

June 2024

# Building drought resilience of vulnerable soils in low rainfall cropping and grazing systems

CASE STUDY

## Using biosolids in soils of the Victorian Mallee





Brian and Cheryl O'Callaghan, along with their son and daughter in law Adam and Liz O'Callaghan, operate a 6500-hectare farm near Ouyen. The O'Callaghan's run a cropping program of wheat, barley, canola, and legumes and opportunistically graze sheep.

Brian and grandson Teddy

Much of the family farm is on a Mallee dune swale system consisting of very light calcareous soils which are highly susceptible to wind erosion.

The O'Callaghan's have been investigating ways to stabilise these soils, increase ground cover persistence, increase agricultural productivity and profitability, and promote a faster paddock recovery in dry times.

This demonstration site investigated the short and long-term impact of using biosolids to promote crop growth and increase ground cover. Two different application rates of 3 t/ha and 6 t/ha of biosolids were applied before sowing in 2014. Biomass and yield assessments were taken in 2014 and 2015 and

ground cover assessments were undertaken across the 2023 season.

Rainfall for the 2023 season was 329 mm with a growing season rainfall of 207 mm.



Image: Aerial view of the trial site, Google earth

## Key Learnings

- Biosolids can be used by farmers as an alternative source of nutrients. Their use on-farm needs to be carefully managed to protect users, the public and the environment.
- An online tool was developed to provide information about key considerations before using biosolids on farm, link provided below:

<https://agriculture.vic.gov.au/farm-management/soil/composting/compost>

- There was no longevity of biosolids observed in the soil as 9 years after the initial application of biosolids, 2023 ground cover was the same across the treatments and control.

## Why use biosolids?

The Victorian Mallee has some of the most vulnerable soils in Australia. When managed through proven, innovative processes, these soils can be productive. Reducing erosion of these soils through increased ground cover is paramount to assist with the stabilisation of carbon in the soil and associated nutrients such as nitrogen.

The Australian and New Zealand Biosolids Partnership defines biosolids as the major by-product of the human wastewater treatment process. Biosolids contain organic matter, moisture, nutrients, and trace elements, and as such are increasingly being viewed as a resource in agricultural industries as an alternative source for both micro and macronutrients.

The addition of nutrients into the soil can lead to improved soil structure and water-holding capacity, in which water and nutrient limiting soil environments can be beneficial for plant production.

In Victoria the use of biosolids on farm is regulated by the Environment Protection Authority (EPA) to ensure that the risk from contaminated biosolids is managed to prevent impacts to both users, the general public and the environment. The use of biosolids is a heavily regulated process requiring EPA approval and expensive and rigorous soil testing prior to application.



Image: Biosolids.

An online tool was developed to provide information about key considerations before using biosolids on farm which can be accessed here: <https://agriculture.vic.gov.au/farm-management/soil/composting/compost>.

## Biomass and Yield

### Biomass and yield 2014 (barley) and 2015 (wheat)

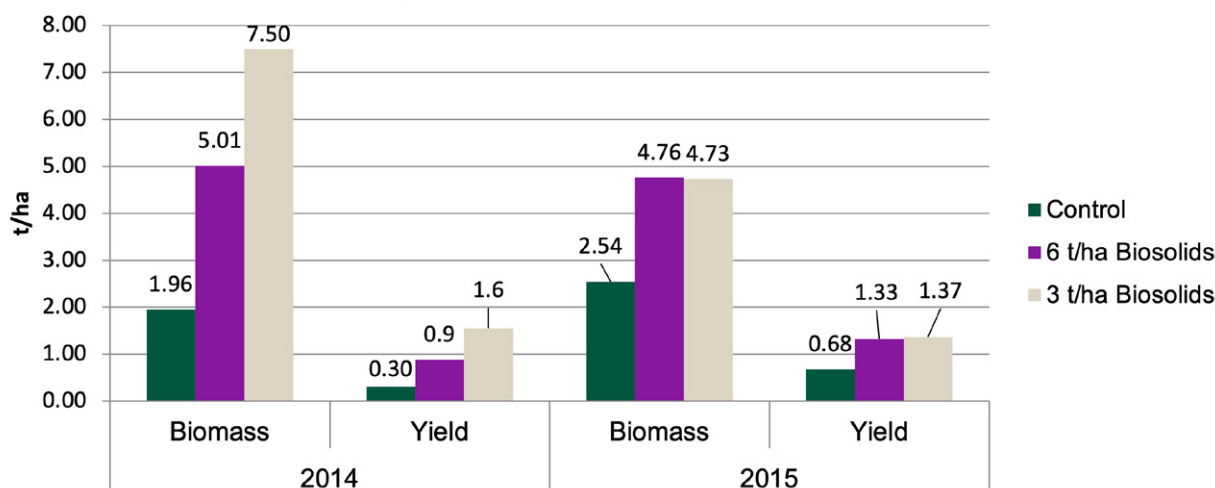


Figure 1. Biomass and yield from the trial site 2014 and 2015.

The initial application of 6 t/ha of biosolids increased yield by 200% whilst the application of 3 t/ha of biosolids increased yield by 433%.

In the second season there was a 96% yield increase in the 6 t/ha treatment and 101% increase in the 3 t/ha treatment.

The trial site was sown to vetch in 2023 and was cut for hay in September 2023.



Image: Trial site, May 2023

## Ground cover and rainfall

Total Vegetation Cover (TVC) was assessed from the MODIS Fractional Cover Product. The Total Fractional/Vegetation Cover includes the sub-pixel proportion of both photosynthetic (green) vegetation and non-photosynthetic (dead/stubble) vegetation. This was assessed over the trial area (Figure 2) from 2002 through 2023 (long-term average).

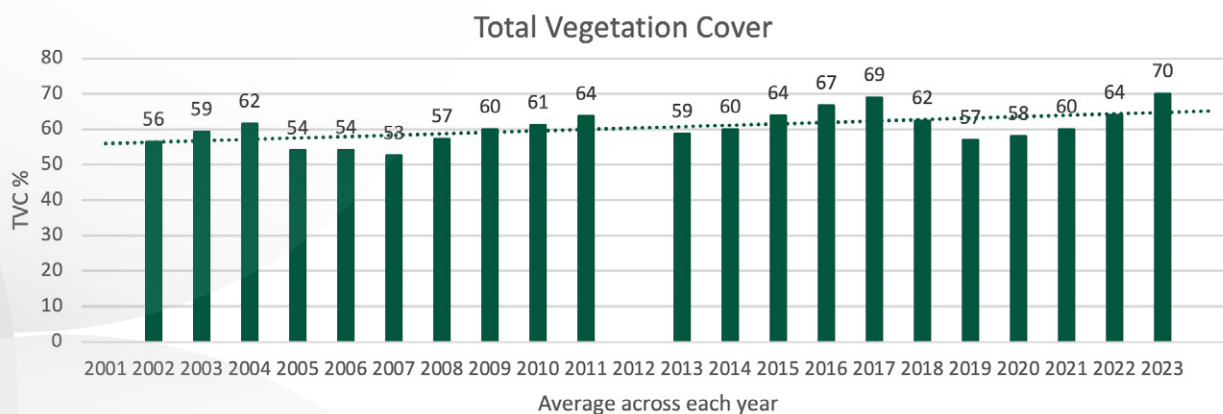


Figure 2. Average Total Vegetation Cover as a % of ground that is covered across the site from 2002 to 2023.

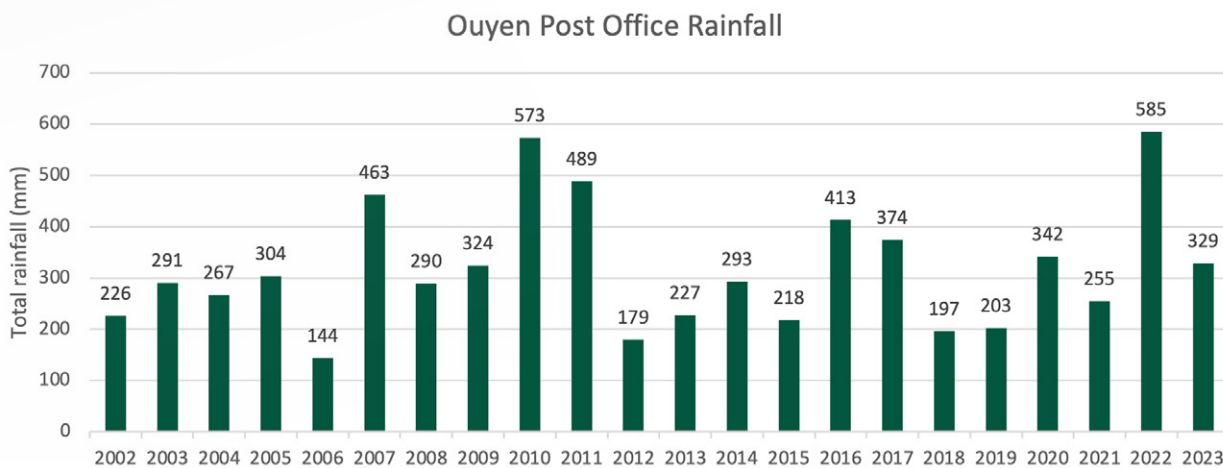


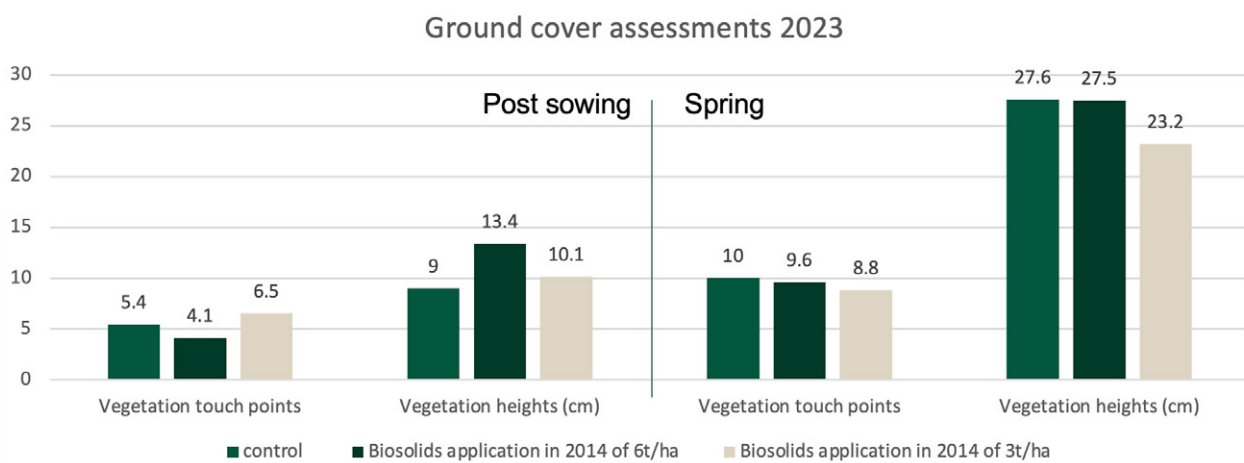
Figure 3. Rainfall.

Rainfall totaled 329 mm in 2023 (Figure 3) at the site, with growing season rainfall 207 mm. The average TVC across 2023 was 70%, 12% above the 22-year average of 58%. Similar rainfall was observed in 2008, 2009, 2017 and 2020 but only 2017 had comparable ground cover.

Ground cover assessments were taken across the treatments using the Mallee Catchment Management Authority In-Paddock Ground cover Assessment Standards post sowing (May 2023) and in spring (August 2023). Spring ground cover was less dense in both the 3 t/ha (4%) and 6 t/ha (12%) treatments compared to

the control. Spring vegetation heights showed the treatments had similar heights in both the 3 t/ha (15.9% shorter) and 6 t/ha (0.35% shorter) treatments compared to the control.

The paddock was cropped and grazed as part of the O’Callaghan’s usual farm management practices over the 9 years since the initial application of biosolids in 2014. Ground cover was similar across the treatments and control in 2023 indicating that there may no longer be benefits observed from the application of biosolids to the soil.



**Figure 4.** Ground cover assessments.

This project is supported by the Mallee Catchment Management Authority, through funding from the Australian Government’s Future Drought Fund. For a copy of the full technical report email [rebecca.mitchell@agriculture.vic.gov.au](mailto:rebecca.mitchell@agriculture.vic.gov.au)

**Disclaimer**

Whilst all attempts were made to represent the data as accurately as possible the Department of Energy, Environment and Climate Action accepts no responsibility for any actions or decisions made associated with information presented in this case study. This document is provided to showcase learning from an unreplicated, one growing season demonstration site.

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