Department of Primary Industries and Regional Development
GOVERNMENT OF WESTERN AUSTRALIA

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Soil re-engineering: building better soils to maximise water-limited yield potential of grain crops on sandy soils in Western Australia

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Global Sandy Soil Conference I 23 July 2025

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Projects: DAW00252, DAW1902_003RTX, DAW2407-001SPX

The new frontier

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Soil strength
Aacidity
Non-wetting
Depleted nutrition
Small water bucket


Photo: Margaret Roper

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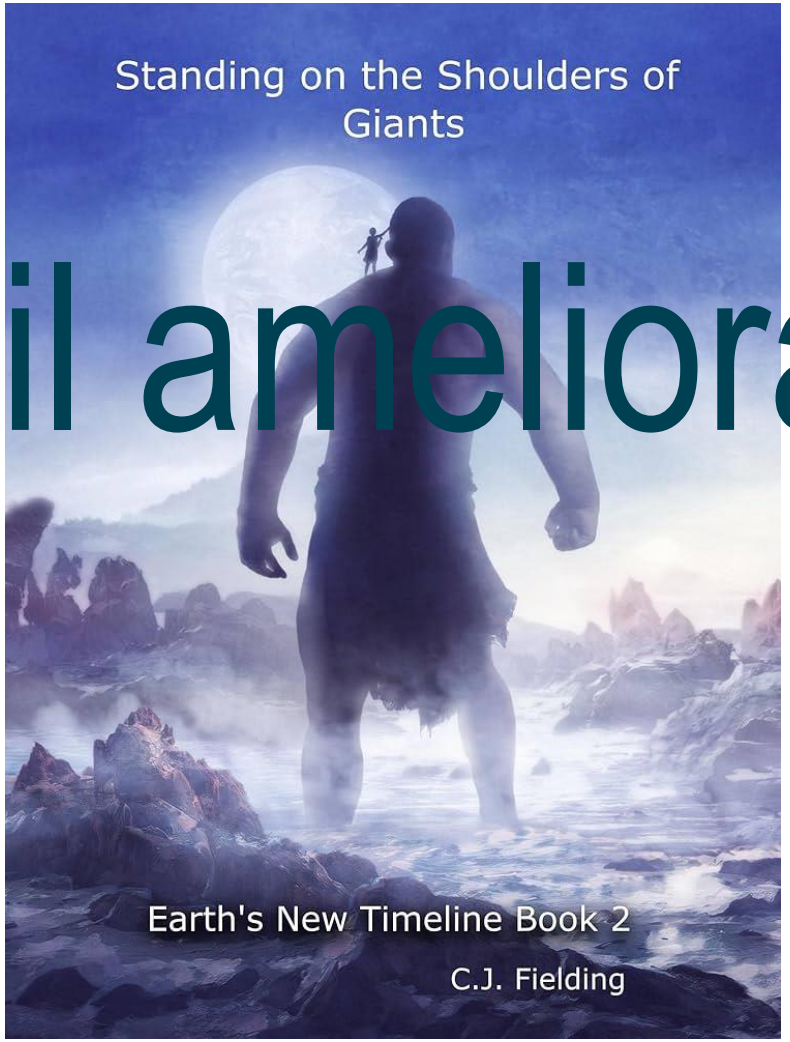
An acknowledgement



Soil amelioration

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Yield doubled

Source: BOM-ABARES-DPIRD

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Yield gap (Laws et al. & Harris et al.)

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WUE ~12 kg/mm

Source: BOM-ABARES-DPIRD

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Reengineering soil to remove the yield gap

Pilot trial at Kalannie (2018), WA

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Objectives of soil re-engineering (80 cm depth)

- ➢ Fix compaction (1.5 g/cm^3), acidity (pH >4.8, Al <3 mg/kg), water repellence (MED <1.5)
- ➢ Increase water holding (clay & OM)
- ➢ Remove nutrient deficiencies (OM and inorganic nutrients)
- ✓ Absorb all rainfall and keep it accessible
- ✓ Deeper root systems that can use water (and nutrients) throughout the season to finish the crop

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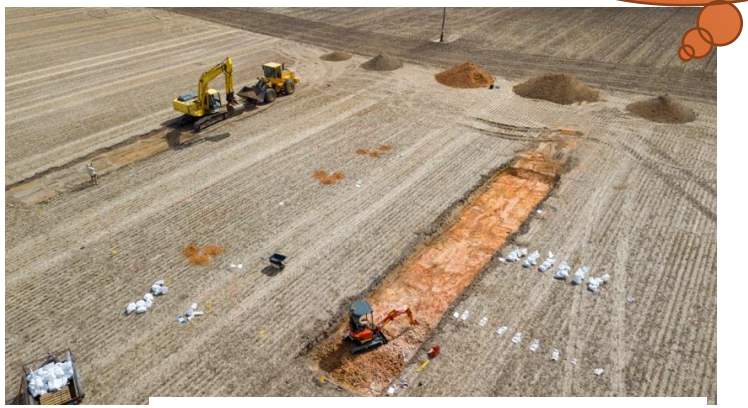
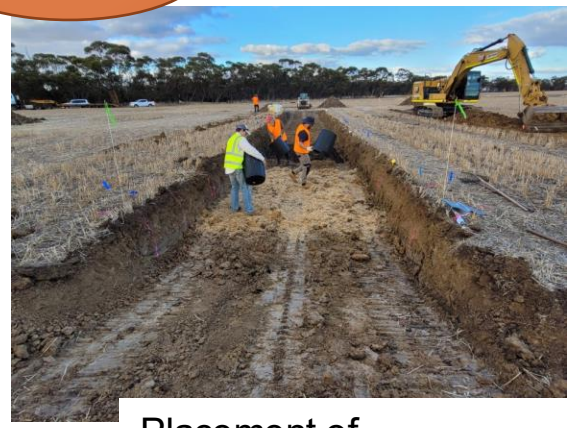
Trial establishment

Trials within the grower's CTF system with same crop management

Identification of soil constraints



Excavation by zones with different constraints



Placement of amendments

Incorporation of amendments

Achieving prescribed bulk density

Preparing for a good seedbed

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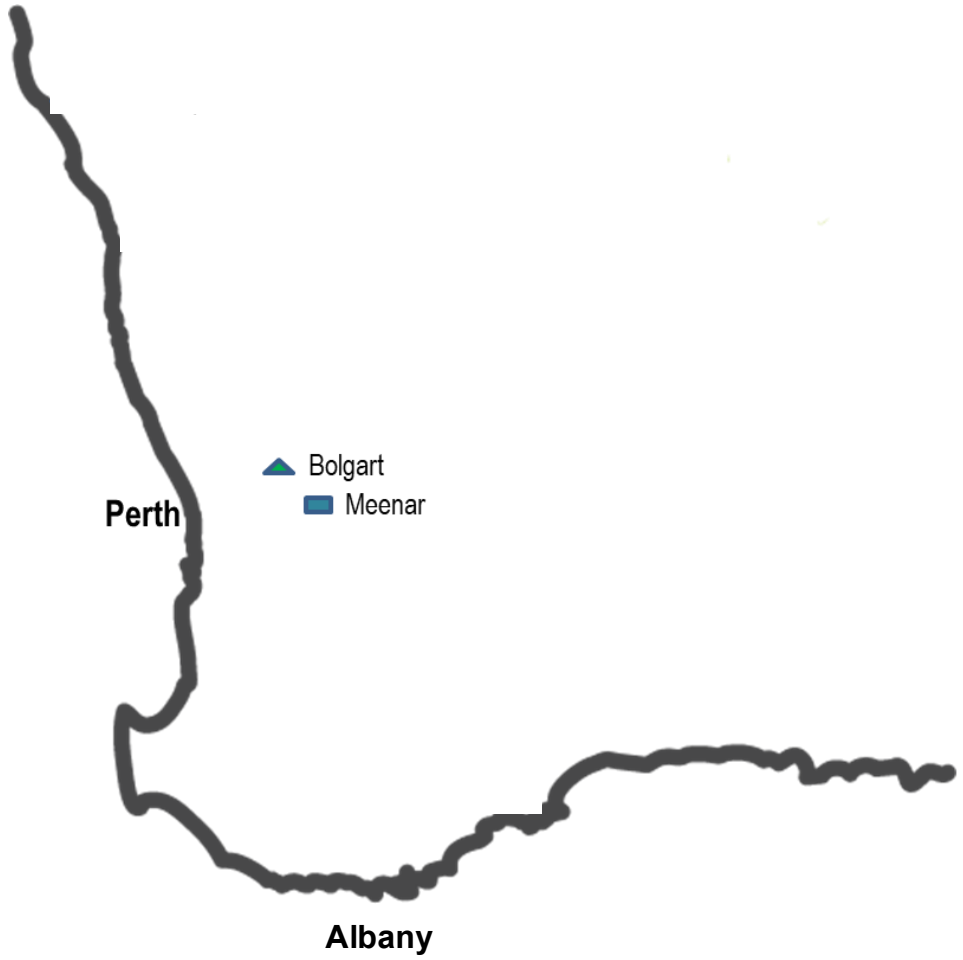
Soil types at two sites

Bolgart

Deep yellow sand - moderately acidic (Arenosol)



Meenar

Loamy duplex – acidic (Kurosol)

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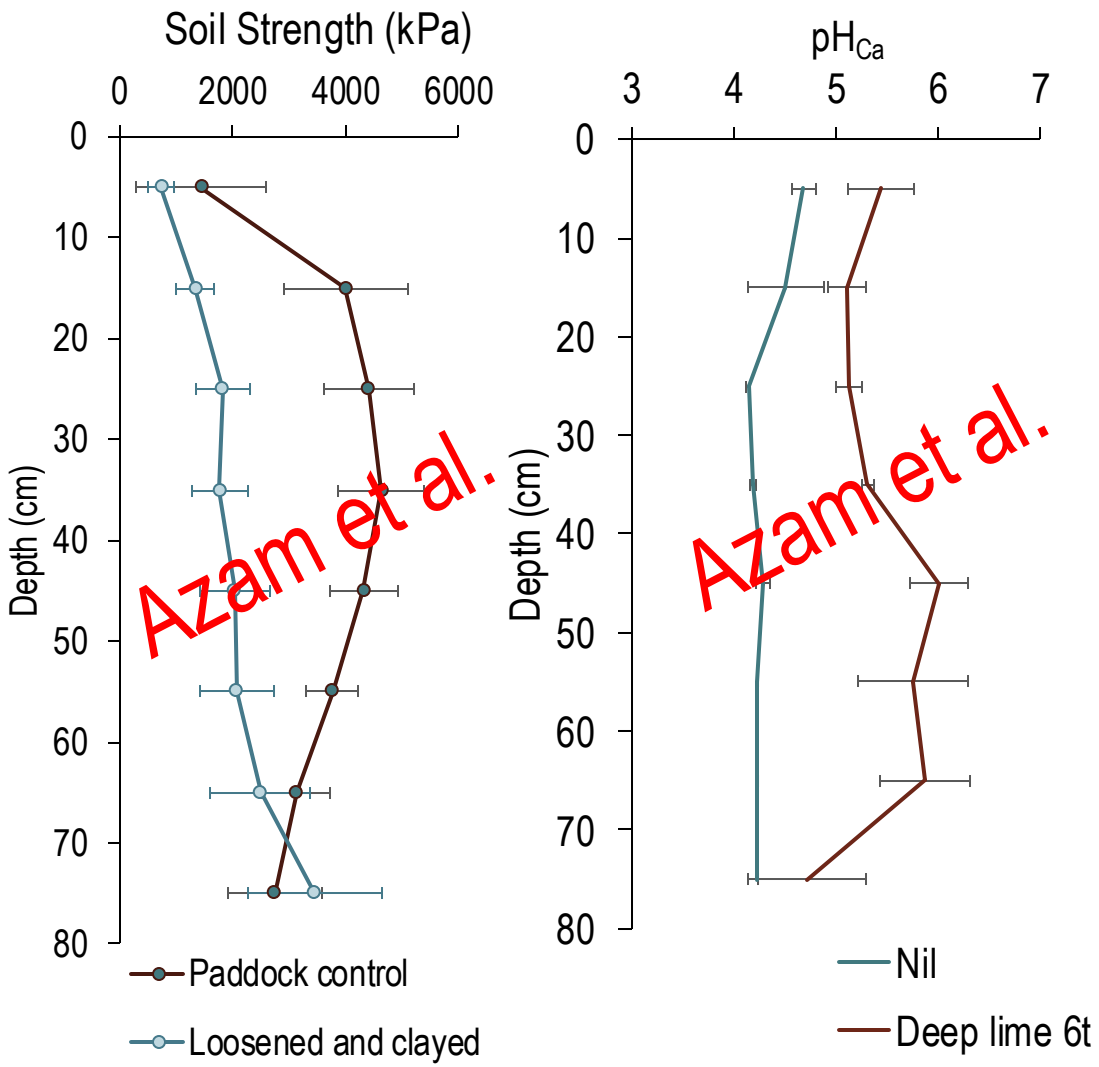
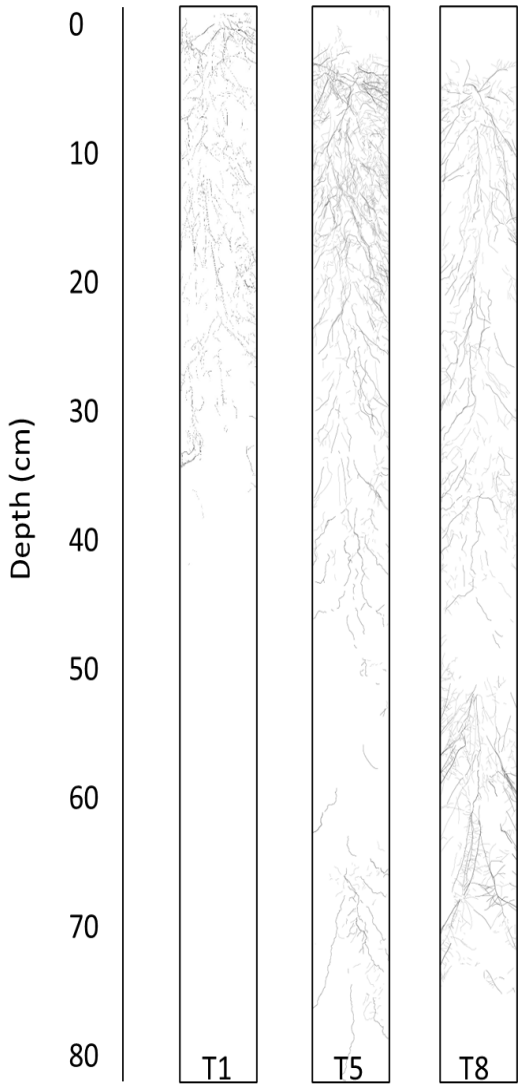
Improvement in soil strength and pH



---Bolgart---

---Meenar---



---Meenar---

Canola (Meenar) roots

T1 = control,

T5 = Loosening & lime

T8 = Loosening & lime & clay & OM.

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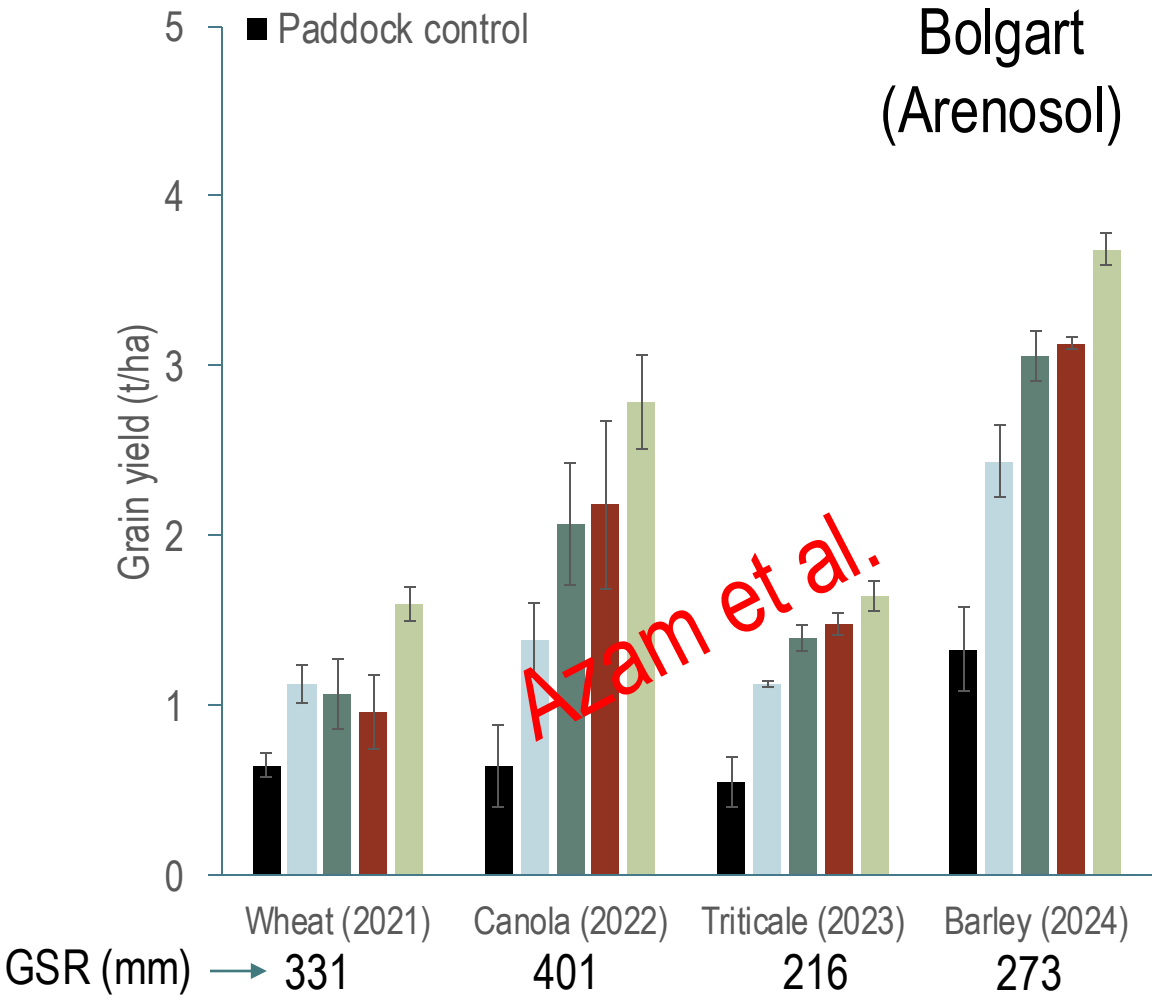
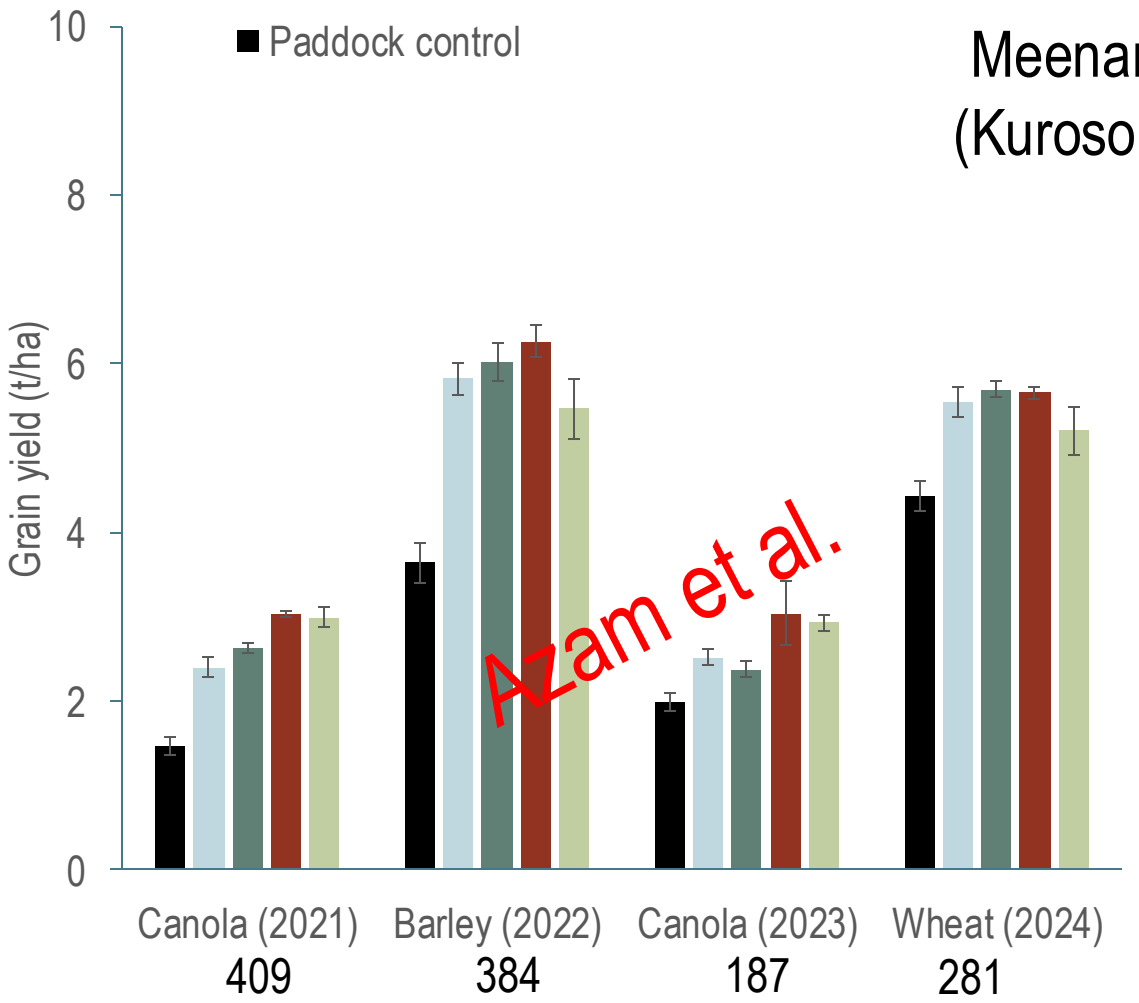
Improvement in grain yield





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Yield and water use efficiency compared to the current best practices (2 trials x 4 years)

Table 1: Cereal yield and WUE (5 cropping years)

Comparisons	Yield (t/ha)	WUE (kg/mm)	Achieved Yp (%)
Water limited yield potential	3.5	-	-
Paddock control	2.1	11	61
Best bet soil re-engineering	3.5	20	100

#WUE calculated using Oliver et al. 2009

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Sneak peek

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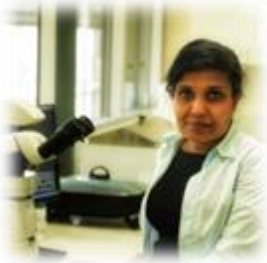
Brand new 4x grower-scale trials (SWAN-P1A)



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Summary

- The yield gap disappeared.
- Benefits from loosening and liming is continuing.
- Benefit from additional inorganic fertiliser lasted for 1-2 season.
- On deep sand, clay and OM enhanced yield, but not on duplex.
- Improvements in soil properties are expected to last longer.
- We are now trialling at grower scale trial – so stay tuned!

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Big thanks to my teams














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Thank you

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