

Focus Paddock Report

Deep ripping to increase access to stored soil moisture

Focus Paddock Summary

The aim of the focus paddock was to see if deep ripping could increase the size of the bucket (plant available water) by removing any compaction and allowing roots to access stored moisture deeper into the soil profile. The focus paddock was under a lateral move irrigator in a paddock that had been unfarmed for several years. With the help of TTQ engineering a strip running the entire length of the paddock was ripped prior to a canola crop in 2021.

In both the 2021 and 2022 crops we saw a slight decrease in yield in the deep ripped strip in comparison to the rest of the paddock. Soil pits were dug in 2023 and we could see no difference in root depth of the cotton crop present and no obvious physical difference in the pits in the ripped and unripped areas.

Key learning from this focus paddock was you can't fix a chemical problem with a physical solution. We need to invest the time and money in investigating the problem and understanding the soil constraints present in the paddock before investing in solutions. Sodidity was an issue and should be the first problem addressed when trying to improve the performance of soils within the paddock.

Background & Paddock Aims

In long-term irrigation paddocks water holding capacity and soil moisture availability are commonly constrained by compaction and lack of soil organic matter. The focus paddock aims to strategically rip to increase the size of the bucket by removing compaction and allowing roots to access stored soil moisture deeper in the soil profile.

Murray LLS conducted subsoil manuring experiments on irrigated paddocks in Deniliquin and Logie Brae showed that 20t/ha manure deep ripped using specialized machinery led to substantial yield increases, ranging from 25% to 110% depending on season and site. Broadcasting manure helped to provide nitrogen and improve surface structure but it didn't improve root growth into the subsoils. Despite the impressive yield gains LLS concluded that even with increases of \$450/ha it would take at least 4 years to repay the cost of ameliorating at depth¹.

The Optimising Irrigated Grains soil amelioration site at Noorong had shown good yield increases in its first year. This site had used lucerne pellets instead of manures and in the first year deep ripping only and surface applying lucerne pellets significantly increased yield over the untreated. Deep ripping and applying organic amendments at depth did not significant increase yield over deep ripping alone or the surface application of lucerne pellets².

We wanted to see if we could get similar yield results as the above trials but reduce the costs by using commercially available equipment. TTQ loaned us a Raptor to conduct the demonstration, this machine is designed to go to 620mm, with semi-parabolic tynes and inclusion plates to maximise cross-fracture and top soil inclusion.

Focus Paddock Details

Location	Pretty Pine
Crop type 2021	Canola
Crop type 2022	Wheat
Irrigation system	Lateral Move

Methodology

Trial treatments:

- 1) Untreated
- 2) Ripped

The ripper was TTQ Raptor with 9 tynes spaced at 600 mm with a tow behind steel crumble roller. Tractor was a Case Steiger 500 Hp. Ripping speed was 4 KPH (at 450mm depth) and the fuel consumption was 96 Lts/Hr. Coverage rate was about 2.1 Ha/Hr.

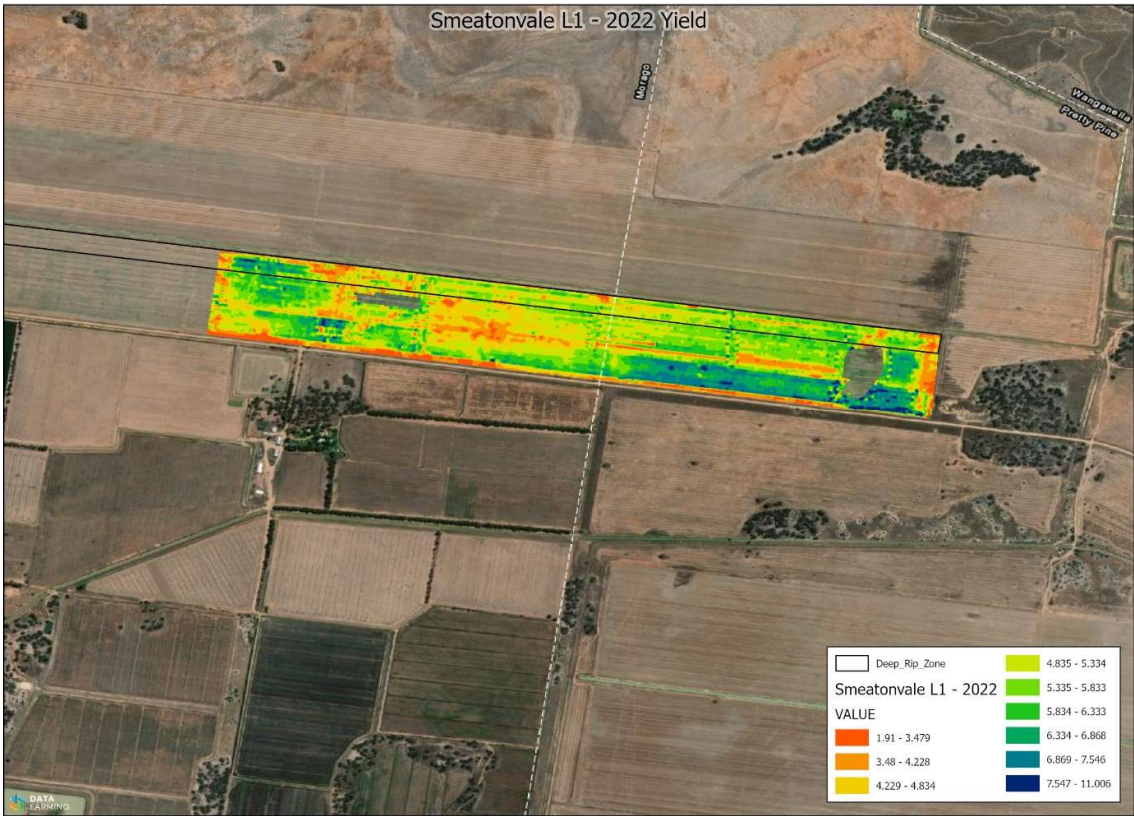
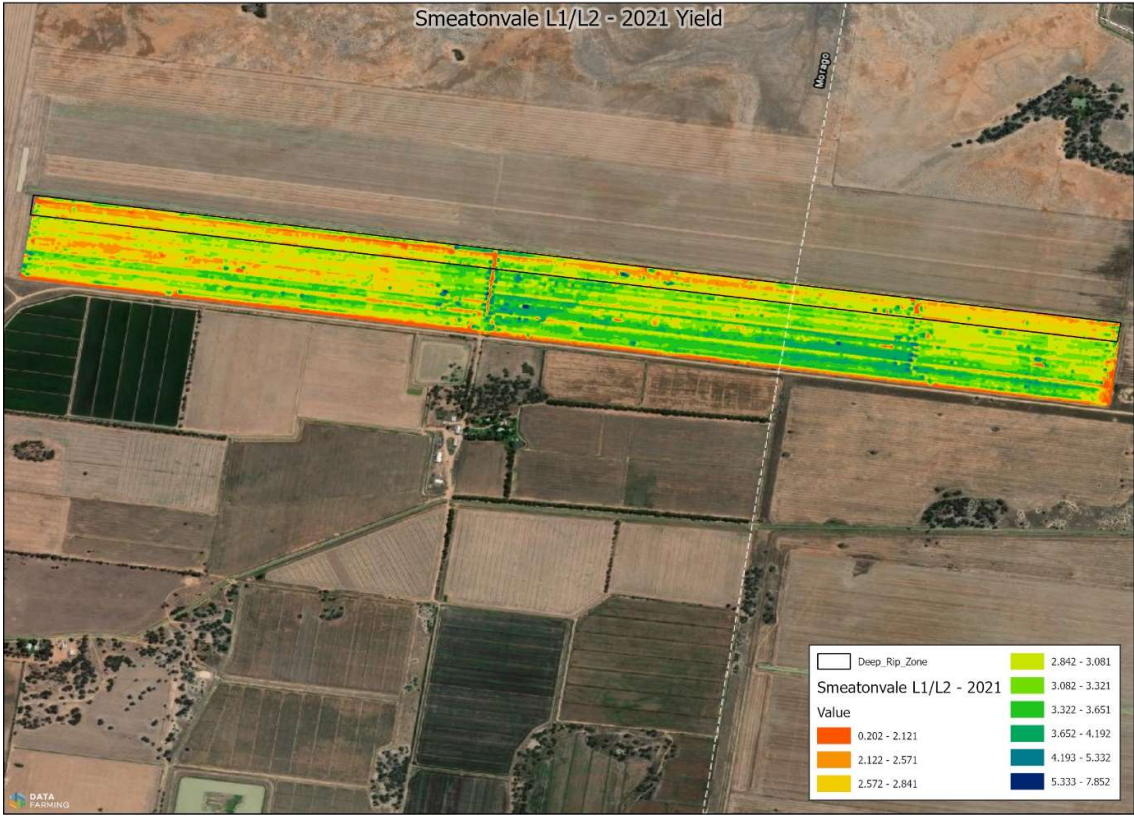


Once the deep ripping treatments were applied all other cropping operations were the same across the entire paddock.

Results

Yield Reponses:

Smeatonvale - L1/L2	Deep rip trial	Rest of field	Difference (%)
2021 - Canola	2.78 t/Ha	3.08 t/Ha	-10.8%
2022 - Wheat	5.13 t/Ha	5.34 t/Ha	-4.1%



Soil Responses:

In March 2023, two soil pits were dug on each in the ripped and un-ripped areas, and research hydrologist Sam North compared the two pits at an Irrigation Discussion Group field walk. The pits were dug about 15 months after ripping had occurred and the key learnings from this were:

- Roots from the cotton crop established following the canola were getting to about 50cm deep
- There were no obvious physical changes between the ripped and unripped soil pits
- There may have been a slight effect with pH testing suggesting some mixing of acid soils between layers
- The 2022 winter growing season was very wet. Sodic soils when wet, disperse resulting in the filling of soil pores, decreasing the flow of air and water through the profile and increasing waterlogging.

A video was taken of the day and can be viewed here: [How soil amelioration in irrigated crops can affect yield and profit - YouTube](#)

Key learnings & recommendations

Key learnings from the deep ripping focus paddock were:

- To avoid investing heavily in a solution that doesn't work, investigate first. Dig a hole, soil test and do a dispersion test to figure out exactly what's constraining yields before implementing a strategy to manage.
- Where sodicity and dispersion are an issue, any opening of the soil profile created by deep ripping can be quickly undone particularly under irrigation or in wet seasons.
- Despite the promising first year, the research team as part of linked project "Development and validation of soil amelioration and agronomic practices to realise the genetic potential of grain crops grown under a high yield potential, irrigated environment in the northern and southern regions" have also found that they have not seen any improvement as a result of deep soil amelioration over the life of the project with ongoing improvements appearing to be solely related to improved nutrition as a result of incorporating lucerne pellets³.

Previous research conducted as part of GRDC's "soils under an irrigated environment" project recommended applying gypsum to the surface. Although deep ripping is not generally recommended for sodic soils, applying before ripping has also been shown to be effective in the past⁴. Further investigation into ways to improve soil structure and manage sodicity through the soil profile are needed.

References:

1. Fowler, J. (2020) Subsoil manuring: is it worth it? <https://www.ils.nsw.gov.au/regions/murray/articles,-plans-and-publications/production-advice-sept-2020/subsoil-manuring-is-it-worth-it>
2. Poole, N. et al (2020) Optimising Irrigated Grain, Winter Crops, 2020 Provisional Research Results [210224-OIG-Provisional-Report-FINAL.pdf \(irrigatedcroppingcouncil.com.au\)](#)
3. Personal communication with Damian Jones, Irrigated Cropping Council
4. North, S et al (2017) Soils under an irrigated environment: ICF0008 Final technical report, NSW Department of Primary Industries

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Acknowledgements

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