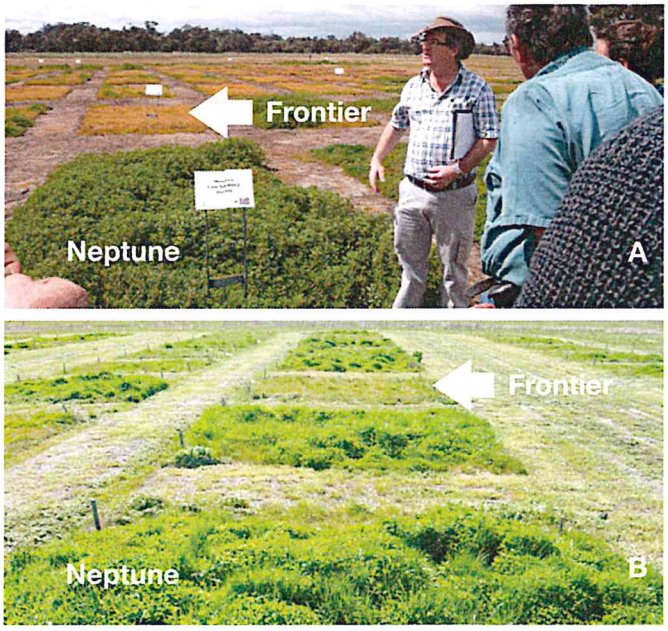


Mean biomass production of Neptune messina, Frontier balansa clover, Scimitar burr medic and Jota white melilot (as a percent of Neptune) over three years at the three most saline sites (Darkan and Tambellup, WA and Keith, SA).

Grazing value

Neptune messina has similar digestibility and protein levels to balansa and subterranean clovers, has no known chemicals that pose a threat to livestock health and produces meat acceptable to consumers.

Grazing trials with crossbred ewe lambs and crossbred ewe hoggets in Kybybolite SA in 2015 and 2016 showed Neptune tended to be less palatable than subterranean clover. This suggests liveweight gains may be limited if Neptune messina is the sole feed source, but weight should be maintained. Neptune appears to be grazed more readily when other species are also present in the paddock and it is, therefore, recommended for use in mixed pastures for livestock production.



Plots of Neptune messina and Frontier balansa clover three years after sowing: (a) Darkan (WA) showing Frontier plot dominated by button weed (Cotula sp.); (b) Keith (SA) with very low Frontier density.

Neptune messina

Sowing recommendations

Seed inoculation and dressing

- Neptune messina will be grown on soils unlikely to contain any suitable rhizobia and must be inoculated with the special salt-tolerant messina Rhizobium (strain SRDI554). Other strains of rhizobia will not survive over the summer in the saline soil.
- Seed should be inoculated with a peat slurry, lime pelleted and sown promptly (ideally within 24 hrs) after inoculation.
- Apron fungicide (metalaxyl) has been used in research trials to prevent damage from Pythium and Phytophthora root rots in wet soils. It should be applied to seed before inoculation with rhizobia.

Sowing

- Sow into moist soil in autumn or early winter.
- Ideal timing is to delay sowing until early rains have flushed salts from the surface, but before waterlogging occurs.
- Recommended sowing rate is 10 kg/ha.
- Sowing depth should be 10-15 mm deep, similar to subterranean clover (which has a similar seed size).
- Sow into a well prepared seed bed following good weed control.
- Apply adequate rates of fertiliser to ensure phosphorous, potassium and other trace elements do not limit production.

(a) Sheep grazing Neptune at Kybybolite, SA; (b) Saltland pasture mix of messina, balansa clover, burr medic, puccinellia and old man saltbush.

Other species

Saltland environments are highly heterogeneous for salinity and waterlogging potential. Species mixtures are recommended to enable different plants to colonise parts of the landscape where messina is less suited and to provide a more balanced feed intake. Neptune can be mixed with other pasture legumes, including balansa clover and burr medic and with the perennial grass, puccinellia. It can also be sown as an understorey species with saltbushes.

Neptune messina

Weed control

The paddock should be weed free prior to sowing. No chemicals are currently registered for use on messina and herbicide testing has been limited.

The grass selective herbicides Verdict, Select and Factor (Group A) used on other pasture legumes appear to be safe. Treflan applied pre-sowing at 1.4 L/ha and incorporated appears to be safe, although some damage has been measured at higher label rates. Post-emergent broadleaf weed control options used successfully in field trials include 25 g/ha of Broadstrike (plus label rate of uptake oil) and 50g/ha of Spinnaker at the 3-8 trifoliate leaf stages. Dual gold and Igran (at low label rate) have also been used safely on messina.

MCPA, Raptor and Simazine have caused significant damage to messina. Messina is very sensitive to the SU herbicide chlorsulfuron (Glean). Growers should avoid paddocks where SU herbicides have recently been used and strictly observe plant back periods on soils where residues persist.

Growers should observe cautions regarding the application of herbicides to waterlogged soils.

Pests and diseases

Messina should be monitored for redlegged earth mites and aphids during emergence and later in the season and controlled as required. Neptune has some susceptibility to powdery mildew.

Breeding and selection

Neptune messina was developed by DAFWA and SARDI as part of the Future Farm Industries Cooperative Research Centre. It is derived from accession SA40002, collected from the wild in Israel.

Seed enquiries

Neptune messina is marketed under the Dyna-Gro Seed brand. For seed enquiries contact Seednet personnel.

Seednet

WA
David Clegg
0408 630 641
david.clegg@seednet.com.au

SA, VIC & NSW
Rob Christie
0427 340 608
robert.christie@seednet.com.au

Technical information
Chris Walsh
0417 891 546
chris.walsh@seednet.com.au

Dyna-Gro Seed logistics
enquiries@dyna-groseed.com.au

Technical information

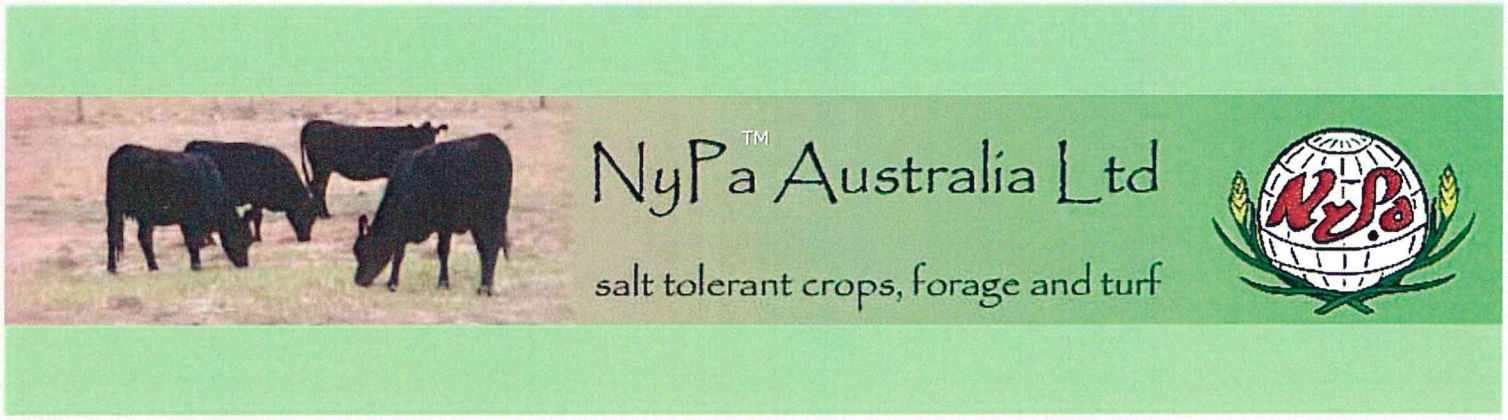
Department of Agriculture and Food

Dr Phillip Nichols
DAFWA, 3 Baron-Hay Court. South Perth WA 6151
(08) 9368 3547, 0418 955 943
phil.nichols@agric.wa.gov.au

Government of South Australia
Primary Industries and Regions SA

SARDI SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

Amanda Pearce
SARDI, Struan Research Centre,
PO Box 618, Naracoorte, SA 5271
(08) 8762 9105
Amanda.Pearce@sa.gov.au



NyPa tm Forage

What is NyPa TM Forage?

NyPa Forage (Distichlis spicata var. yensen-4a) is a perennial salt loving forage grass that is the result of 20 years of selections from the native American grass. NyPa Forage has been granted protection under the Australian PBR system (Plant Breeders' Right Act 1994) Reference 2004/122 Yensen 4A and was granted a Plant Patent in the US (patent number 8,999 29 Nov 1994) It has also been granted plant breeders rights in the EU (Decision No. 10059/2002). It was selected for its forage like qualities of larger leaf size, softer growth, palatability and tolerance to high salt concentrations. Although it is been selected from the native American grass, NyPa Forage is a male clonal plant, and spreads only by vegetative means, which significantly reduces the chances of this grass becoming a weed by limiting its method of spread. Water logging is also not an issue with NyPa Forage due to specialised tissue running the length of the root system, which allows oxygen from the leaves to be transported down to the roots, allowing them to grow in waterlogged conditions, the same mechanism which allows rice to grow in waterlogged conditions. Being a C4 grass, it is most active during the warmer months of the year. It has a deep roots system, that has been traced down to 1.5m, which allows it to access the watertable. Currently NyPa Forage is being utilized in Victoria, South Australia and Western Australia and in Spain and SW USA.

What are the benefits of NyPa Forage?

1. Produces palatable green forage on saline discharge sites throughout the summer months
2. Helps stabilize the soil, helping to prevent further degradation such as erosion and salt spread.
3. Has been shown to improve the soil chemical and physical properties including through the bio-sequestration of carbon (see environmental and productivity pages)

How do you plant it?

As NyPa Forage is a male plant, it can only be established vegetatively. Currently there are two techniques used, which are:

Harvesting bare rooted tillers from the field, and then directly planting these into your location. This is currently the cheapest method of planting, however also takes the longest for the plants to establish.

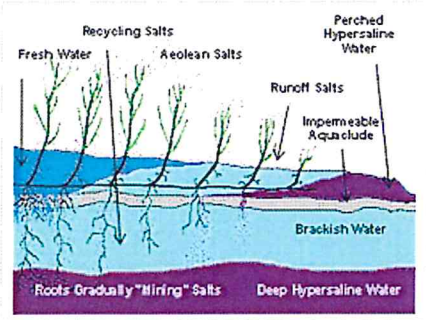
Tube stock can also be used to establish NyPa Forage. Tube stock are grown out at nurseries and contain an established root system, which enables faster and more reliable establishment. These are a similar size to trees that may also be planted from tubes.

6

How do you manage it?

It is best grazed as a pasture, although will survive in very hostile circumstances it performs best with good plant nutrition and a long rotation grazing regime (three grazings a year (also see productivity page)

Environmental Benefits



Yensen N.P 2003

The NyPa plants have an exceptional capacity to move salt out of the water they take up in respiration, this is due to its deep root structure and it's very efficient salt gland. This diagram illustrates the different potential fates of this salt, It either falls to the ground and is washed away or back into the aquifer or is blown away. (reported in Leake et al 2002,2016)[1]
Leake J E The role of *NyPa Distichlis spp.* cultivars in altering groundwater & soil conditions – a work in progress. Salinity Seminar. Hydrological Society of South Australia, Australian Geo-mechanics Society, South Australian Chapter, and International Association of Hydrogeologists, Australian National Chapter, North Adelaide, 14 July 2003

This is a photo of the NyPa Forage salt gland in action, the characteristic fine salt 'whiskers' finer than a human hair are shown exuding from the leaf salt glands. In humid conditions these crystallize and drop off onto the ground. In dry air conditions hypothetically they blow away to rejoin the atmosphere where much salt comes from according to Teakle (reported in Leake 2002) Photo taken by Mark Sargeant in the laboratories at La Trobe University in Victoria

This photo shows the action of the roots penetrating to the saline water table, improving soil structure and drainage and soil carbon through the *Rhizocanicular* effect, as described by Yensen (reported in Leake 2002,2016)[1] Photo taken at Wickepin Western Australia by Raymond Matthews.

The effect of these processes can be seen in this picture where salt has been taken up from the saline aquifer, exuded through the NyPa leaves and dropped on the ground where rain is washing the salt away. Photo taken at Wickepin Western Australia by Raymond Matthews

Of note in connection with the plant's capacity to rehabilitate degraded land is its capacity to tolerate and move heavy metal salts thought its leaves.

Angas cattle grazing NyPa forage growing on a salt scald near Meningie South Australia, producing Coorong Angas Beef (reg Trade Mark). Grazing is the best method of utilizing the NyPa Forage and correctly managed it produce a good ration sufficient for non lactating animals. It is notable that the grass does not hold salt in it's tissue, unlike most halophytes.

The management requirements to achieve good levels of animal nutrition have been measured for both irrigated and dry land situations;

irrigated with saline effluent from land base aquaculture at 15,000 ppm, fertilized and cropped every 42 days provided animal feed of 31.4 kg/ha dry matter per day with 16.7% crude protein, 67.6 dry matter digestibility and 9.5 mJ/kg, metabolisable energy (ME). These are laboratory figures (Lymbery A. 2009 Murdoch University)[1]

- in dry land circumstances similar crude protein and energy levels are achieved with high nitrogen and phosphorus regimes and grazing three times a year. These improvements are attributed to larger leaf area, and higher leaf-to-stem ratios due to adequate fertilizer (Sargeant 2009 LaTrobe University).[2]

COOMANDOOK SALTLAND REDEMPTION PROJECT – 2018 UPDATE

AN INITIATIVE OF THE COOMANDOOK AG BUREAU AND THE COORONG TATIARA LAP

Project Summary

The Coomandook Saltland Redemption project was initiated by the Coomandook Ag Bureau to investigate the application of new developments in the productive use of saline land across Coomandook / Cooke Plains area. This included testing the suitability of new salt tolerant legume species Messina and complimentary salt tolerant pastures in broadacre farming systems. After consultation, and as a result of the dryland salinity information sessions held across the Coorong District Council area in 2016, it was decided to establish an additional site in the Meningie East area.

Key issues that farmers wanted to investigate were:

1. Does Messina grow in the environment?
2. Can it be productive either as a stand alone species or as part of a pasture mix?

Project Activities

To address these issues, three farmer demonstration sites were established during the 2017-18 season at Cooke Plains, Coomandook and Meningie East. These sites were sown down with Messina – either in mixes with other potential salt tolerant pastures or as a stand-alone species to assess the potential for Messina across not only saline areas, but in the gradational areas surrounding saline areas. All sites were sprayed out prior to sowing and then sown with inoculated Messina plus or minus other companion species.

A replicated trial site was also established at Cooke Plains (in collaboration with SARDI) to look at the seeing rates for Messina in a low rainfall environment, and the impact of fungicide seed treatments (Apron SD™) on establishment and nodulation of Messina.

The results in 2017 were highly variable with the limitations of Messina as a curative plant on salt scalds being observed. 2018 plans were reviewed based on results in collaboration with growers and sites were either resown or left to regenerate.

PROJECT DETAILS

Project ID: 1268C

Funding Body

This project is supported by the South Australian Murray-Darling Basin Natural Resources Management Board, the South East Natural Resources Management Board, The Coorong Tatiara Local Action Plan and the Coomandook Agricultural Bureau through funding from the NRM Levies and the Australian Government's National Landcare Programme.

Project Duration

2017-2019

Site Locations

- Cooke Plains (K & R Roberts)
- Coomandook (Hansen Farms)
- Coomandook (Simmons)
- Meningie East (S.Williss)

Australian Government | National Landcare Programme

Government of South Australia | Natural Resources SA Murray-Darling Basin | Natural Resources South East

Coorong

Agricultural Bureau of South Australia Inc. PATHWAY TO IMPROVEMENT

September 15, 2018 Report prepared by Felicity Turner on behalf of the CTLAP

In 2018, the same sites were utilized, with areas either being resown or being left to see what levels of plants regenerated (Table 1).

There was also a shift in focus by the steering committee from looking solely at the remediation of saline scald areas to try and pro-actively identify areas that were potential areas where salt may occur. Unfortunately, this was 12 months too late, with large areas being lost to salt scalds over the summer period and further areas of dryland salinity observed in crops in 2018.

Digital Elevation Modelling (DEM) has been captured for the region, and it is hoped that this may be combined with the Piezometer data and farmer knowledge to see how the relationship in elevation and groundwater depth varies across the region, and to also see if this correlates with areas in which 'new' areas of dryland salinity has been observed in 2018.

Historical EM38 data has also been utilized as part of the monitoring / soil testing process on paddocks that were surveyed 8-10 years ago.

Site Location	2018 Activities
Cooke Plains	Mulching to provide a micro-climate for Messina establishment Various pasture mixes Use of various liquid fertilisers to try and increase establishment levels
Coomandook (Hansen Farms)	Regeneration observed and monitored from 2017; some areas resown
Coomandook (Simmons)	Regeneration observed and monitored (from initial planting in 2016)
Meningie East	Regeneration of Messina and Puccinellia observed

Table 1. Site Activities for 2018

Preliminary Findings 2018

Meningie East

The site has been monitored every 60 days since the opening rains in early May.

Initial observations showed regeneration occurring, however the germination and early vigour observed at Williss' site wasn't as good as at the sites where sheep had been grazing (Fig.1-2).

Fig 1. Initial germination, Hansen's (31st May 2018)

Fig 2. Initial germination, Williss' (31st May 2018)

Later observations showed good plant establishment across the majority of the site with good groundcover from either Messina or from other plants – including tall wheat grass that had regenerated and some puccinellia (Fig 3).

Fig 3. Regeneration at Williss' (September 13th 2018)

Going forward, Messina looks like an option for areas that become wet and underwater due to rising groundwater levels. It is limited in its ability to colonise highly saline areas, and so a soil test should always be undertaken to ensure that Messina is suitable to plant at a site. The key to establishing Messina is ensuring that the waterlogged areas do not scald and become highly saline, providing a micro-environment for the Messina to germinate in.

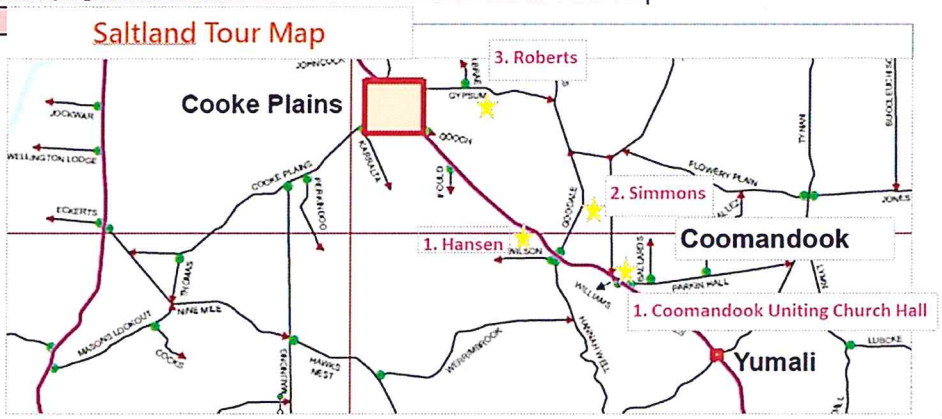
It's ability to fix nitrogen three years in has been observed at other sites, making it a suitable companion species to some of the traditional species being grown on saline areas (eg. puccinellia).

Acknowledgements
Heritage Seeds
Seednet
Landmark, Cooke Plains and Keith
Platinum Ag Services, Meningie

Saltland Pasture Redemption Project – Dryland Salinity Trends Program

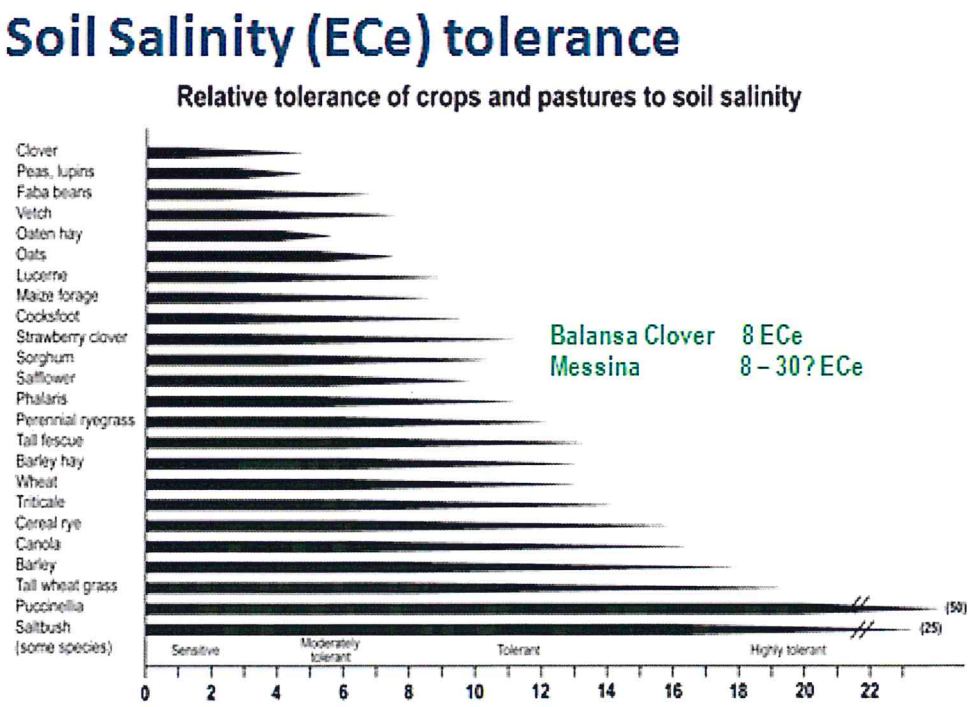
Wednesday 19th September 2018 – Coomandook / Cooke Plains

Time	Location and Topic
8.30am	**Coomandook Uniting Church Hall Super Room** - 3223 Dukes Highway Coomandook Welcome and Introduction
9.20am	**Andrew & Garry Hansen's** - 132 Wilson Road – Coomandook - Second year Messina
10.30am	**Paul Simmon's**, Goodale Road – Coomandook - Third year Messina – EM Mapping
11.00pm	**Bluey Roberts** - opposite 543 Gypsum Road next to the Gypsum pit – Mulching – Alternate treatments – A range of seed mixes
12.15pm	**Coomandook Uniting Church Hall Super Room - LUNCH**
12.40pm	**Funding.** **Where could this program focus next?**
1.30pm	**Finish**



SALTLAND PASTURE REDEMPTION PROJECT – YEAR 1 and 2

The Coomandook Saltland Redemption project was initiated by the Coorong Tatiara Local Action Plan, Coomandook Ag Bureau, & Saltland Pasture Redemption Working Group to investigate the application of new developments in the productive use of saline land across Coomandook / Cooke Plains & Meningie East. This included testing the suitability of new salt tolerant legume species Messina and complimentary salt tolerant pastures in broadacre farming systems. This project followed on from the Dryland Salinity Information Sessions held across the Coorong District Council area in 2016. Three sites have been established at Meningie East, Coomandook & Cooke Plains.



Outcomes from Year 1 - 2017

Saltland Pasture Redemption Sites – What's next?	Elders Site at Andrew White's – Cooke Plains
- Oversowing Messina with puccinellia for enhanced feed value and palatability - Staggered germination - Waterlogging survival - Messina 8-30 dS / ECe - Target Messina establishment on 'at risk' areas - Seed soil contact – check with results this year - Sheep grazed down Messina very well	- Finesse Q Fescue held on well until very late in the season, as did the legumes - Lucerne on the rise did well, as did Millet using up plenty of moisture - The Puccinellia performed well - The Messina performed well close to the water edge, but did not perform well further away from the water where the other legumes were more successful - It will be interesting to see what regenerates this coming season - Find something that will grow >30ECe

Directions for Year 2 - 2018

Robust discussion occurred at our Spring 2017 Farm Walk. Producers, Agronomists, NRM & PIRSA Staff, and SARDI Reps were interested in addressing the following questions in regard to Saltland Pasture and Messina establishment, regeneration, and management going forward;

- Staggered seeding of Messina after several rainfall events (suggestion that the salinity concentration in the topsoil may change throughout the season affecting the ability of messina and other salt tolerant pastures to germinate),
- Use of groundcovers to reduce salinity concentration over the summer period in the top soil, plastic vs organic mulch vs groundcover,
- Use of raised beds or mounds to enhance Messina establishment, providing a micro-climate of lower salinity in which to get Messina to germinate.
- Different seeding techniques, treatments, and ongoing management techniques.

A **Planning Forum** was held in March 2018 with participating landholders, agronomists, seed merchants, and Natural Resources SA Murray Darling Basin and South East, to explore the outcomes from Year 1 and to plan Year 2 of the project.

FUTURE DIRECTIONS – *in response to the increase of area affected by dryland salinity*

1. Mitigation & Rejuvenation of ground affected by Dryland Salinity

Work is currently underway through the Saltland Pasture Redemption Project with ongoing support likely to come through the Mallee Seeps Project and Natural Resources SAMDB. Further support is needed and will be sought to expand this work, to come up with agronomic solutions that suit current conditions, and makes use of all available options.

2. Mapping

Natural Resources SAMDB has provided this group (through Coorong Tatiara LAP) with access to Digital Elevation Mapping. We would like to understand whether the lowest points correlate with areas affected by dryland salinity, or at risk.

3. Survey and Monitoring

Landholder Survey

Coorong Tatiara Local Action Plan will undertake a simple landholder survey to estimate;

- How much area has been affected by dryland salinity in the last 5 years?
- How much land do you think is at risk over the next 5 years?

Coomandook Piezometer Network

The Coomandook Piezometer Network needs to be more regularly monitored. These piezometers need to be plotted on to Digital Elevation Map. Do we know the elevation of the piezometers? Explore whether data loggers can be placed on key piezometers.

Obswell Data

Chris Hentschke with support from DEW will look at the active local Obswell Data to see what trends can be drawn out of this data.

4. Understanding what is going on in the broader landscape and hydrology - $?

We need to take a fresh look at exploring the hydrology of this area to explain why this expansion in dryland salinity is happening now. Including;

- Change in land use
- Overall water balance
- Lakes and River levels – either confirm or discount this theory
- New work done on the Dukes Highway redevelopment?
- Climate variability
- Intense rainfall events
- Old Paleo Channels

5. Awareness Raising

Aim to organise a visit by Local MP's and Ministers to educate them about the issue and seek support.

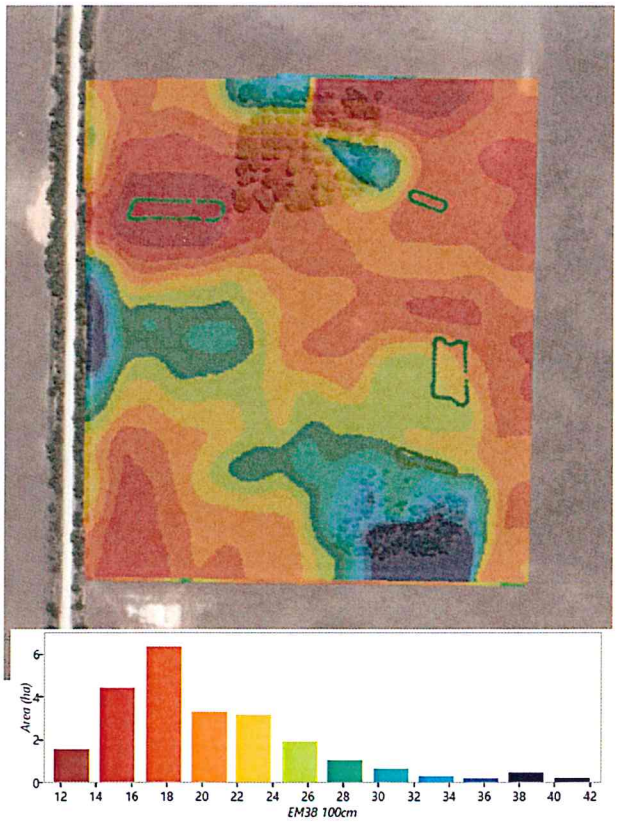
6. Fund Raising

Stay abreast of arising funding opportunities eg. GRDC and Smart Farms etc.

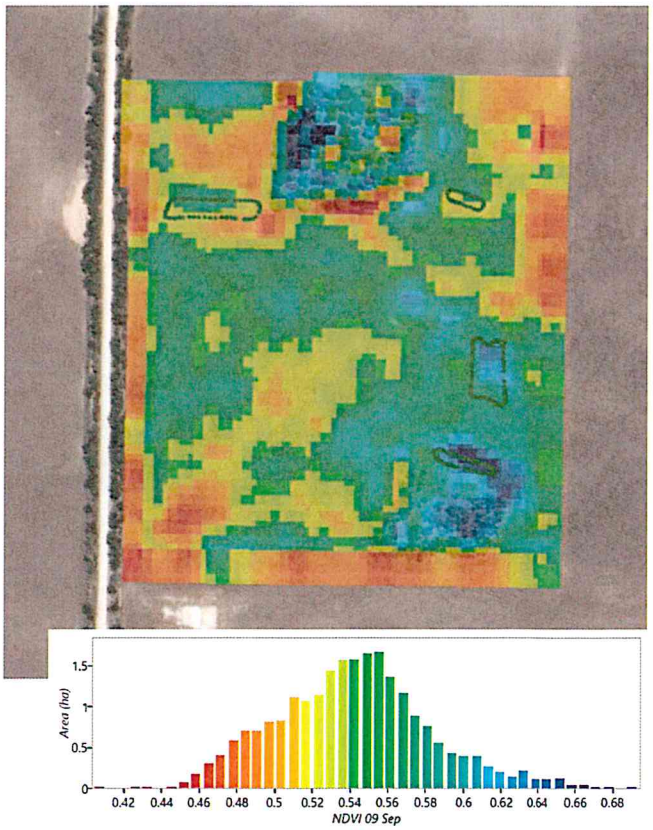
7. No local media Discuss in the media only as a statewide issue

Yeomans Plough with inclusion plates – 14th May 2018

EM38 Map (13th May 2018)



NDVI Imagery 9th Sept 2018)



National Standard for Reporting Seed Contamination in Lamb Carcases

Australian lamb processors have adopted a new language to describe seed contamination in lamb carcases at slaughter. The introduction of this national standard will reduce confusion for lamb producers and their agents, ensuring that any feedback about seed contamination is consistent across processing plants.

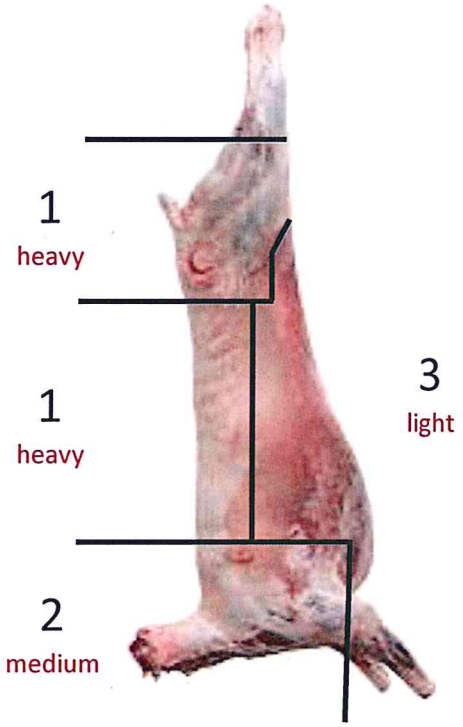
This new language is based on the location of the seed in the carcase and the potential impact that it may have on the final value of that carcase.

The reporting of seed contamination in a lot/line of sheep is triggered if seed is detected in carcases, and the slaughter floor supervisor assesses that it will be necessary to either:

- **send carcases to the retain rail for further trimming; or**
- **the chain speed requires slowing to enable extra trimming; or**
- **extra trimmers are required on the chain.**

If extra trimmers are required or the chain speed decreased to cope with the level of seed, then the level of contamination must be recorded as follows:

1. Any seed in ***Section 1*** of the carcase means it is described as having ***heavy*** seed contamination.
2. If there is no seed in Section 1 but there is seed in ***Section 2*** then the carcase is described as having ***medium*** seed contamination.
3. If there is only seed in ***Section 3*** then the carcase is described as having ***light*** seed contamination.



The presence of infected seeds means the carcase is graded as heavily contaminated, regardless of the location of the seed.

The carcase inspector then estimates the percentage of the lot with heavy, medium and light seed.

For example, in a lot of 100 sheep, 10% (10 animals) have seeds in the belly region (**Section 3**) only, and 20% (20 sheep) have seeds in the belly and shoulder **(Section 2)**, with none infected.

The inspector records for the lot:

- 10% as **light** levels of seed contamination; and
- 20% as **medium** level of seed contamination.

For more information:
Anne Collins, Rural Solutions SA *0427 486 115*
JBS Bordertown *8752 1233*

February 2018

16