

PROJECT CONCEPT

Livestock Production on Sandy Soils 'Lets make the Bucket Bigger!'

Improving grazing production off sandy soils in the mid rainfall zone of the South East (South Australia) and the Wimmera (Victoria)



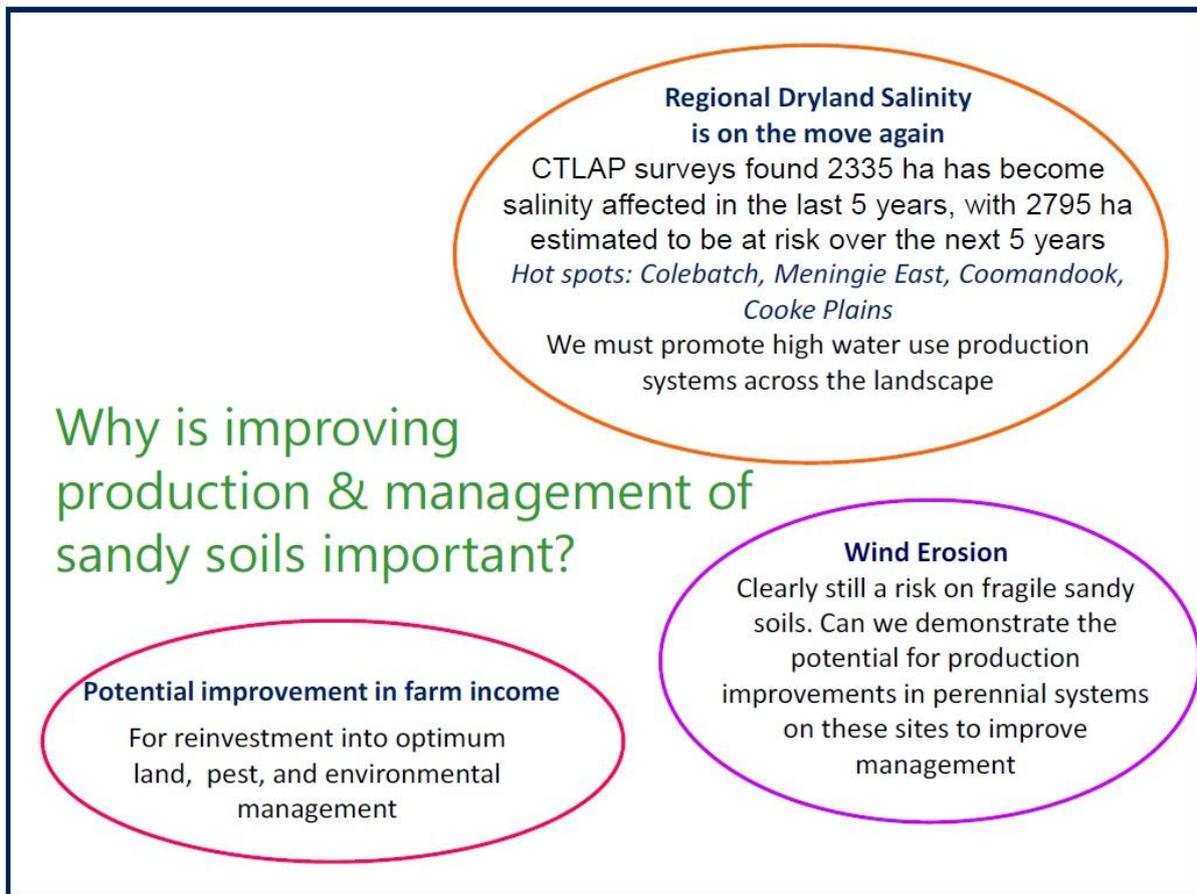
BACKGROUND

The aim of this project is to take innovative technologies and techniques that are being used on cropping soils, and transferring them to perennial pasture based sandy grazing country, with the aim of increasing production, *'making the bucket bigger'* to optimise pasture growth, and to deliver increases in livestock production by improving the carrying capacity of this country.

The time is right to drive a project like this forward because;

- Livestock producers are more willing to give new techniques a try due to the current higher livestock and wool prices.
- The effect of the drought has pushed south in the form of land sales, and increased land prices. With drought affected livestock producers from up north expanding their holdings and feed base in the south.
- As a result existing livestock producers now realise they need to maximise their production on the land they have.
- The opportunity has arisen for our new neighbours to learn about grazing sandy soils sustainably, and bring them on the journey of maximising livestock production from this country.

This work will have the additional land management benefits of wind erosion, ameliorating dryland salinity through improved water use, & recognising and treating soil acidity which is becoming more prevalent on sandy soils across these districts.



WHAT IS THE VALUE PROPOSITION FOR MEAT AND LIVESTOCK AUSTRALIA?

In the SA Beef Blueprint numbers of cattle in this area of South Australia has recently dropped. Targets in both the SA Beef and Sheep blueprint contain quite ambitious goals for increasing the numbers of livestock produced from our area (Upper South East). This success is contingent on improving production from the existing grazing areas. Similar potential exists on the Victorian side of the Border.

The South Australian Beef Industry Blueprint 2018 has identified that there are nearly 240,000 fewer beef cattle in SA than five years ago and some 140,000 fewer breeding stock. In our region (Upper South East) there has been a 37% decrease in the number of cattle turned off over the last 7 years. The SA Beef Industry Blueprint identifies that improved feed base, finishing systems and cost-effective management strategies will be crucial to ensuring ongoing supply of high quality beef. The Blueprint’s primary target is to increase the supply of SA bred stock by 60,000 per year.

The key aim of the South Australian Sheep Industry Blueprint 2016 is to grow the SA sheep industry’s production and value from \$1.48 billion in 2015 to \$1.80 billion in 2020 while maintaining international competitiveness. An additional aim is to increase gains in flock size and weaning rate leading to 12.5% more lambs weaned.

Approximate livestock numbers in the Wimmera are;

- 1,166,028 sheep and lambs
- 35,029 meat cattle
- Livestock production businesses 657

Not data on projected growth figures for livestock production in the Wimmera were available at the time of writing this report.

LIMITING FACTORS TO THE GROWTH IN LIVESTOCK PRODUCTION in the Upper South East (SA) and Wimmera (Victoria)

The key limiting factors to limiting the potential increase in production in our Districts are: increasing feed production, and in South Australia high SA Water prices for livestock producers with no other source of water available www.coorong.sa.gov.au/watersecurity

This project will target improving the grazing systems feed base to extending the growing season, increasing pasture utilisation, optimising fertiliser use, and reducing the overall cost of production per hectare by producing more feed, converting to increased meat production in our region.

EVIDENCE OF PRODUCTION INCREASES

From 2018 Grassgro Modelling for Keith – Meningie SA in an average rainfall year (Decile 5)

Under a lucerne grass pasture – grasses unimproved grasses eg. barley, brome and silver grass

Sandy soil with low Plant Available Water (38mm)	SOIL AMENDMENT Increasing organic matter and / or breaking hard pan to increase root depth	Increased Plant Available Water /'bucket size' to 55mm	RESULT: Increase in feed production of 1.88T/ha/year Increase in carrying capacity of 1.8 DSE/ha
Produced approx 3.52T/ha DM/year		Increased production to 5.4T/ha DM/year	

Assumptions: 70% efficiency in amount consumed = 1316 kg DM/ha/year extra that stock can eat (=3.6kg/day extra). A dry sheep (eg. 65kg) – can eat 3% of its bodyweight = 1.9Kg/day.

Source: Felicity Turner

From 2014 – 2018 GRDC Sandy Soils Project

GRDC Cadgee SA

Under Crop

Unmodified Sandy Soil	SOIL AMENDMENTS Clay Spreading Clay spreading & spading Spaded clay & lucerne	6.4 tonne of grain/ha	RESULT: Transferring these techniques to livestock feed production will produce similarly impressive results
Produced 4.77 tonne of grain/hectare		7.29 tonne of grain/ha	
		9.3 tonne of grain/ha	

Source: Melissa Fraser – Rural Solutions SA, GRDC Sandy Soils Project

See attachment: Clay and hay increases yield on SE Sands

Eckert's clay spread and ripped cropping site 2018

Malinong SA

Under crop, side by side harvesting comparison

Clay Spread Sandy Soil	SOIL AMENDMENTS Deep Ripping to break hard pan and increase rooting depth	Produced 3.5 tonne of grain/hectare	RESULT: Transferring these techniques to livestock feed production will produce similarly impressive results
Produced 1.2 tonne of grain/hectare			

Source: Tim Eckert 2019

THE PROJECT CONCEPT

The technologies and techniques that this project would like to demonstrate, and promote include, but are not limited to;

Site Monitoring – Before/After	Potential Mechanical Soil Amendment	Potential Nutrient/pH Soil Amendment
Electromagnetic induction based soil sensing (EM38) Mapping <i>also used for clay finding for clay spreading</i>	Plozza Plough to treat hard pans and water repellent sands to improve pasture growth	Normalised Difference Vegetation Index (NDVI) paired with yield mapping and tailored fertiliser applications
NDVI Images and Mapping	Deep Ripping to treat hard pans to improve pasture root depth	Tailored nutrient & trace element application to amend leaching effect & deficiencies
Grid soil testing at multiple depths – chemical, physical and water repellence	Spading to improve water repellent sands to improve pasture growth	Manure and straw to improve nutrient and organic matter content
Ground digital penetrometer to measure compaction / hard pans	Yeomann’s Plough with inclusion plates to treat hard pans and water repellent sands to improve pasture growth	Liming to amend acidic soils
Precision & Grid Soil Sampling	Building carbon levels in soils / using different techniques to incorporate organic matter	A fresh look at wetting agents and associated pasture establishment techniques
<p>Site Monitoring After: Measurement of pasture biomass production comparing control vs treated sites – to measure change in livestock carrying capacity and potential meat production. Photopoint monitoring to compare and promote control vs treated sites.</p> <p>One on one tech support to 7 producers to implement of successful treatments</p>		

Stage One of this project will establish whether these treatments can improve pasture production and the livestock carrying capacity of sandy soils. Funding will be actively sought for

Stage Two of this project which will measure livestock weight gain on a larger scale of the treatments that are demonstrated to be successful in Stage One of the project.

PROJECT OBJECTIVES

In the grazing areas of the Upper South East and Wimmera:

1. Demonstrate and assess the potential of up to four mechanical soil amendments and up to four chemical soil amendments on demonstration sites to increase:
 - a. Biomass production on annual and perennial based pastures
 - b. Livestock carrying capacity / Dry Sheep Equivalent
 - c. Quality of feed produced, comparative seedling establishment and root depth
 - d. Soil nutrient, trace element, water repellence, & pH improvements
2. Conduct case studies / cost benefit study to determine the relative economic performance of these different treatments to increased livestock feed production
3. One on one technical support to producers to carry out soil assessment and advice on implementation of successful treatments
4. Implement a series of skills & training development materials & activities to increase the confidence of 60 core and observer producers to implement the best performing mechanical & nutrient soil amendment practices.

MONITORING & EVALUATION

Measurement of pasture biomass production comparing control vs treated sites – to measure change in livestock carrying capacity and potential meat production. Photopoint monitoring to compare and promote control vs treated sites.

Strategic soil and feed testing to demonstrate changes in soil properties and feed quality.

MEASURING PRODUCER CHANGE (knowledge, skills and adoption)

- Entrance and exit surveys of producers (core and observer) to benchmark Knowledge, Attitudes, Skills and Aspirations in relation to the subject
- Entrance and exit surveys of producers (core and observer) to measure level of adoption
- Participation at monitoring events, farm walks, and planning forums
- Evaluation of events and one on one technical visits
- Web hits on project web site
- Number of media articles
- 'Opens' on e newsletters containing project updates, bulletins and promotions
- Reach, likes, and forwards on social media
- Known shares through other organisations

PARTNER ORGANISATIONS AND PROJECT LINKAGES

Coorong Tatiara Local Action Plan *See attachment one for complementary projects*

www.coorong.sa.gov.au/gotolap

MacKillop Farm Management Group

<http://www.mackillopgroup.com.au/>

Mallee Sustainable Farming

<http://www.msfp.org.au/>

Natural Resources SA Murray Darling Basin

<https://www.naturalresources.sa.gov.au/samurraydarlingbasin/land-and-farming>

Natural Resources South East

<https://www.naturalresources.sa.gov.au/southeast/land>

Wimmera Catchment Management Authority

<https://wcma.vic.gov.au/soils>

Agriculture Victoria

<http://agriculture.vic.gov.au/agriculture/weather-and-climate/soil-moisture-monitoring-pastures>

WHO ELSE MAY BE INVOLVED IN PROJECT DELIVERY (external agents, providers, third party contractors etc?)

Felicity Turner – independent agronomist and agricultural technology expert

Melissa Fraser – Senior Land Management Consultant, Rural Solutions

Existing relationships with Agribusiness, Contractors and Seed Merchants will be utilised to ensure the effective delivery of this project

PROJECT DURATION

Proposed start date: July 2020

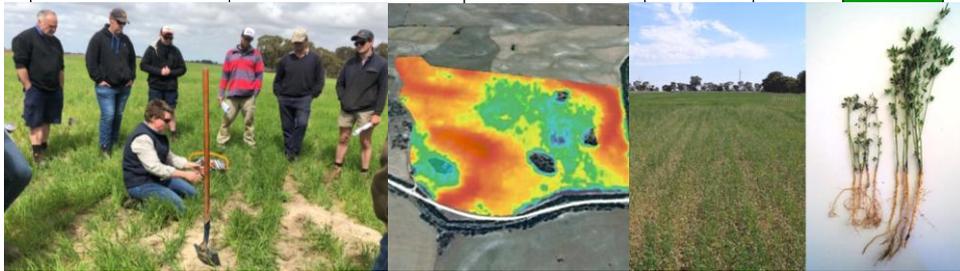
Proposed completion date: July 2025

ATTACHMENT 1

Complimentary Coorong Tatiara Local Action Plan Projects

Sandy Soils Projects

Project	Purpose	Funding Source	Project Length	Funding	Location
Upper Soil East Sandy Soils Projects	EM 38 for clay locating, demonstration sites, workshop	Natural Resources SE	7 months	\$18,450	Coorong Tatiara
pH and Potassium on sandy soils project	Improved monitoring and knowledge	Natural Resources SA Murray Darling Basin	7 months	\$3,000	Coorong
Meningie – Field Healthy Soils Group	Improved understanding and demonstrated techniques on sandy soils	Meat and Livestock Australia	2 years	\$22,500	Coorong
Speakers Grant	To fund speaker at Upper South East Soils workshop	GRDC & Ag Ex Alliance	1 years	\$1,100	Tatiara



Livestock Water Security Projects

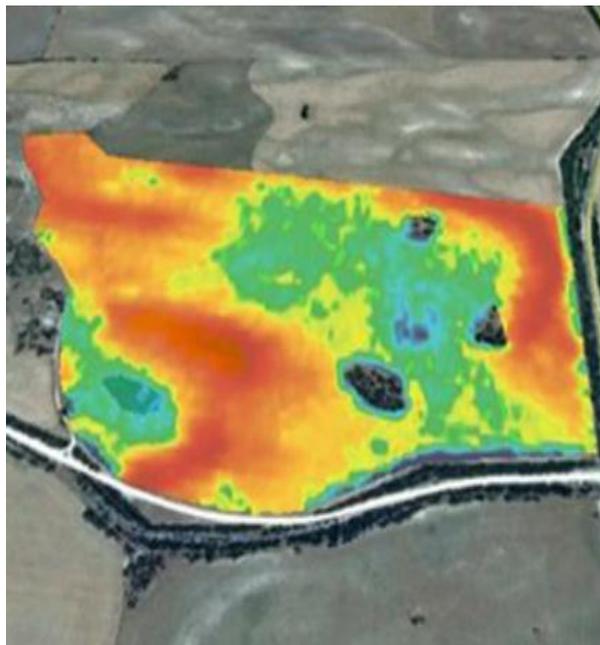
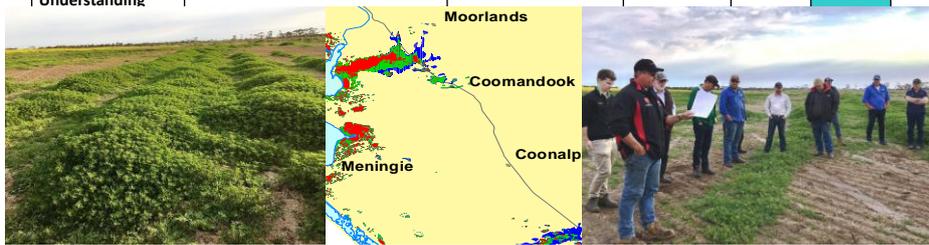
Project	Purpose	Funding Source	Project Length	Funding	Location
Coorong Water Security Innovations Applied	Demonstration of innovative water saving technologies. Case Studies	Small Smart Farms - Commonwealth	18 months	\$63,658	Predominantly Coorong
Coorong Lined Catchments Water Harvesting Project	Four lined catchments, one Coorong Weather Stations (NRM Network)	Regional Growth Fund – SA Government	2 years	\$370,000	Coorong

Work on; Coorong Water Transportation Scheme EoI, raising awareness of issue, submissions to State Water Price Inquiry etc



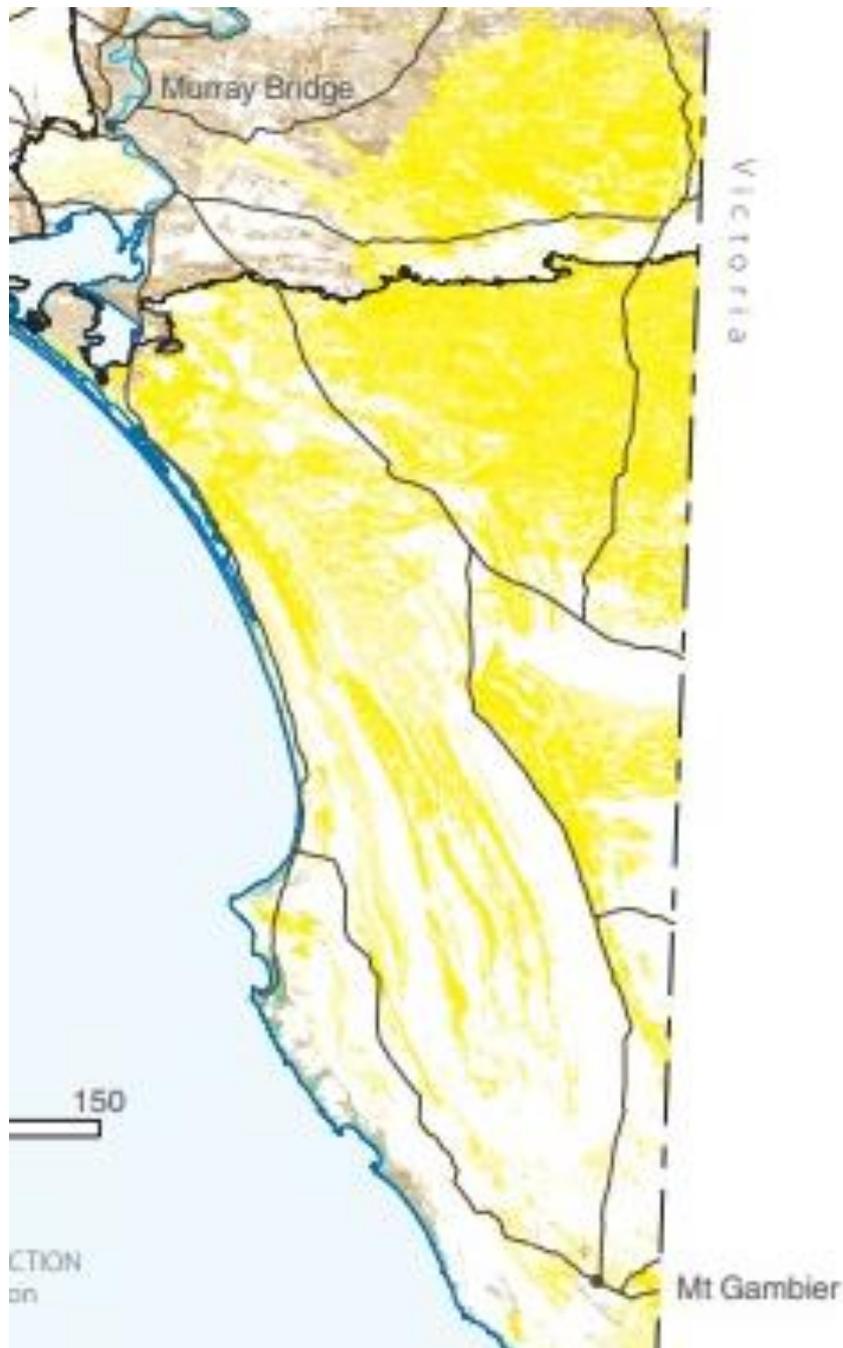
Dryland Salinity Projects

Project	Purpose	Funding Source	Project Length	Funding	Location
Saltland Pasture Redemption Project	Demonstrating saltland agronomy options	Cwth- National Landcare Program 2	18 months	\$28,599	Coorong
Mallee Seeps	Improved understanding of dryland salinity causes, and improved water use	Cwth- National Landcare Program 2, Mallee Sustainable Farming	4 years	\$80,000	Coorong
Regional Land Partnerships – Salinity	Improved understanding of current dryland salinity & hydrogeology	Cwth- National Landcare Program 2, Natural Resources SAMDB	5 years	\$75,000	Coorong
Improving Coorong District Hydrogeology Understanding	Improved understanding of current dryland salinity & hydrogeology – Public Update	Natural Resources SAMDB	7 months	\$3,000	Coorong



Left: EM38 map image for clay finding

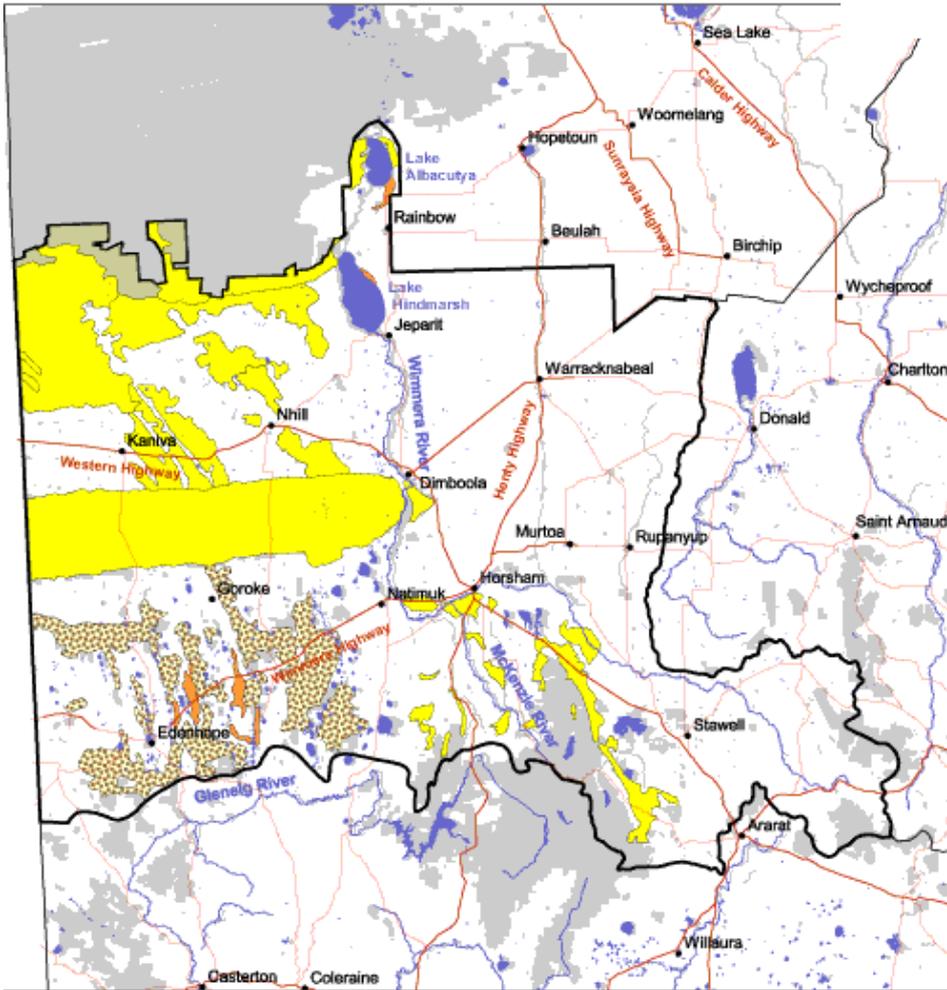
Right: Rip lines showing yield response from Yeoman's Plough with inclusion plates



South Australia: The areas this project would tackle are the deep sandy grazing country around Meningie, along the Coorong, North of the Dukes Highway, and through sections of the mid South East.

South East – Sandy Soils: 676,870 hectares, 22.3% of total area

WIMMERA - VICTORIA

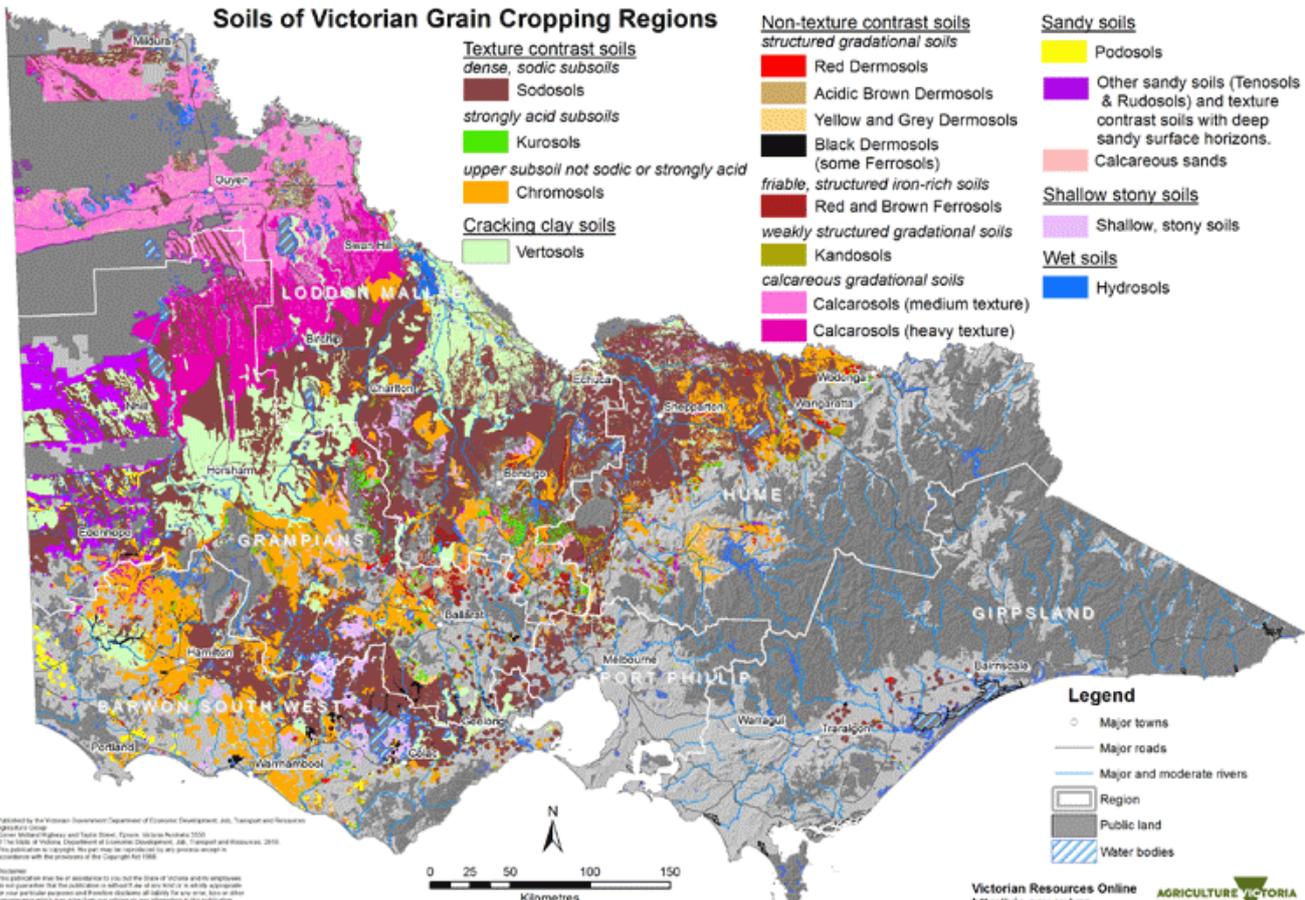


Sandy Soils

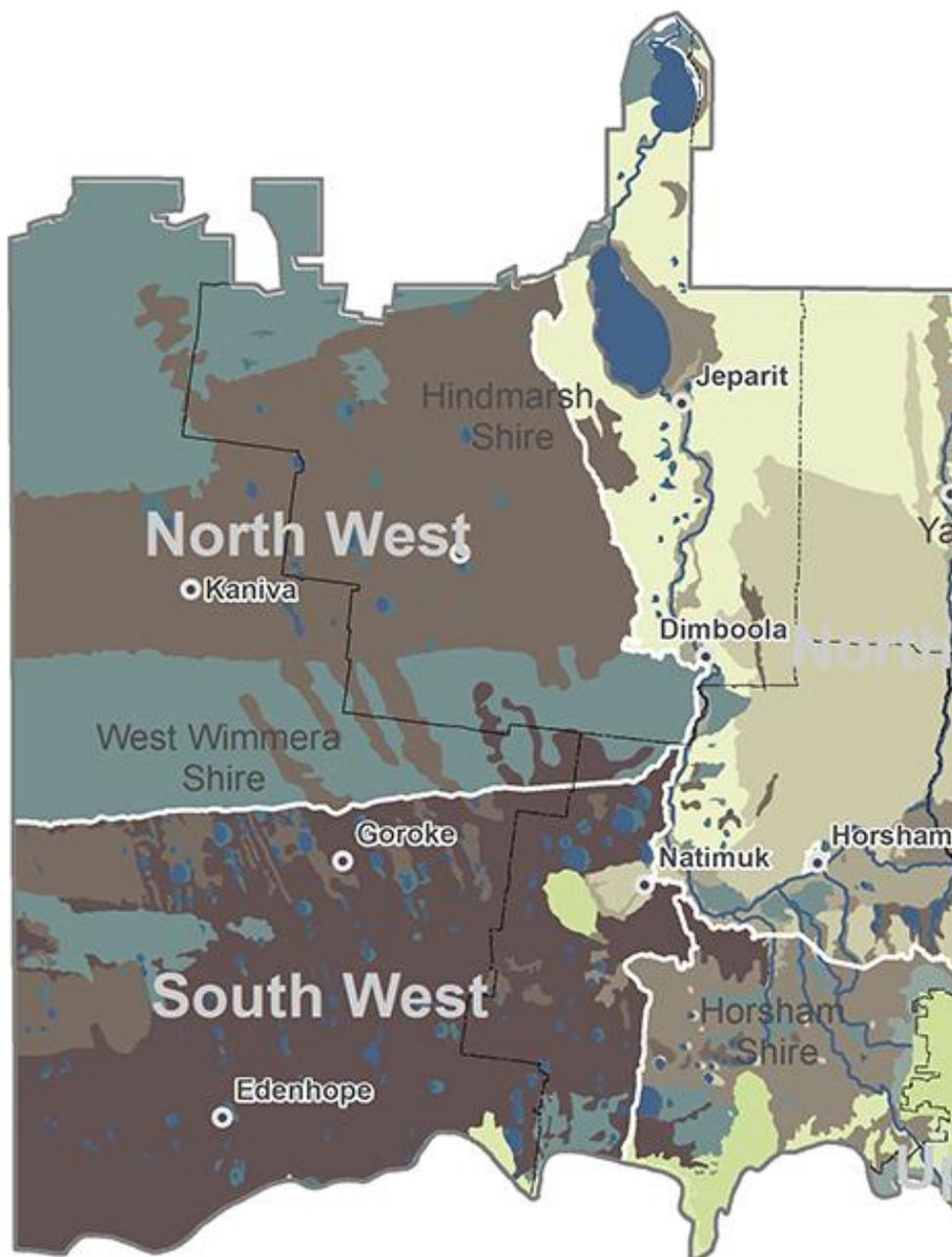
- Sandy soil type**
- Deep sands (Rudosols and Tenosols) [on sand dunes]
 - Deep sands (including Podosols) - occur with other soils (sand plains and rises)
 - Sandy soils (associated with lunettes)
 - Sandy soils - occur with other soils (dunes and sand plains)



0 20 40 60 Kilometers



Published by the Victorian Government Department of Economic Development, Jobs, Transport and Resources
Agriculture Victoria
21 Snowy Mountains Drive, Melbourne, Victoria 3048
© 2013 Victorian Government. All Rights Reserved. All trademarks and registered trademarks are the property of their respective owners.
This publication is copyright. No part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the Victorian Government.
For further information, visit the Victorian Government website at www.vic.gov.au



This map has been designed for illustrative purposes only. It is not to scale.



Dune Field Sands

Victoria: The areas characterised by Dune Field Sands would be the target area for this project.

Wimmera – Sandy Soils: 381,904 hectares, 21.7 % of total area *approximately*

Wimmera Catchment Management Area Region total area:

2,344,679 hectares

Podosols total: 40,200 hectares (1.7%)

Other sandy soils total: 573,557 hectares (24.5%)

TOTAL AREA: **613,757 hectares (26.18%)**

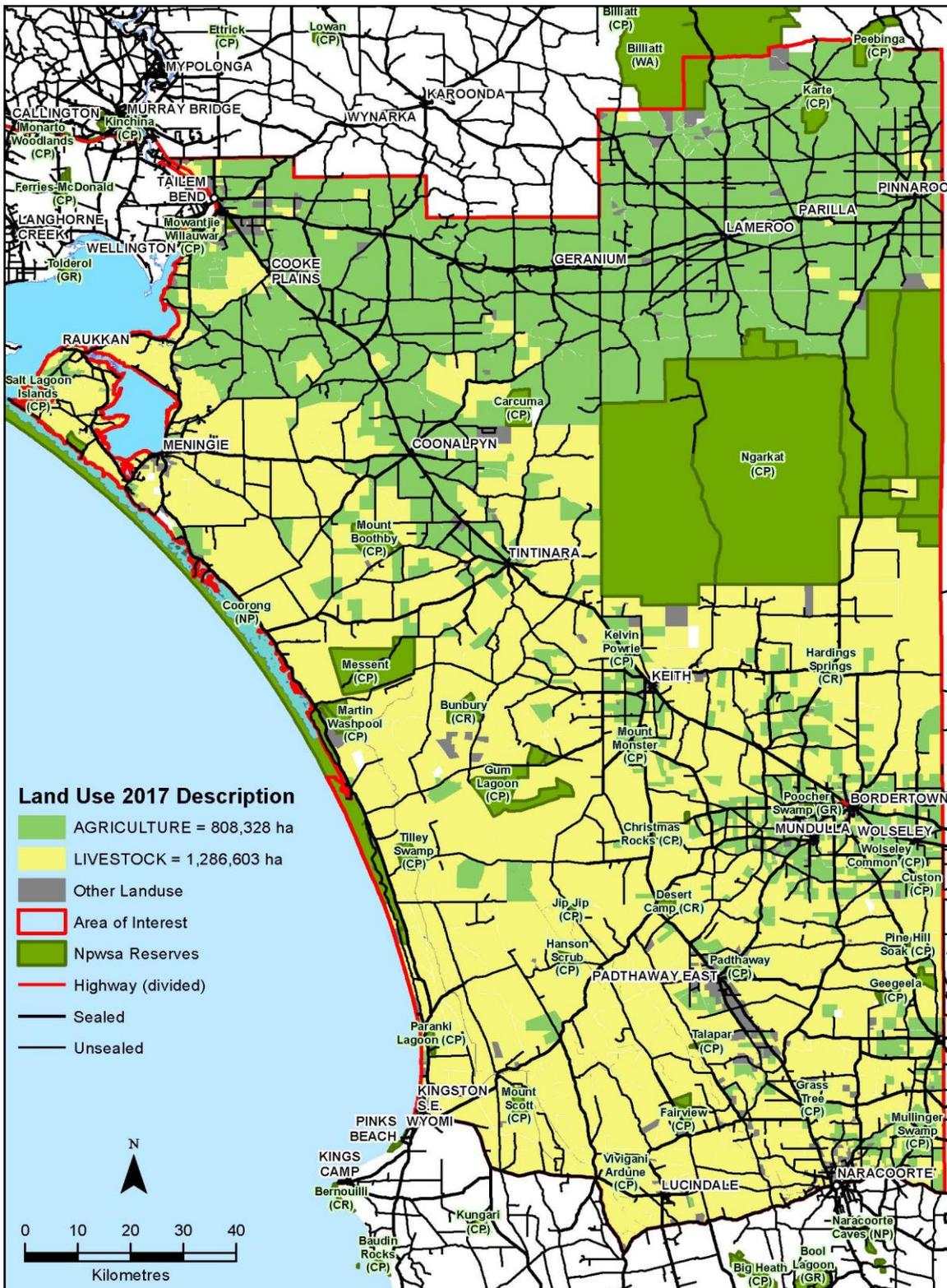
Podosols within grain cropping area: 31,885 hectares

Other sandy soils within grain cropping area: 326,477 hectares

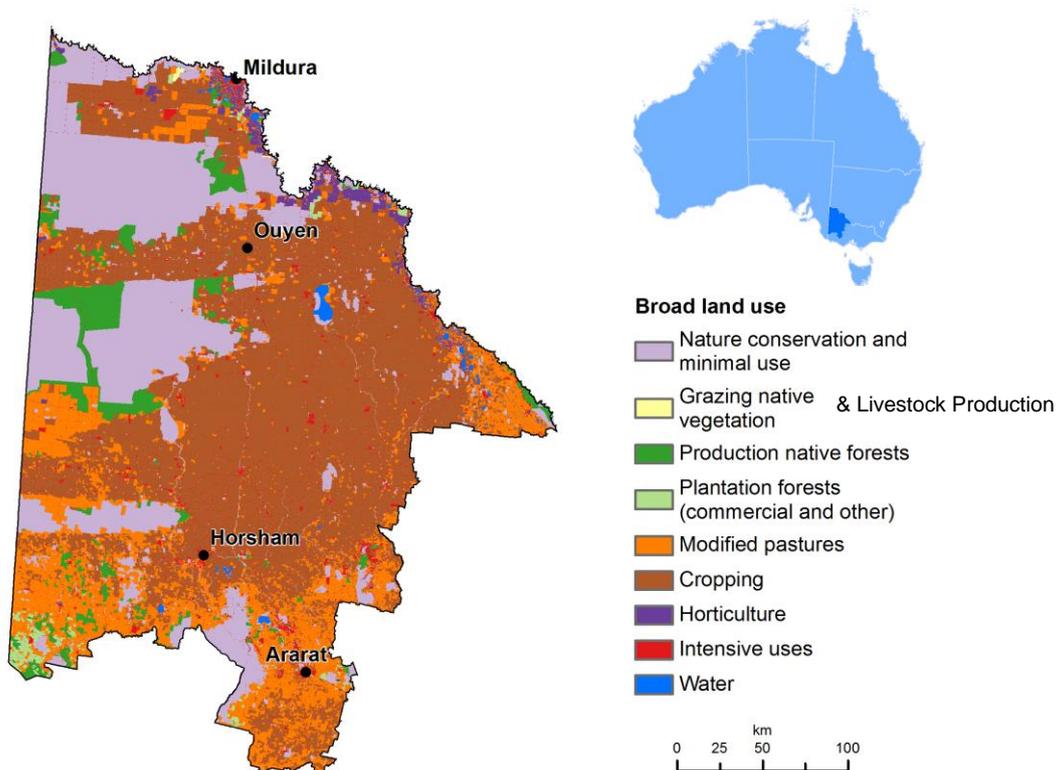
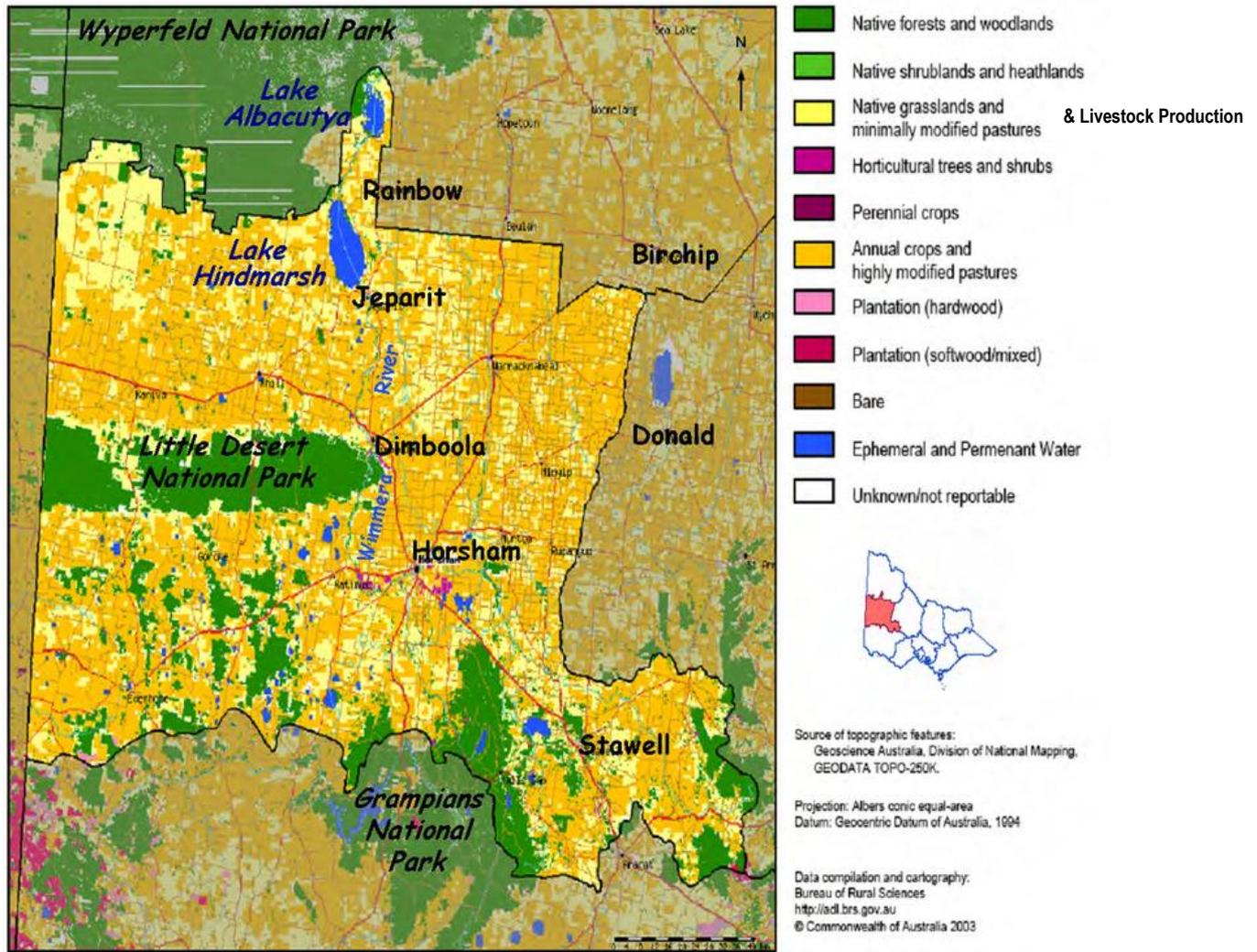
LAND USE – South East & Southern Mallee, South Australia

Agricultural landuse

SOUTH AUSTRALIA



LAND USE – Wimmera, Victoria



ATTACHMENT 4 – CLAY AND HAY INCREASES YIELDS ON SE SANDS

Clay and hay increases yields on SE sands

Authors: Melissa Fraser¹, Nigel Wilhelm², David Davenport¹

Research Team: Peter Telfer², Brett Masters¹, Claire Dennerley¹

¹PIRSA Rural Solutions SA, ²South Australian Research & Development Institute

Funded By: GRDC Sandy Soils CSP00203

Project Title: Increasing production on sandy soils in low and medium rainfall areas of the Southern Region

Key Messages

- Positive crop production responses still remain at Cadgee five years after amelioration treatments were applied.
- Application of clay improved establishment and flowering biomass, regardless of incorporation depth (shallow, 10 cm and spaded, 30 cm), compared to the control and the spaded lucerne treatments (Fig. 1).
- Grain yield response to clay application increased with the depth of incorporation, and were doubled in the spaded clay + Luc treatment compared to the control, adding 1.58 t/ha in 2018.
- Over the long term, this treatment has produced an additional 95 % grain (4.5 t/ha) since 2014 (four years grain data; Fig. 2).
- Changes in soil chemical, hydrological and physical characteristics as a result of spading and lucerne and clay addition were the focus of 2019 soil measurements at the site.
- A full report detailing temporal trends and long term soil fertility changes will be released soon.

Why was the project undertaken?

The objective of this trial was to assess changes in crop productivity as a result of overcoming the chemical, physical and biological constraints of a sandy soil at Cadgee.

How was the project undertaken?

Soil amendments including clay, lucerne hay and fertiliser were incorporated into the top 30 cm of the sand either alone or in combination to assess their impact on crop production and soil fertility. Amendments were applied in 2014 and incorporated using a spader; they have not been reapplied. Long term crop productivity gains were best attained when clay was applied, adding ~1.6 t/ha over a 5 year period when incorporated in the top 10 cm and ~2.5 t/ha when mixed to 30 cm (Fig. 2). An additional 2 t/ha was gained when lucerne was added to the spaded clay treatment (95% increase above the control).

Acknowledgements

We acknowledge the assistance and contribution of Karatta Pastoral, the co-operators at the site. CSP00203 Sandy Soils is a collaboration between CSIRO, University of South Australia, SA state government through Primary Industries and Regions SA, Mallee Sustainable Farming Inc, AgGrow Agronomy and Trengove Consulting.

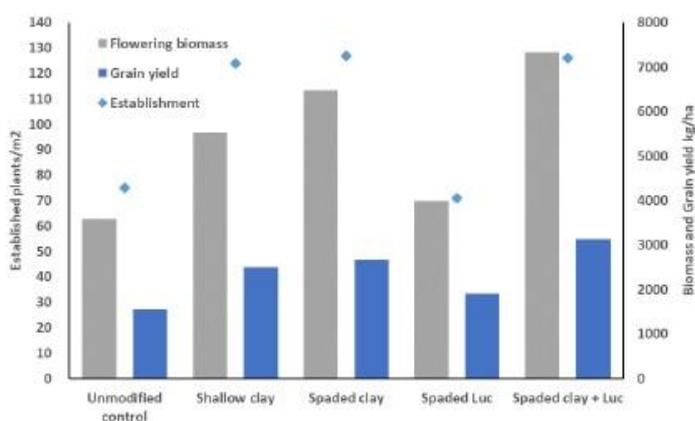


Figure 1. Crop measures for key treatments at Cadgee in 2018.

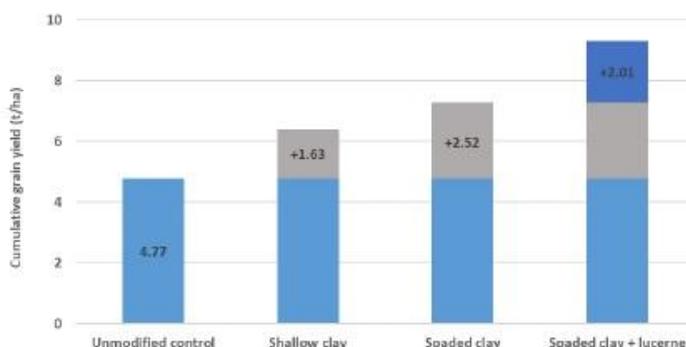


Figure 2. Total grain produced (2014/2015/2017/2018). Bars show the baseline control (blue), gains from the application of clay (grey), and additional gains from the 2014 incorporation of Lucerne hay (dark blue).