Root growth in dual-purpose wheat

Implication for soil water use

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Sensing the future for resilient farming systems

John Kirkegaard

EU Marie-curie Global Fellowship

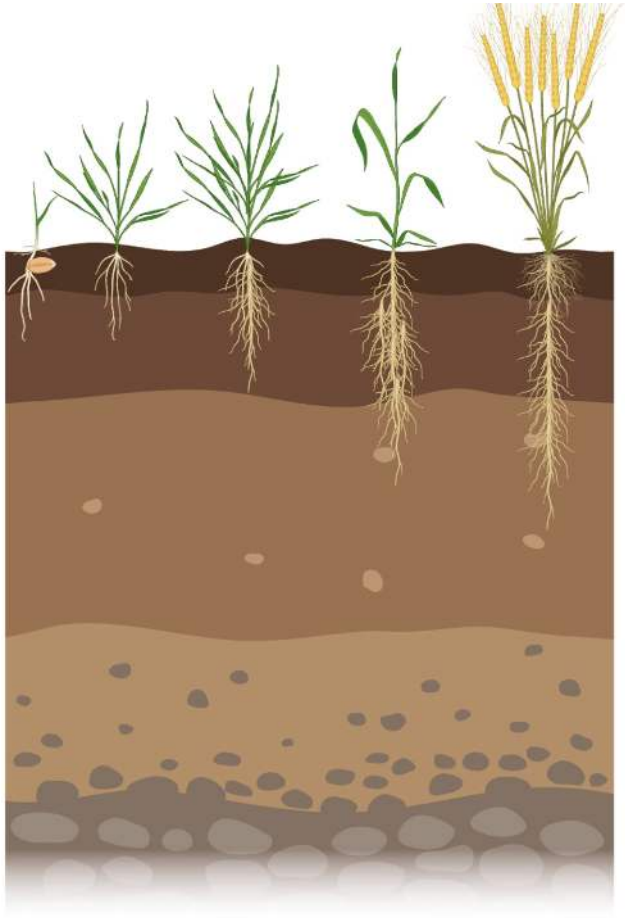
Kristian Thorup-Kristensen

2 year in Australia

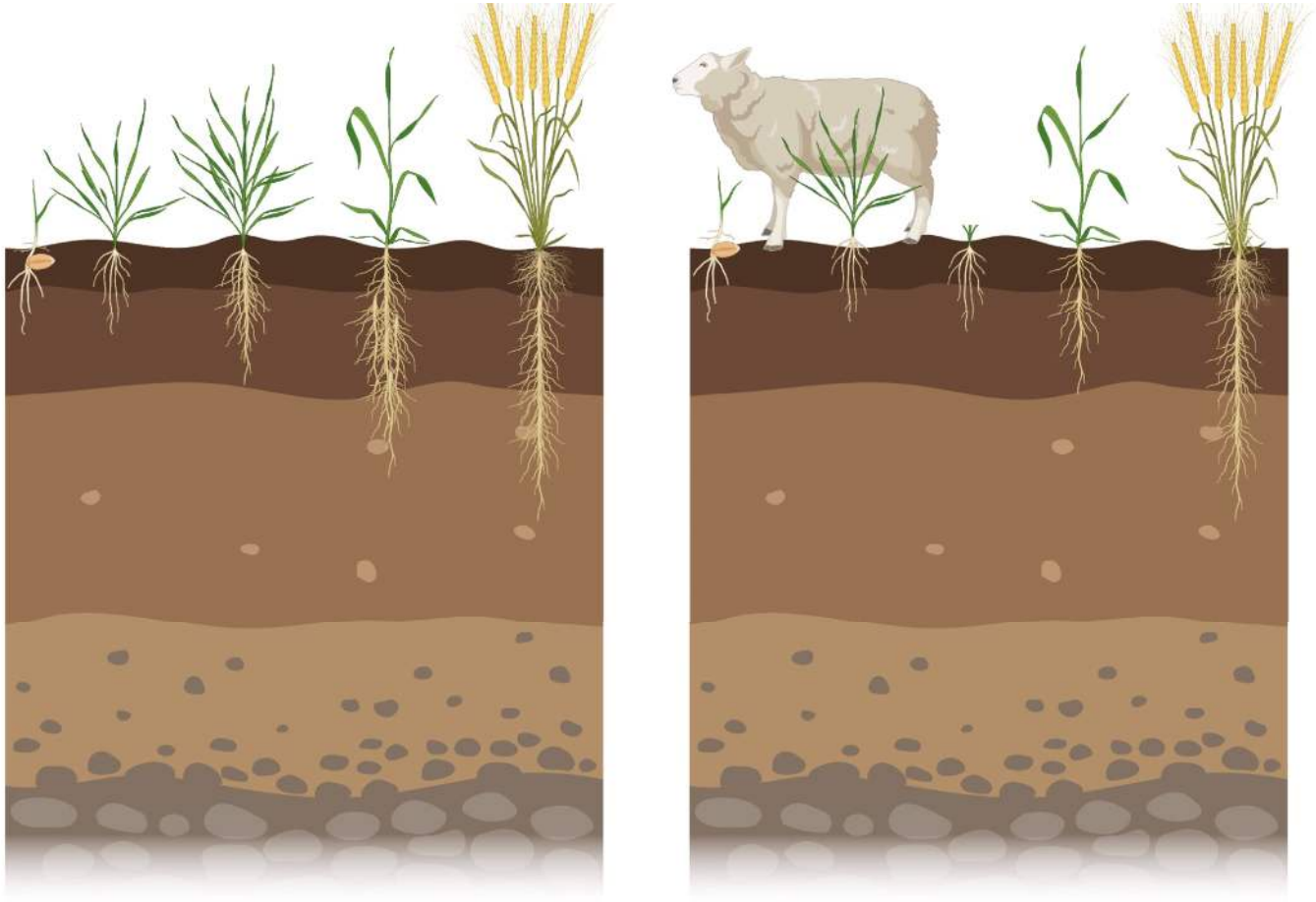
Dual-purpose cropping
Root growth
Water use efficiency

1 year in Denmark

Background

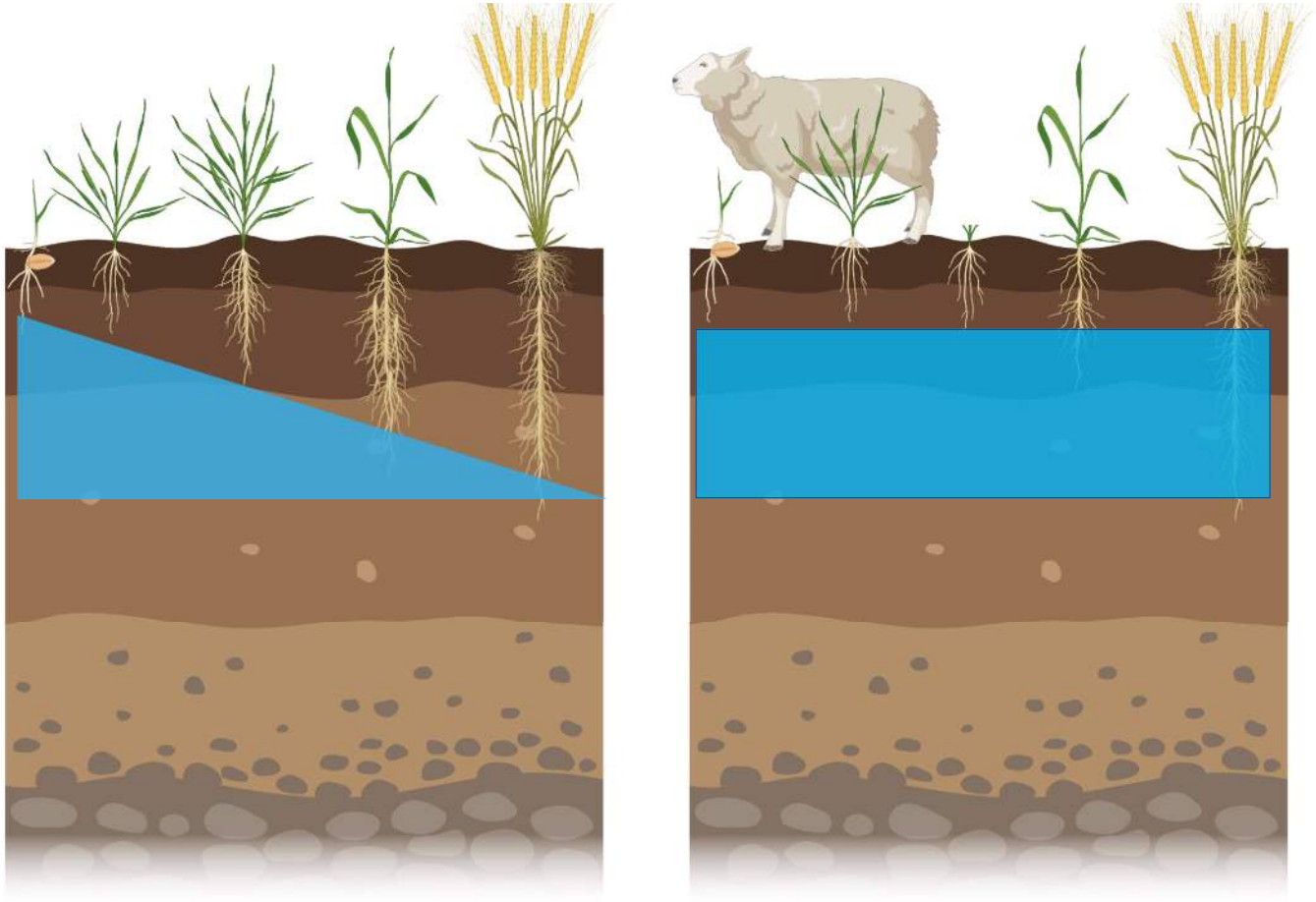


Background: Dual-purpose cropping



Wool/meat + Grain

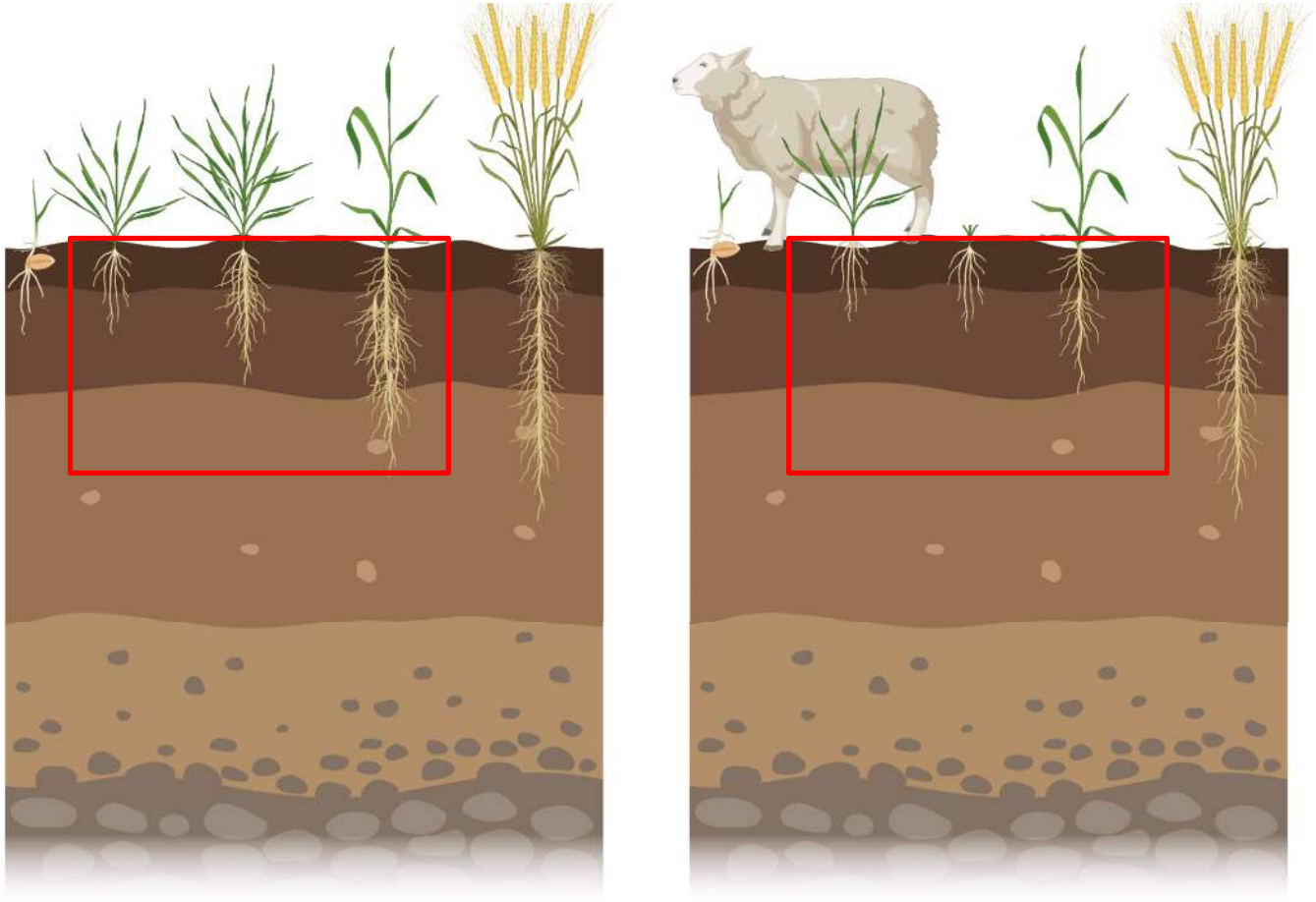
Background: Dual-purpose cropping



Wool/meat + Grain

Water sparring

Background: But what happens to the roots?

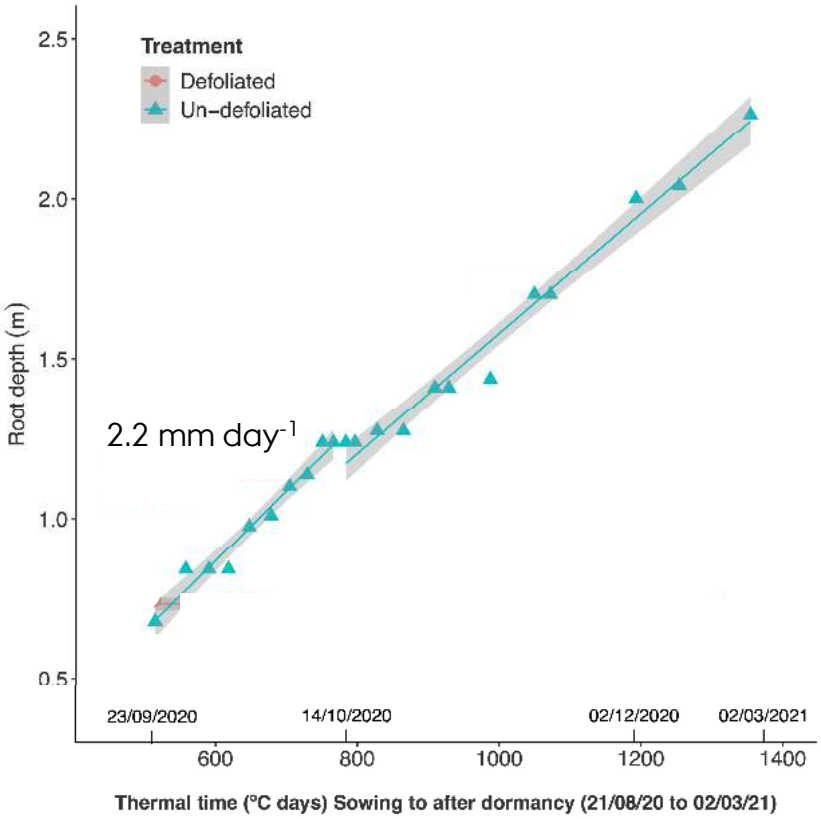


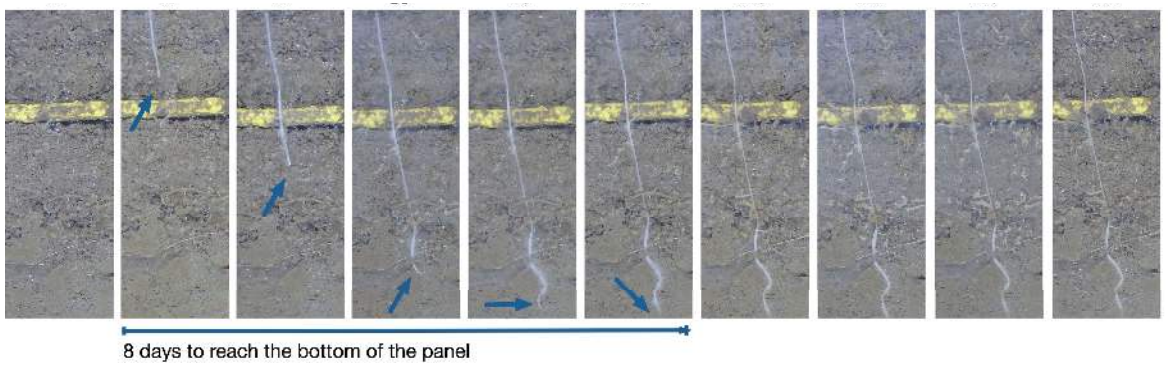
Wool/meat + Grain

Water sparring

Rhizobox experiment – 4 m tall:

20 days of root growth cessation





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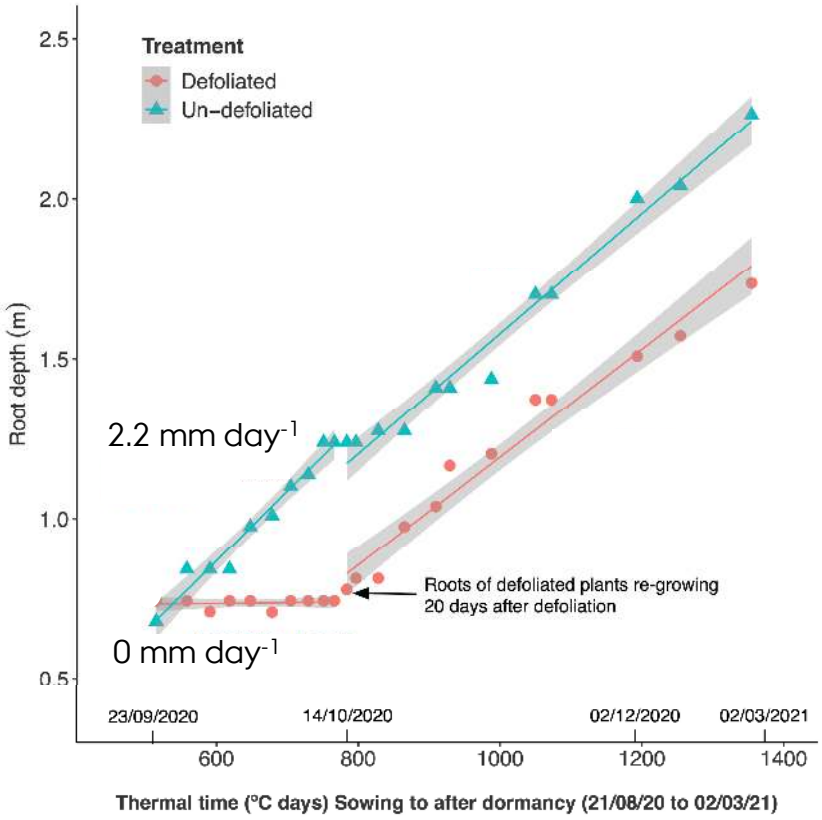
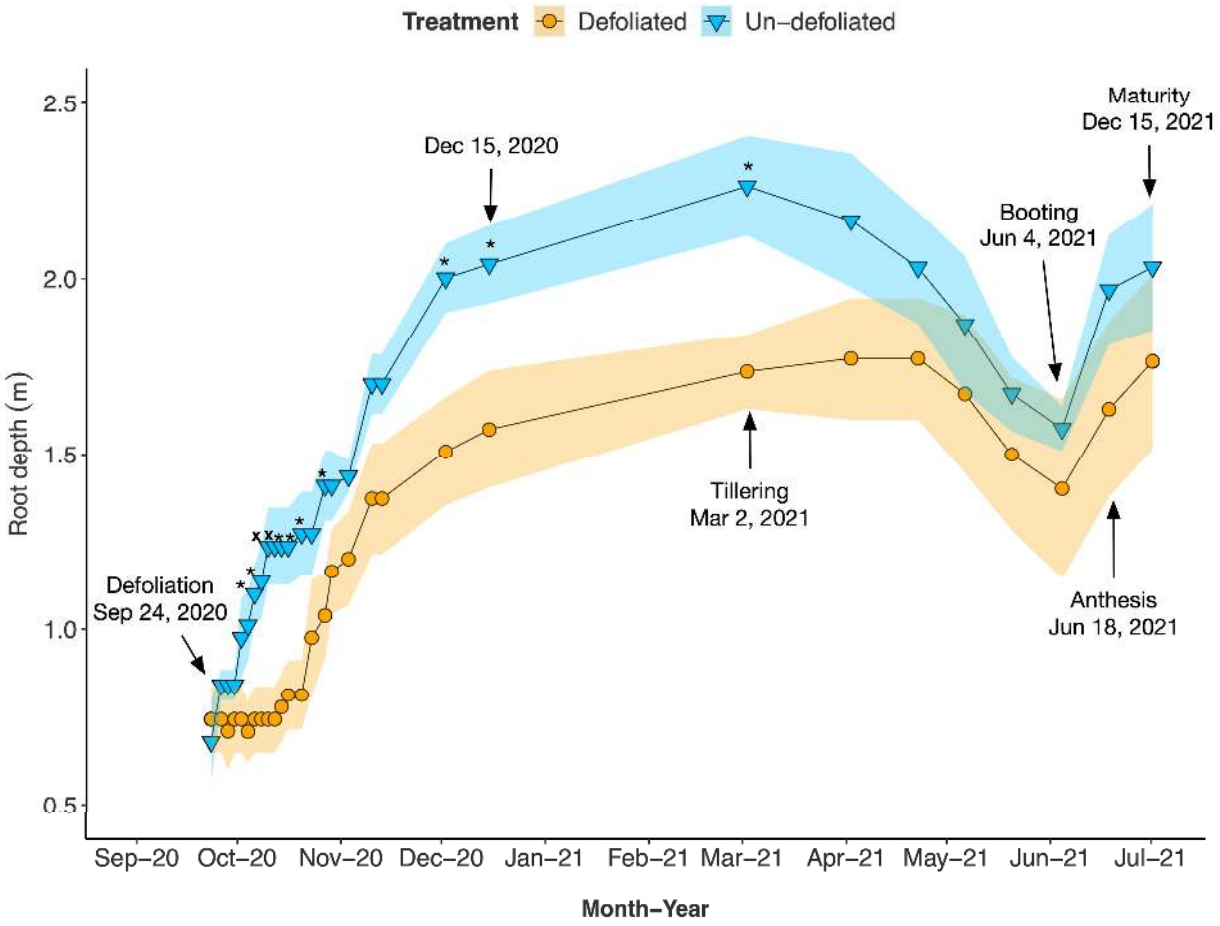
20 days of root growth cessation





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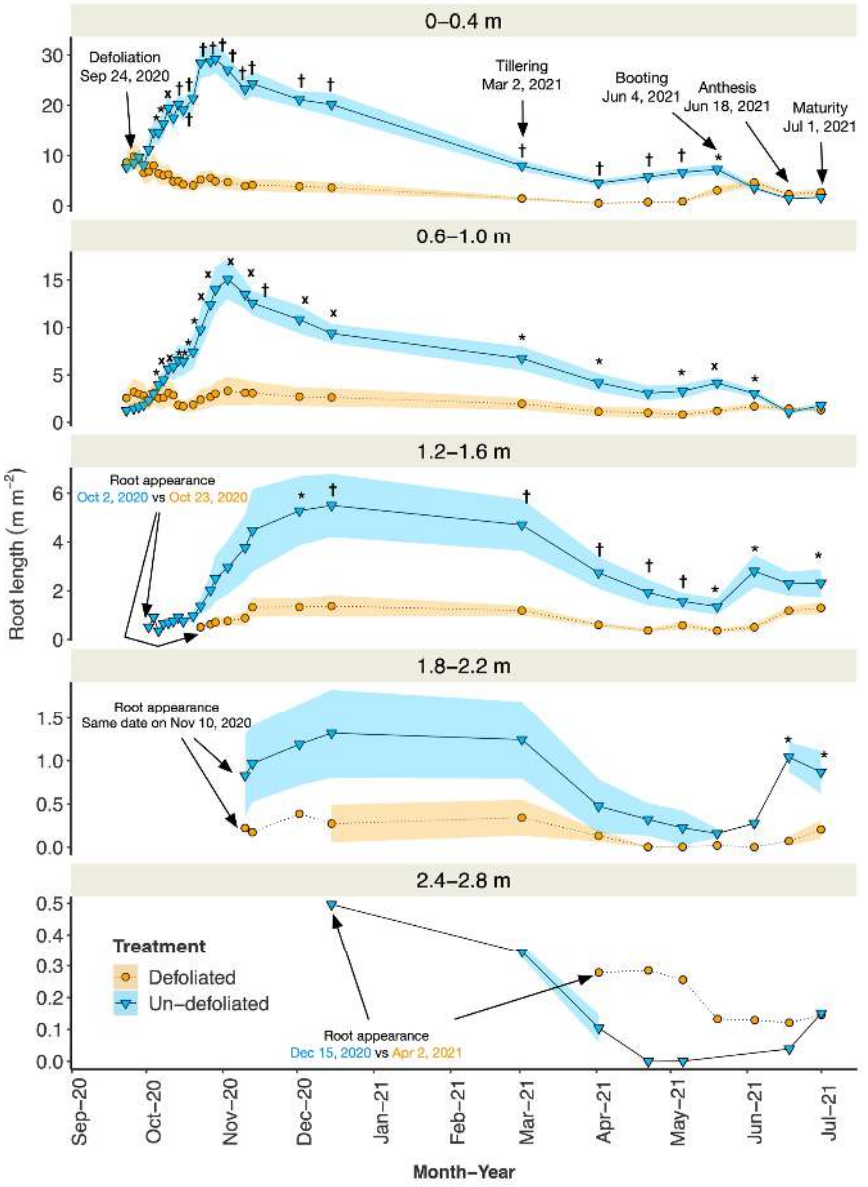
Resource uptake potential??

Root depth recovered.
Root density did not...



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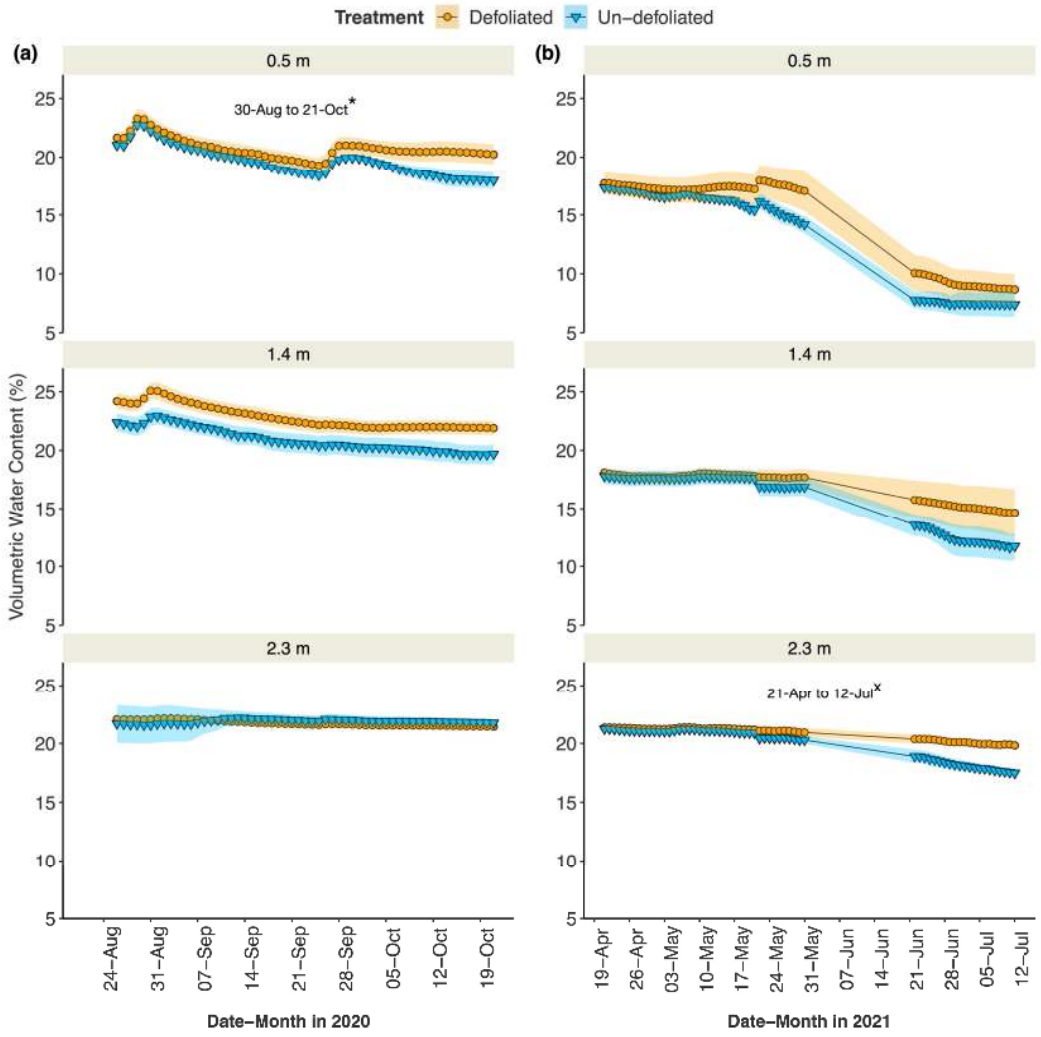
Resource uptake potential - Water



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Lesson learned

Root growth cessation can be temporary (e.g. 20 days).

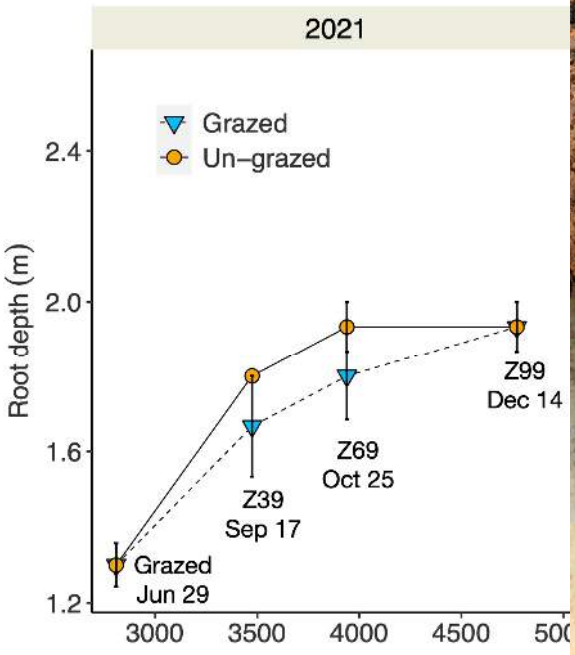
But root density can decrease till maturity.

Defoliation reduces resource use (e.g. Water).

What if, it was done under DRY | FIELD conditions?

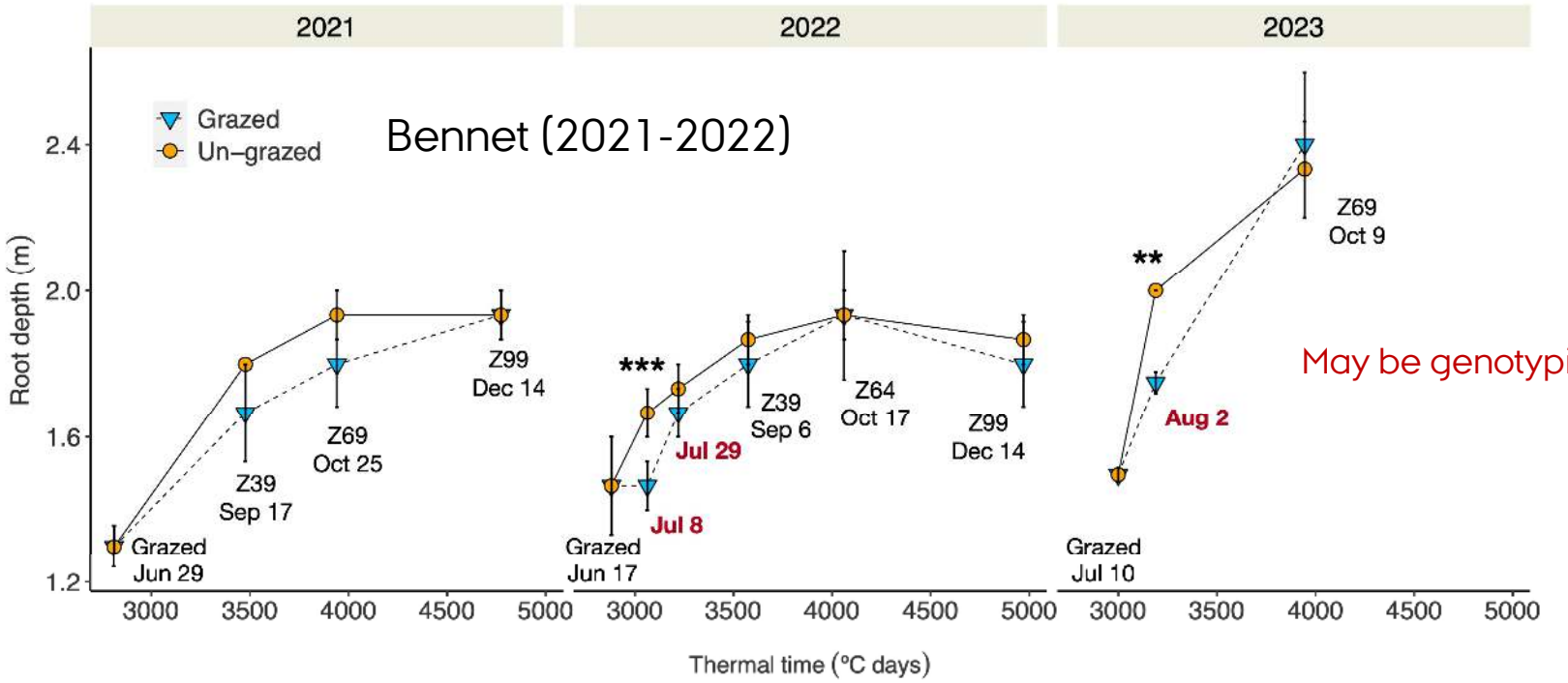
Field experiment in Australia - NSW

Root growth cessation – not conclusive



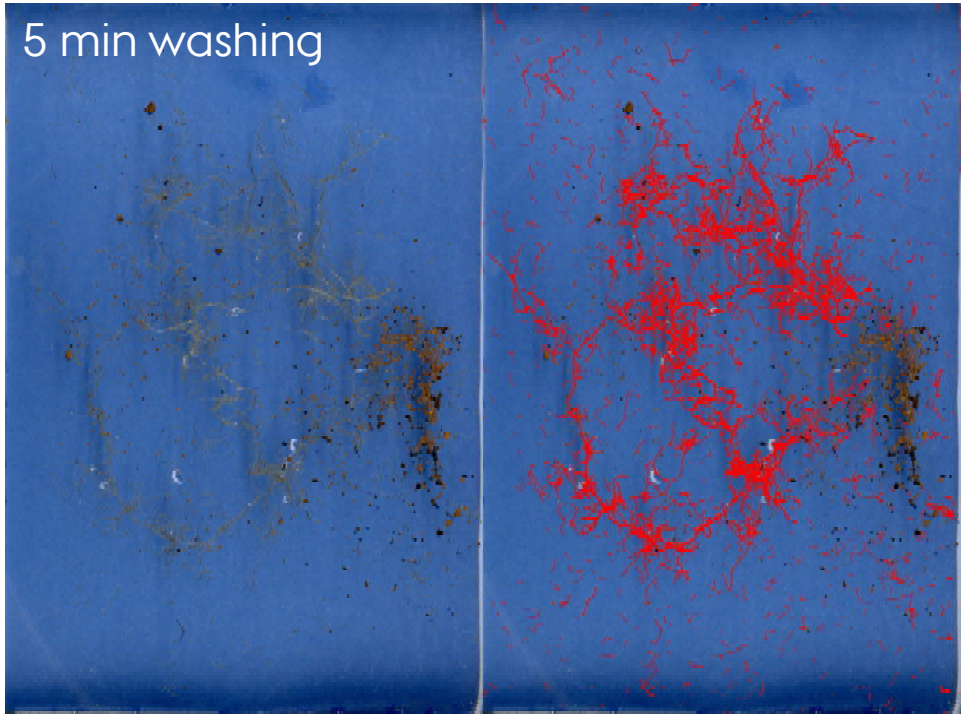
Root growth cessation – confirmed

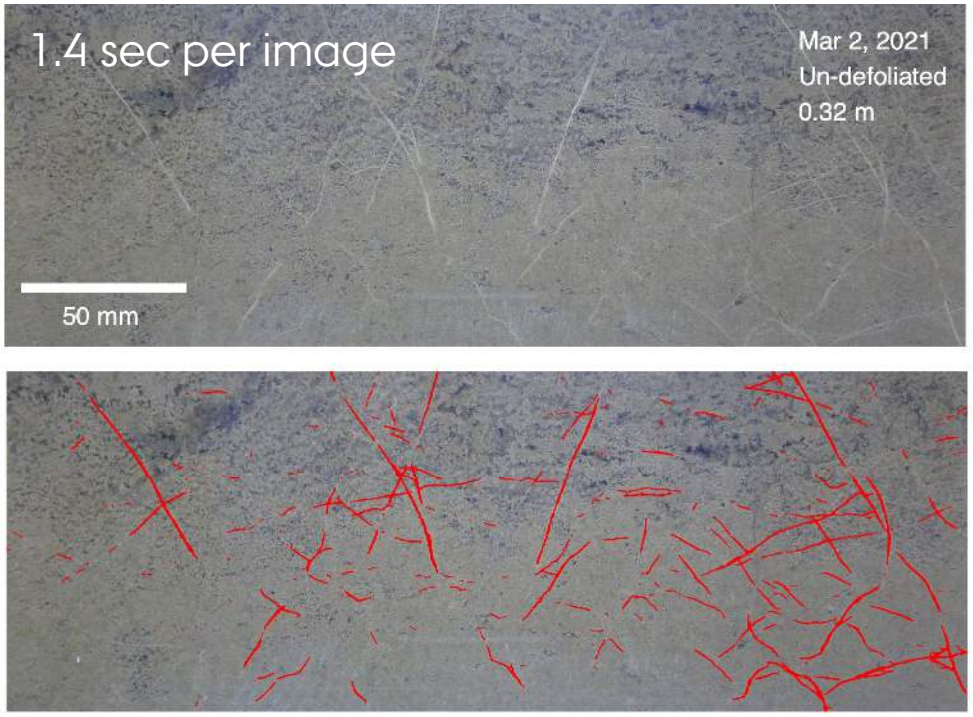
Waugh (2023)



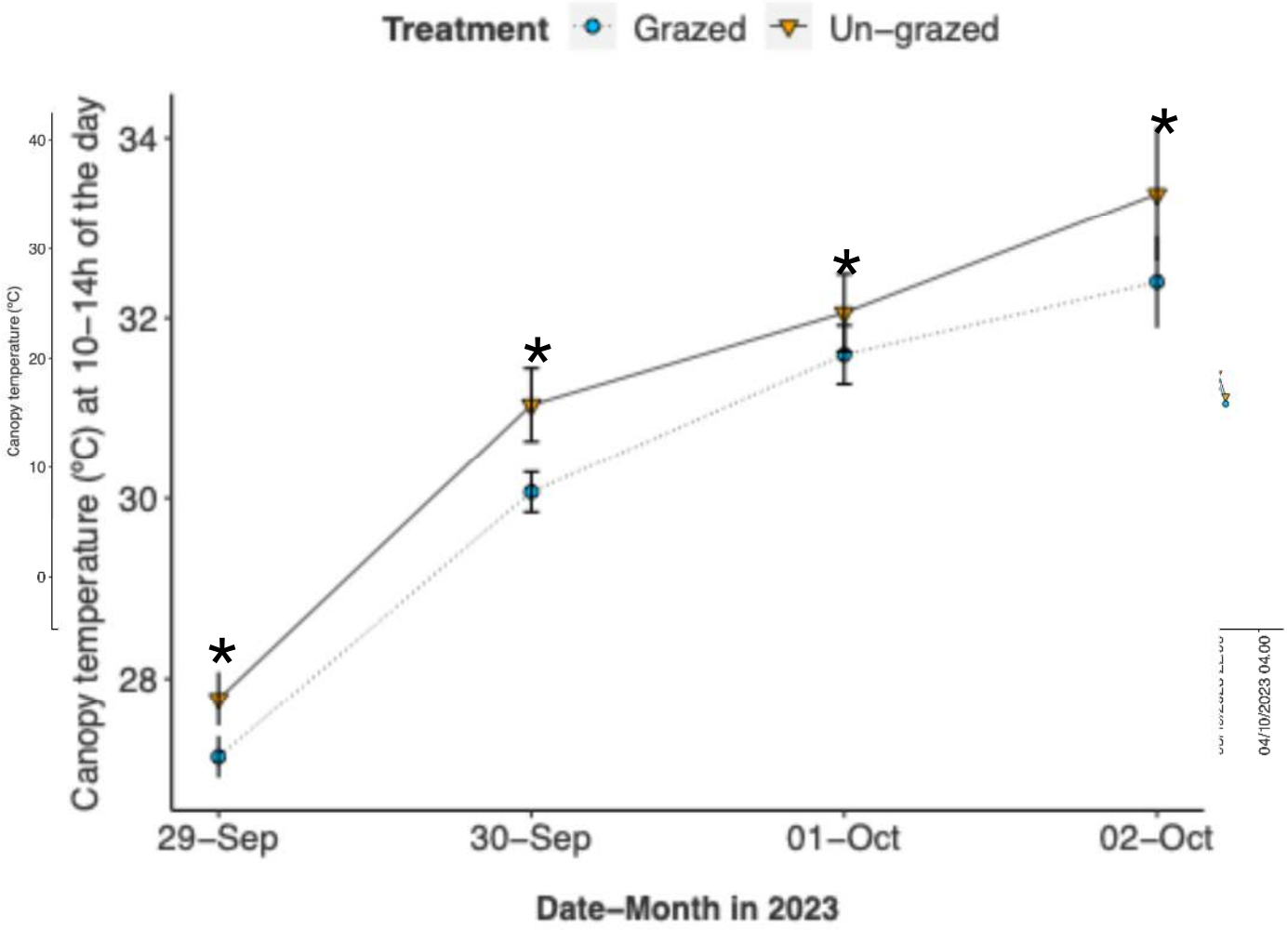
May be genotypic difference..

How it was possible – RootPainter





Sensing the water from canopy



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Yield – but I couldn't test the hypothesis

Does grazing, and deviated root density/depth affect water use/grain yield?

I need the power of APSIM

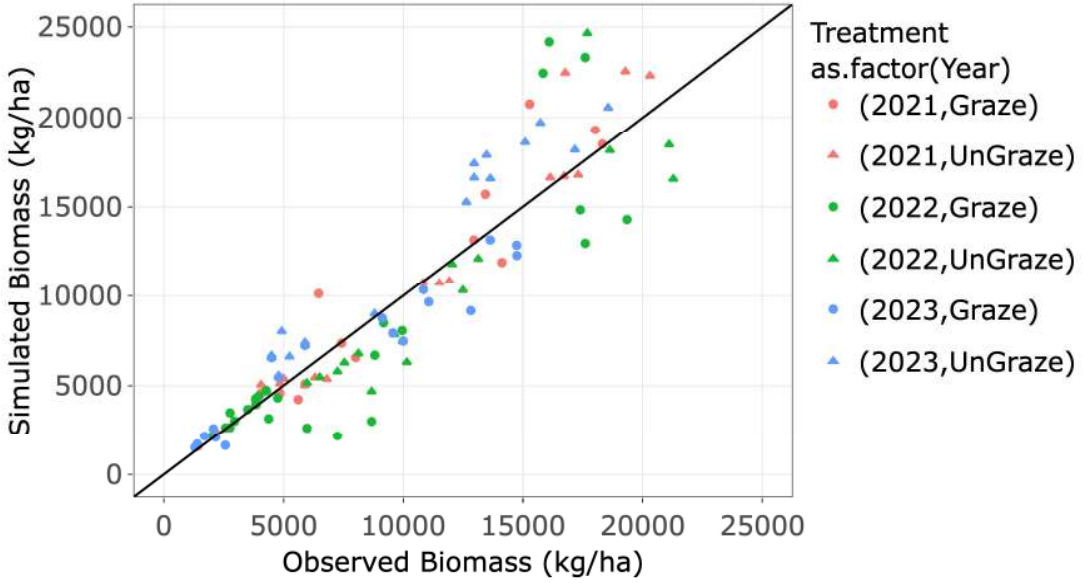


Figure courtesy: Jeremy Whish

TAKE HOME MESSAGE

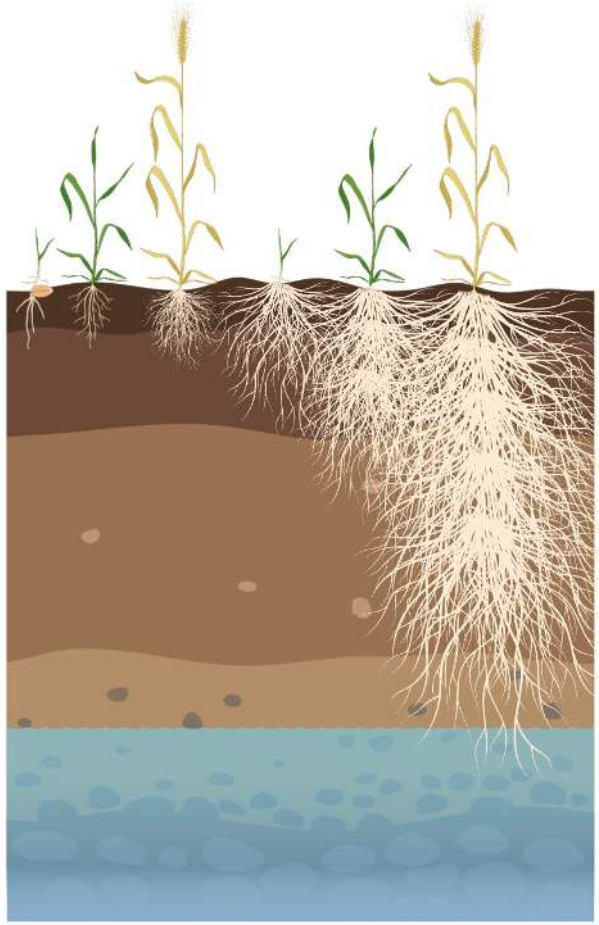
Defoliation causes a transient effect on **root penetration.**

The effect on resource use is highly **context-driven (MxE)**

Separating plant **demand (for yield)** and **capacity (roots)** is hard.

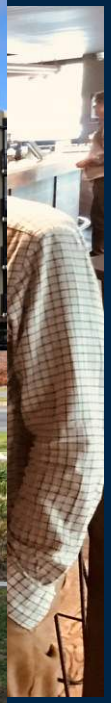
What is the long-term effect? e.g. Perennial crops?

Perennial dual-purpose crops in making in Denmark



Perennial System Trials at Aarhus University

THANK YOU, AUSTRALIA!



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