

Managing Dry Saline Land update.

Chris McDonough, Insight Extension for Agriculture



Dry Saline Land (Magnesia Country)

What I think I know,
and don't know,
but hope to find out,
after Year 1.5 of the project.



Dry saline land Dynamics. How does it work?



Schmidt - Waikerie

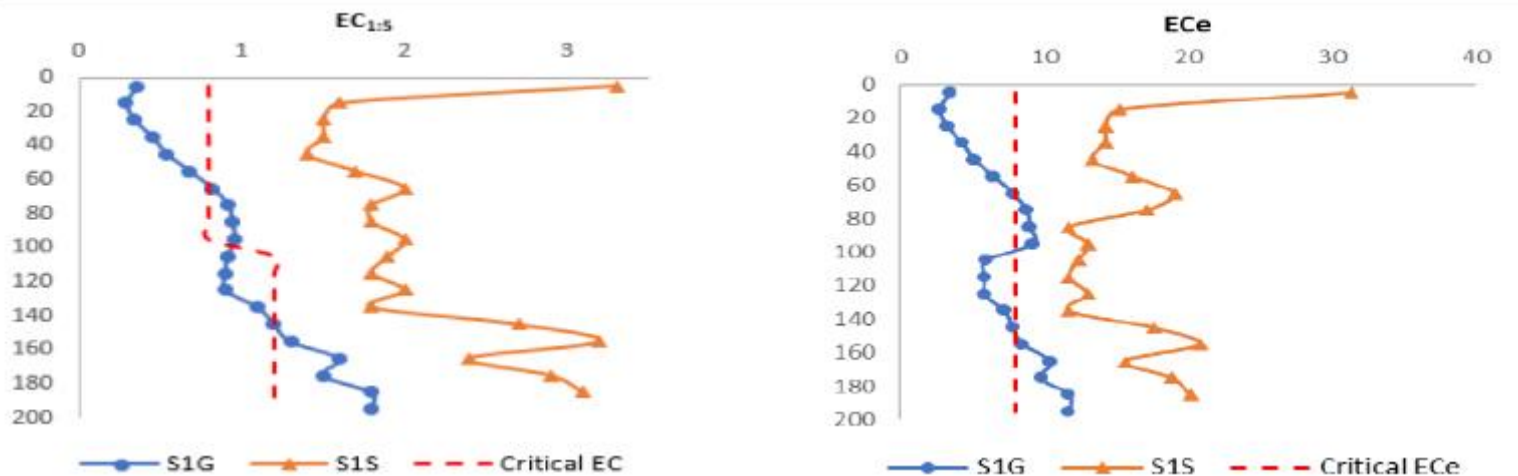


Image 2: Surface comparison (Schmidt). Good, S1G (left), salt-affected, S1S (right).

Unaffected good ground next to affected bare patch



Comparison of EC_{1:5} and EC_e down the soil profile: Schmidt

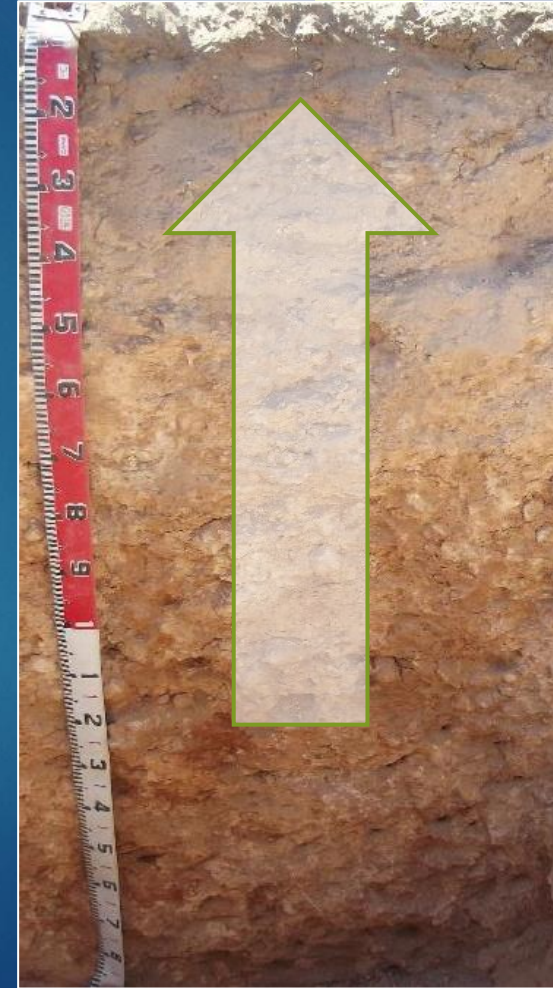


Unaffected ground

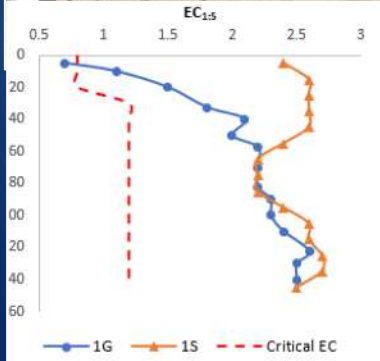


Transient salinity
From
Subsoil layers
Makes its way to the
surface through
evaporation & capillary rise
to concentrate in the
surface layers
Making them
Temporarily or
permanently toxic
To crop and pasture
growth.

Affected bare patch



Unaffected ground



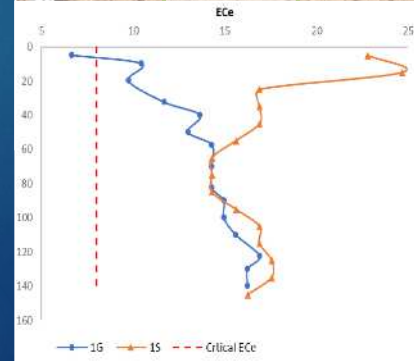
Dry saline land impacts are greater due to:

1. Higher subsoil salinity levels not always
2. The soils strong wicking tendency
3. Long hot dry periods - drought/summer (increased evaporation & wicking)
4. Lack of soil cover – bare over summer

But in some areas are quickly reversed after high rainfall due to:

1. Temporary leaching of salts from surface layers
2. Dilution of salts toxic effects on crops germination & establishment

Affected bare patch



Key DSL management being tested:

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- ▶ **Change the Topsoil / Reduce Surface Salinity – to allow plants to germinate & grow**
- ▶ **Establish soil cover (grow or add) & never allow it to bare out – provide more protection against evaporation and capillary rise... grazing mgt critical**
- ▶ **Ameliorate the subsoil layers (top 30cm) to reduce the wicking as well as decrease subsoil saline toxicities.**
- ▶ **Find practical and profitable, salt tolerant agronomic options**
- ▶ **Nutritional additives to counteract salt impacts...**

What I know works...

Adding Sand on Surface

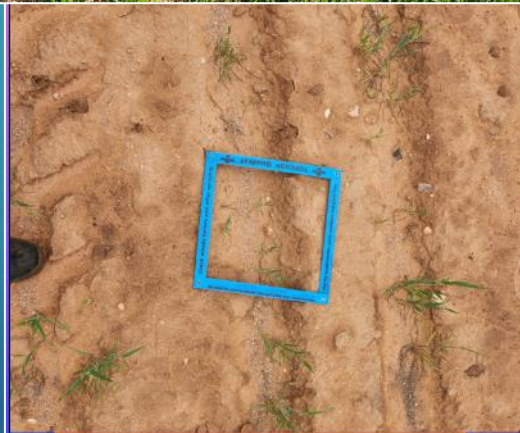


Control

8cm Sand



Original soil layer no longer toxic



Control



8-10cm Sand on Surface

Adding Sand on Surface

4 years previous
Sand on Surface,
2.4t/ha



Untreated, 0.1t/ha

Adding Sand on Surface

How much sand is enough?

- To germinate seed,
- To limit capillary rise with salt,
- Is economically viable,
- Is physically practical,
- Will provide lasting results?

I currently think 8cm sand.

**Ave 1.5t/ha/yr benefit over 5 years =
approx. \$1775/ha extra income** (@\$350/t
and \$170/ha crop input costs).

*If sand is close, farmer has land plane,
labour available...*

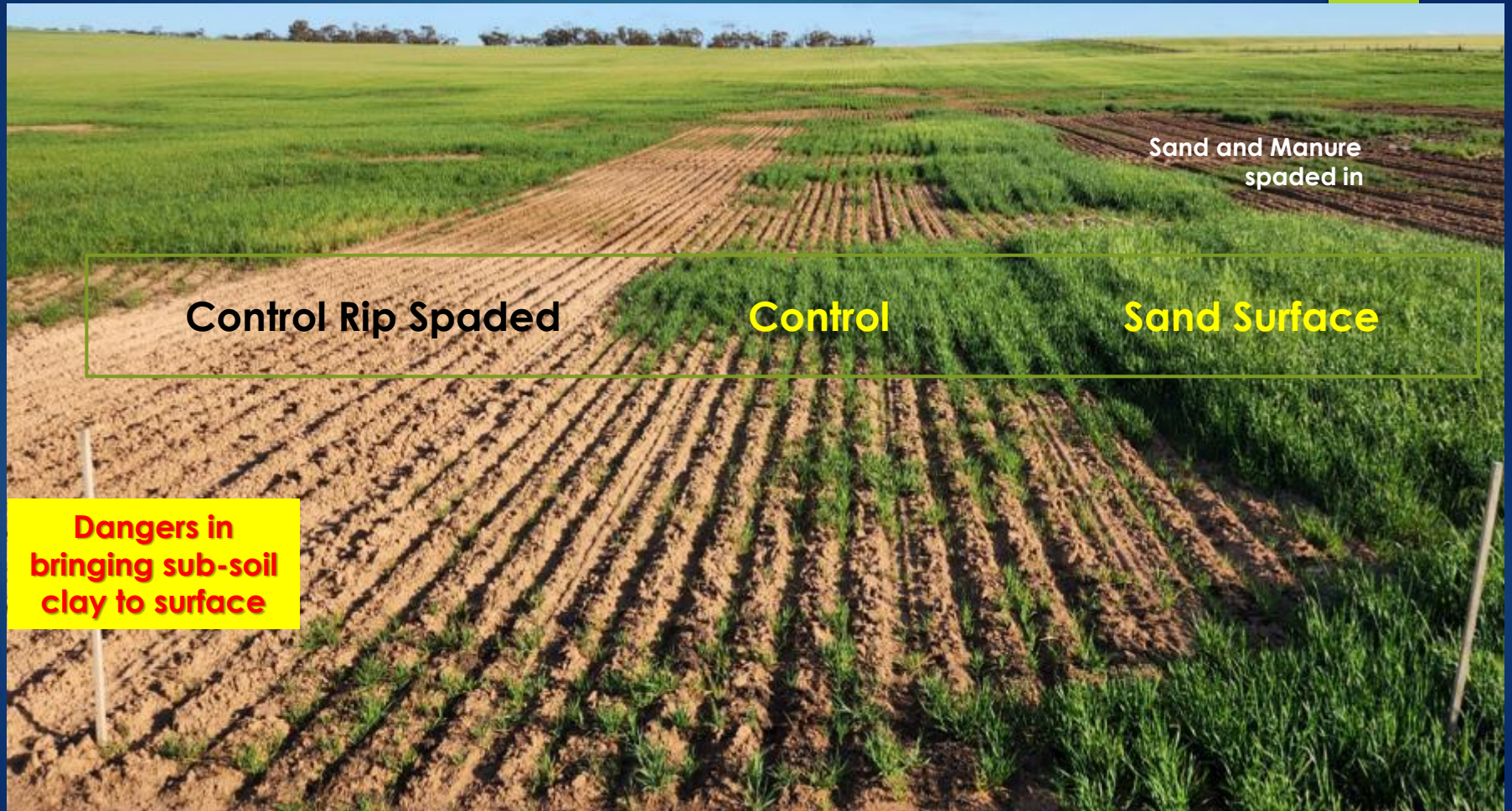
*Larger areas may be viable to fix – not
just small patches*

Other project sites with lower rates...

**Every bare untreated area cost at costs
\$150/ha or more for crop inputs alone...**



Heavy soil site, Mannum



Sand and Manure
spaded in

Control Rip Spaded

Control

Sand Surface

Dangers in
bringing sub-soil
clay to surface

Sand on Surface still best in year 2

Sand on Surface

Sand and Manure
spaded in





**Sand/manure mix
on Surface, Yr 2**





**Sand applied
10 years prior**

Heavy soil site, Walpeup Victoria

5cm sand strip, Buckleboo, 2nd year crop



Schmucker Kyancutta



Former heavy,
patch flat now even
production after
Sand on Surface

Fixing very large
areas with Sand on
Dry Saline Land



Sand strip



Adding straw on the surface

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- ▶ Clear benefits at many sites.
- ▶ Straw minimising wicking of salts to surface after hot dry summer periods.
- ▶ Improved soil organic matter and soil health
- ▶ Good option for smaller scald patches – labour, time, availability.



Pea Straw on
surface

Grape marc on
surface

Control



Control

**Surface Straw over
summer**





Bruce Heddle, Minnipa 5cm Chaff cart residue

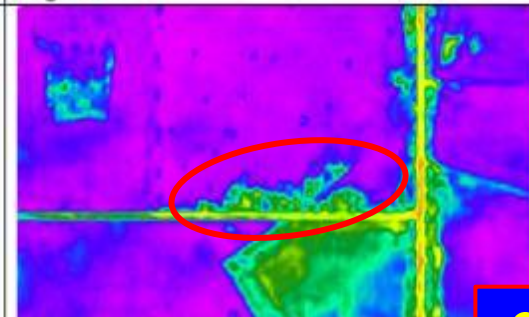
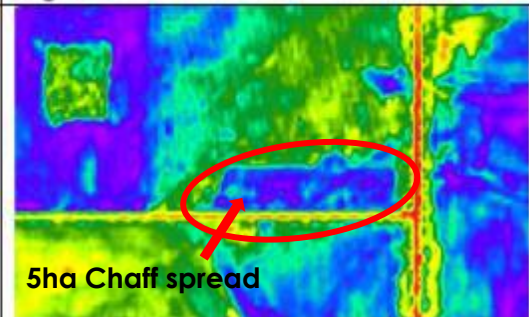


Google Earth image

Aug 2023

Aug 2022

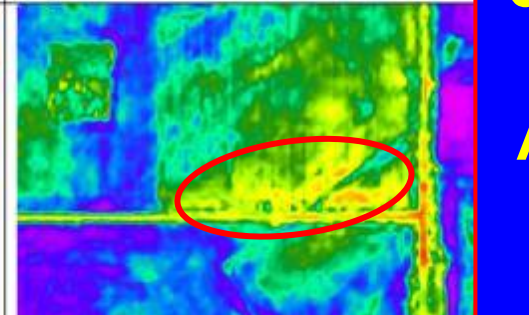
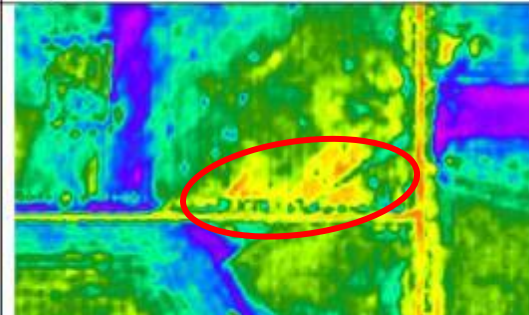
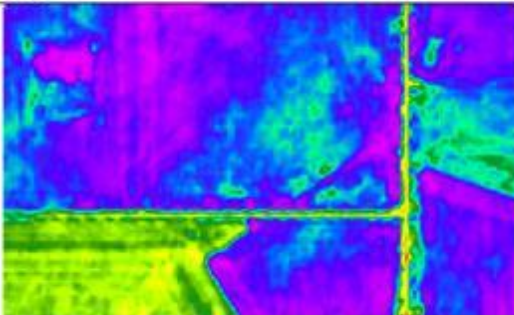
B Heddle, Minnipa



Aug 2021

Aug 2020

Aug 2019

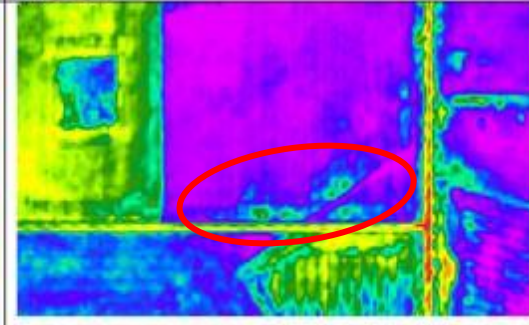
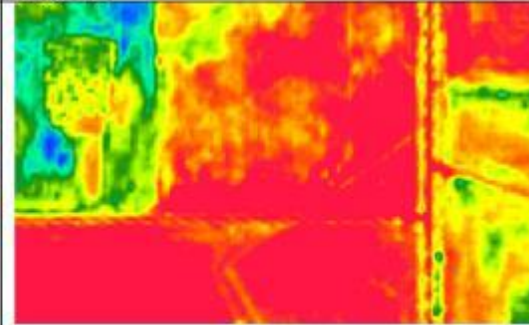
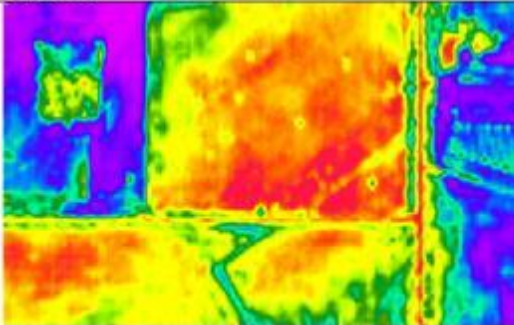


**Summer
or
Autumn
Rains?**

Aug 2018

Aug 2017

Aug 2016





Preliminary indications that April/May rainfall is most useful at reducing DSL impacts. Summer rain can often wet up profile and leach some salts, but hot & dry weather following can bring it back to surface.

Good seeding rains can both leach and dilute salt in surface layer, allowing for crop/pasture germination. *More investigations to come...*

B Heddle, Minnipa													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	5.4	14.8	11.8	1.8	60.2	33.8	6.8	53	44.2	68.6	4.2	21.4	326
2011	0.4	45	73.6	12.2	29.2	35.4	38	58	36.6	41	5.6	18.2	393.2
2012	25	19.8	19.4	16.8	25.4	62.4	24	18.2	16	5.4	2.6	2	237
2013	4.6	26	31.8	25.8	27.2	44.4	60.8	41.4	17.2	5.6	18.2	12.8	315.8
2014	27.8		6.8	57.6	75.4	61.4	67	6.2	15.8	1.6	8.2	7.8	
2015	11.2	0.4	0.8	34.8	16	47.2	37.2	84.8	23.6	5	43.6	9.6	314.2
2016	4.2	25.6	32.8	13.2	42.8	64.2	49.8	26.6	39.6	24	5.8	49.4	378
2017	52.6	29.4	0.4	15.6	15.2	7.2	25.6	46.2	13.6	17.8	22.6	15.4	261.6
2018	17.8	5.4	1.2	3.2	12.6	23	24.8	86.2	7.2	29	29.6	4.2	244.2
2019	4	1.2	0.2	11	57.2	56.4	15.6	19.2	53.6	3.4	7	6.4	235.2
2020	10.8	46.4	20	36.8	16.4	17.4	16.6	34.8	33.2	63.2	1	22.6	319.2
2021	18	16.2	9.6	2.6	21.8	72.4	53.4	29.2	4.4	26.2	101.4	3	358.2
2022	50.2	36	2.8	32.4	63.8	24.2	25.4	49.4	47.4	57.6	75	22.4	486.6
2023	21.6	2	12	7.4	12.6	8.4	16.6						

Salinity variations through the year

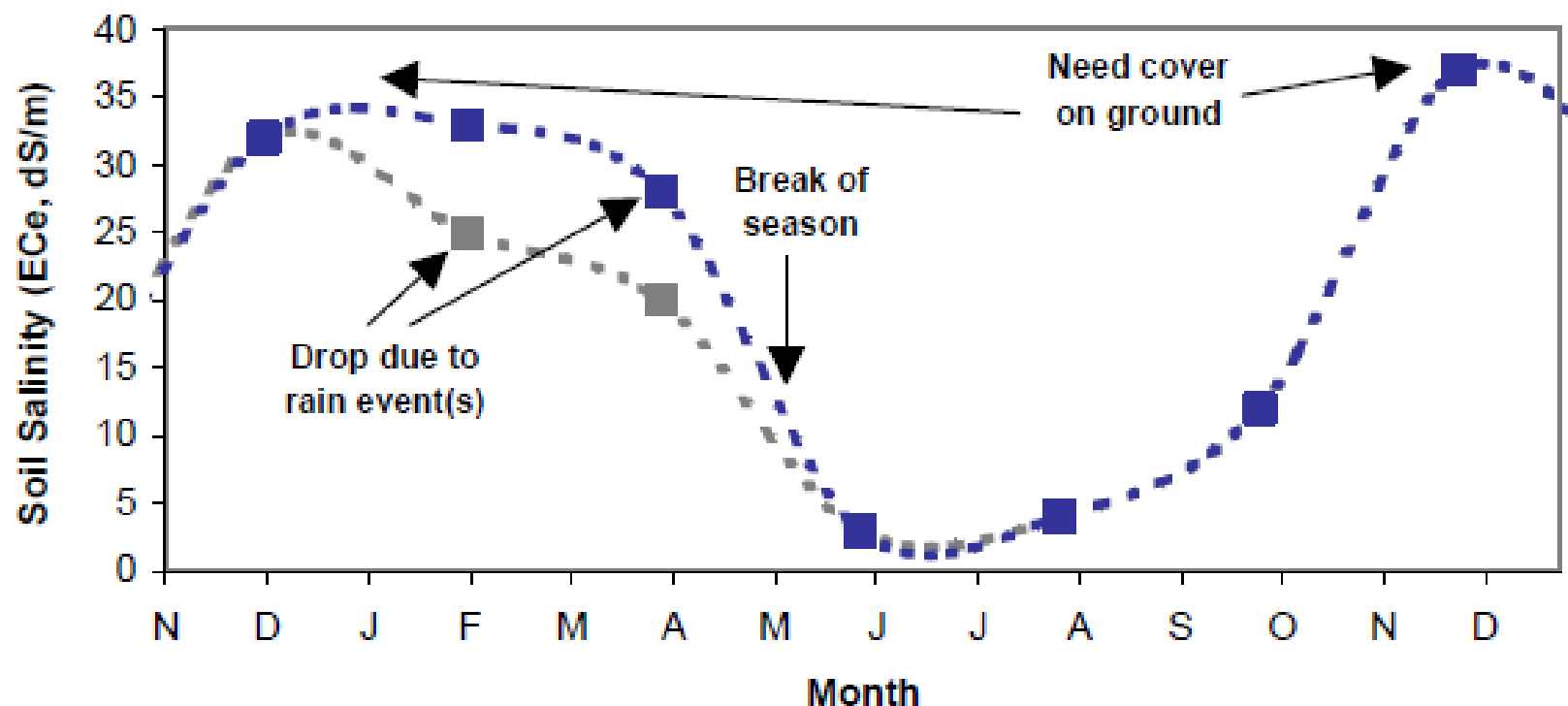


Figure 12. Example of seasonal trends in surface soil salinity. (Large seasonal fluctuations, especially in surface soil, such as this are often found in parts of the Upper South East.)

Ameliorating 0-30cm depth of soil.

- ▶ Active inclusion plates deep ripping and with organic matter
 - ▶ Initially unsuccessful on heavy soil with dry start in 2022.
 - ▶ Some evidence of increased OM at depth that should be positive
 - ▶ Site had good and poor strips – possible compaction issues, however...





Clear evidence of positive impacts in 2023, with plant roots growing laterally then down through deep organic furrows between salty, hard soil profiles

Ameliorating 0-30cm depth of soil.

- ▶ Reefinating in sand and / or manure on shallow stone
- ▶ Slight improvements over surface application



More salt tolerant varieties?

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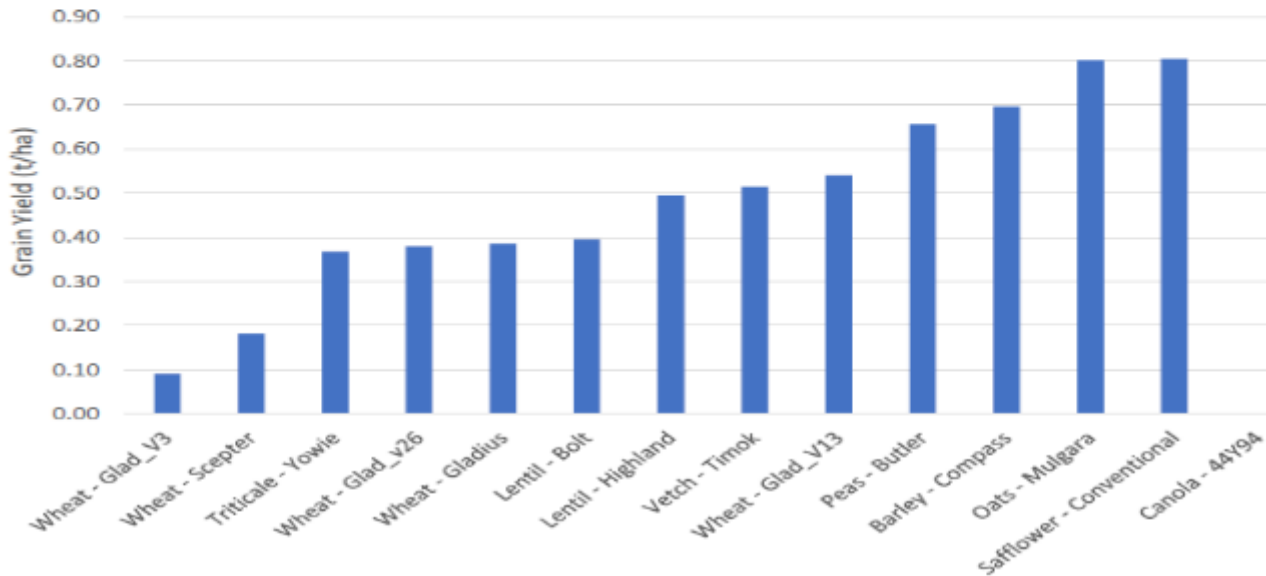
2022 Alford Trial – Sam Trengove

9/3/20XX



Some promising results, but hard to be conclusive on such variable, patchy trial sites

Crop type results



I have generally not been able to replicate similar varietal advantages in the Mallee in 2023





**Puccinellia for 250mm
severe DSL patches??**



**Neptune Messina
showing some
promise**





**Don't rake up
iceplant and burn
it on good
ground...**



Can added nutrient products help?

Nutrients*

Calcium Nitrate, @ 40 kg/ha or 80 kg/ha

Potassium Silicate Supernatant @ 20 l/ha or 40 l/ha

Fermented Kelp Extract, @ 20 l/ha

Commercial Wetter

Kitchen Sink – All products together.



Only 2-3 sites showing a benefit, with majority showing nothing.
More work and investigation required.



Rare good site treatment, Jury still out, no silver bullet at most sites...



**Calcium Nitrate helping early
volunteer growth at Wunkar...**

Compaction – wheel tracks...



Increased wicking
affect, and lack of
summer cover





Adjacent Airport paddock

No grazing for 40yrs appears better in 2023



Port Pirie.

History of regular grazing, baring patches over summer. Big bare scalds. Farmer now uses Dorper sheep for more even grazing.

There is an ongoing need to better understand the soil/water/plants dynamics of DSL, and explore and develop all practical solutions possible.

However, the 2 main aims for all dry saline land management:

- a. Stop salt accumulating in surface layers
- b. Establish and maintain cover over scalded bare areas...

...and don't let your sheep bare out areas over summer, after the last 2 better seasons!!!

We are still working with farmers and researchers to better understand all key factors and establish clear and practical management strategies for Dry Saline Land.

the MSF " Building Resilience to Drought with Landscape Scale Remediation of Saline Land" project



Australian Government
Department of Agriculture,
Water and the Environment



Future
Drought
Fund

SARDI



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Mallee Sustainable Farming



AIR EP

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