Department of Primary Industries and Regional Development

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Strategic deep tillage and crop rotation for improving the productivity of non-sodic heavy soil in the low rainfall regions of WA

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Background

Non-sodic heavy soil

- Topsoils are fertile & well structured
- BUT the subsurface soils are:
- Dense clay with poor structure;
- Alkaline (high pH) & calcareous;
- This prevents root exploration for water and nutrients;
- Do not reach the grain yield potential

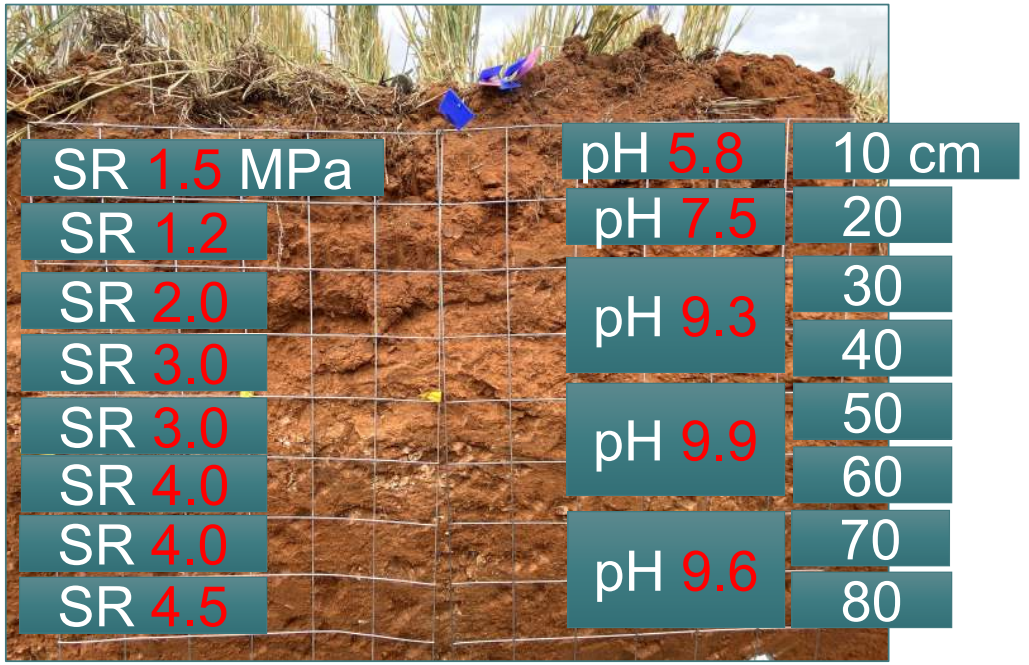

Fig: A vertical opening of a non-sodic heavy soil in Bencubbin

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Materials and Methods

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Aim

To investigate whether the loosening of dense layers through a strategic deep ripping followed by growing crops with vigorous root systems can improve exploration of roots in subsurface soil and crop yield in subsequent years.

Trial establishment and cropping details

Year 2020	Summer 2020	Winter 2021	Winter 2022	Winter 2023
Deep ripping (40 cm)	Summer crop	Fallow		
Slanted-leg soil Loosening Paraplough	(Super Sweet Sudan, SSS)	Barley	Grass root type	
		Bonito Canola	Taproot but less vigorous	
		Trident Canola	Taproot but more vigorous	
		Chickpea	Deep tap root	
		Vetch+Oat	Tap and grass root mix	

Barley Barley

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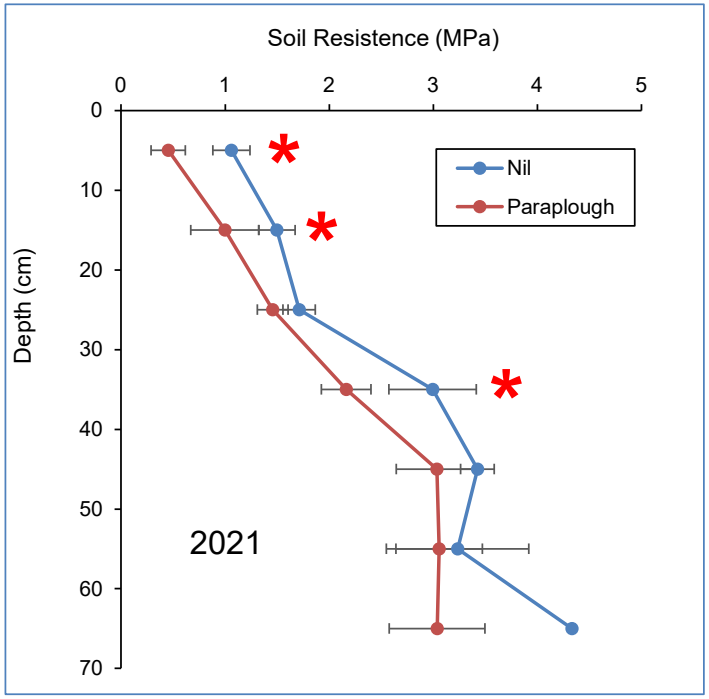
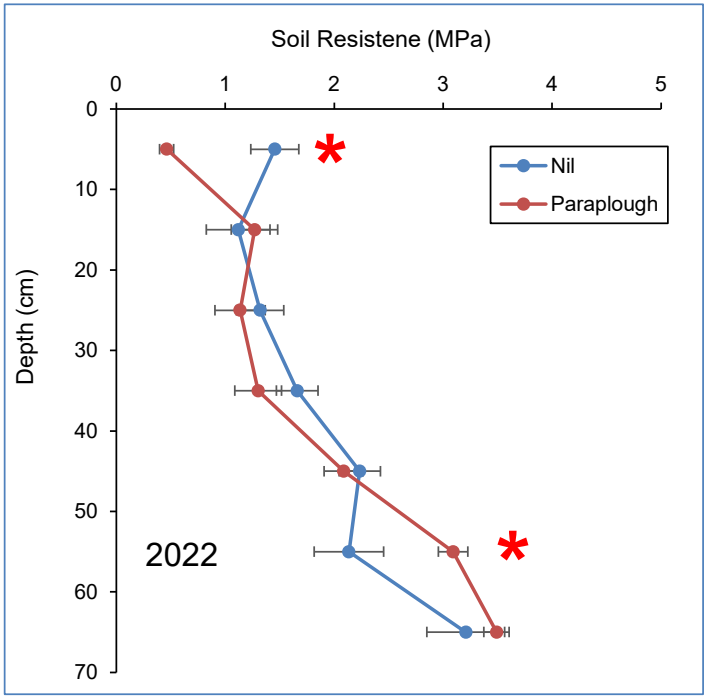
Results

Soil strength



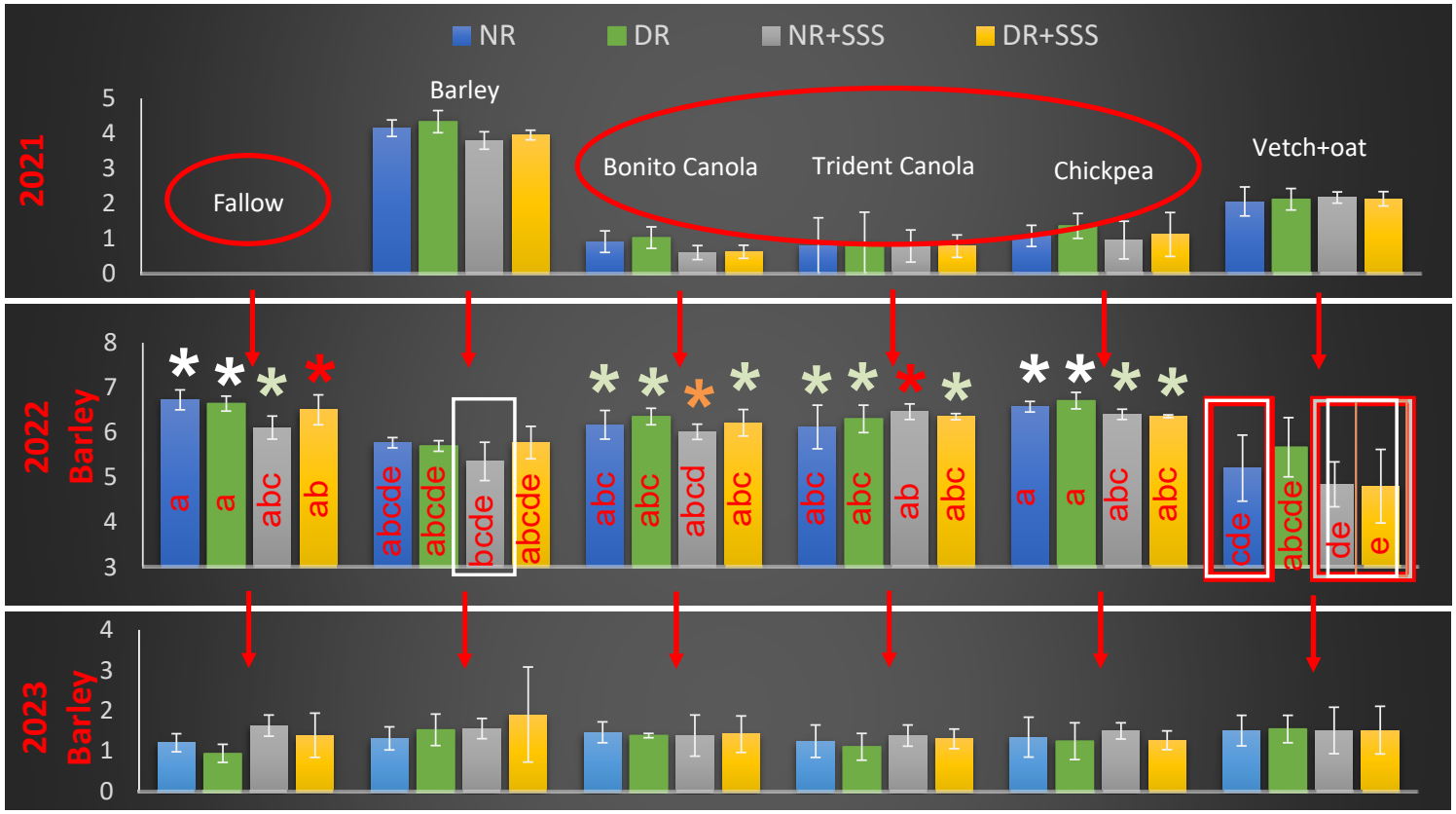


*significant at P<0.05

Short-term improvement in soil resistance

Results

Yield (t/ha)



* significant at P<0.05

Deep ripping and SSS had NO impact in any seasons

Crop Species significantly impacted barley yield in 2022

NO Yield response in 2023 due to extreme dry season (GSR 111 mm, Decile 1)

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Conclusion

Take home message

1. Deep ripping had no significant impact on the crop yield compared to no ripping in this dense, non-sodic, heavy soil.
2. Summer crops such as Super Sweet Sudan forage sorghum could be used to fill the feed gap for grazing because it had no negative impact on the yield of the following crops.
3. Barley yield can significantly increase following a fallow or a break crop compared to continuous barley.

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Thank you

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Important disclaimer

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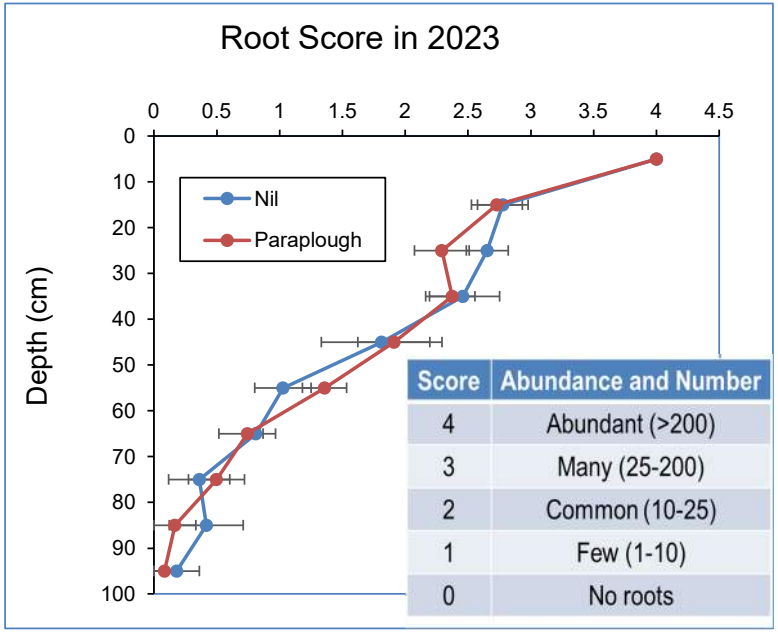
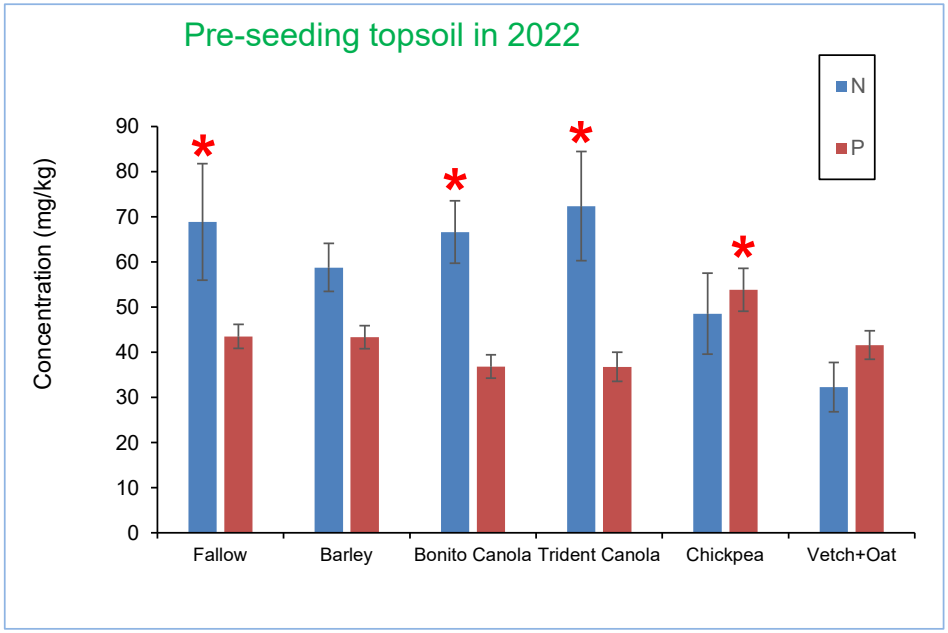
Discussion

Factors affecting yield

- Subsurface soil strength: Short-term
- Root growth in subsurface soil: Limited



- Nutrient availability: Increased



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- Less weed and disease: Break crop

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