Department of Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

Protect
Grow
Innovate

Deep mixing of gravelly loamy duplex increased canola yields

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DAW1902_003RTX: Re-engineering soil

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

Why?

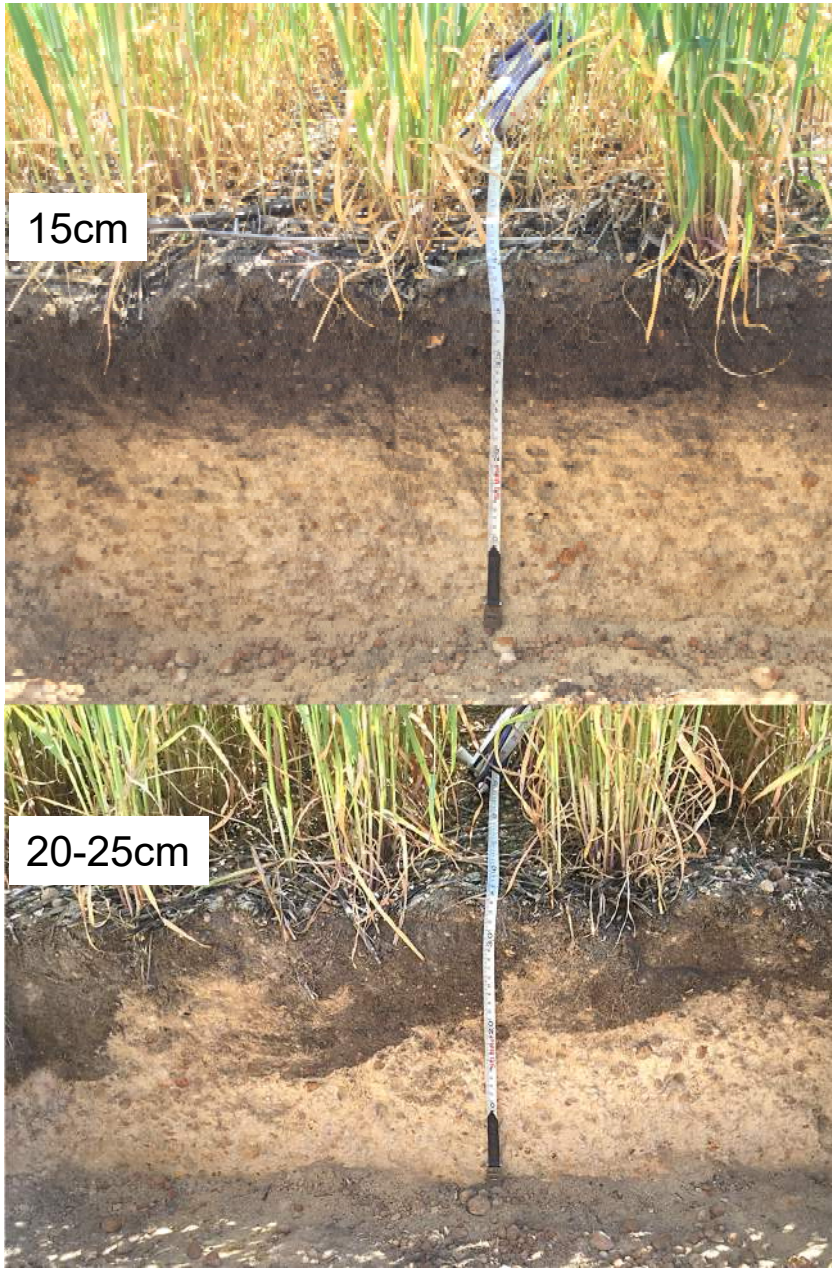
- Amelioration knowledge in gravel relatively poor
- Sparse research
- Multiple constraints (SWR, pH, vol, MPa, WL, WHC/NHC)
- Growers uncertain of responses & lack confidence (also roots/rocks)

Aims

1. Determine advantages of mixing subsoil clay into upper soil

1. Determine whether improved soil conditions benefit from extra N (more root volume, more water extracted, etc)

OM rich cultivation layer = 0-15 cm
MBP cultivation (2015) = 20-25 cm
Subsoil clay = 40-45 cm



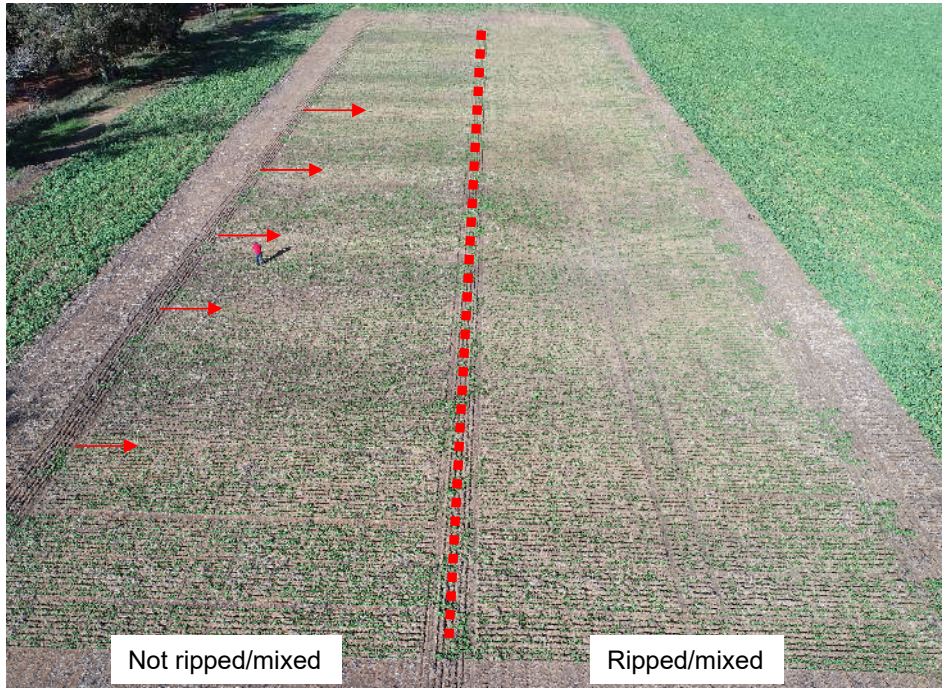
Treatments

Utilised repurposed soil water repellence (SWR) site → impact of historical tillage on crop
(OM placement, fertility, repellence, etc)

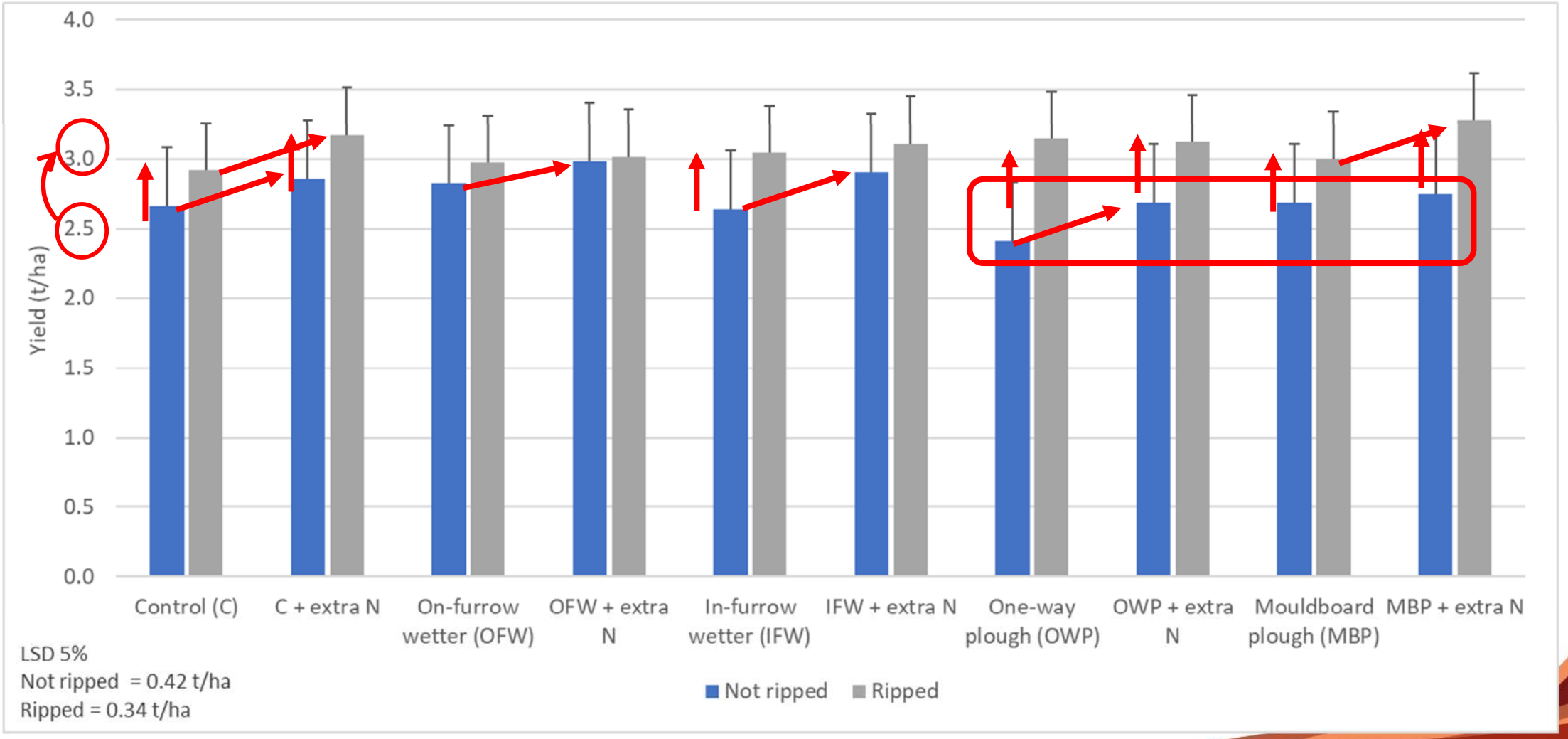
2020 Bulk cereal to break treatment regimes

- Deep tillage to mix soil → +/- mixing
- Targeted SWR options → control, banded wetter (on-furrow/in-furrow), historical tillage (OWP, MBP),
- +/- extra 40 kgN/ha IBS

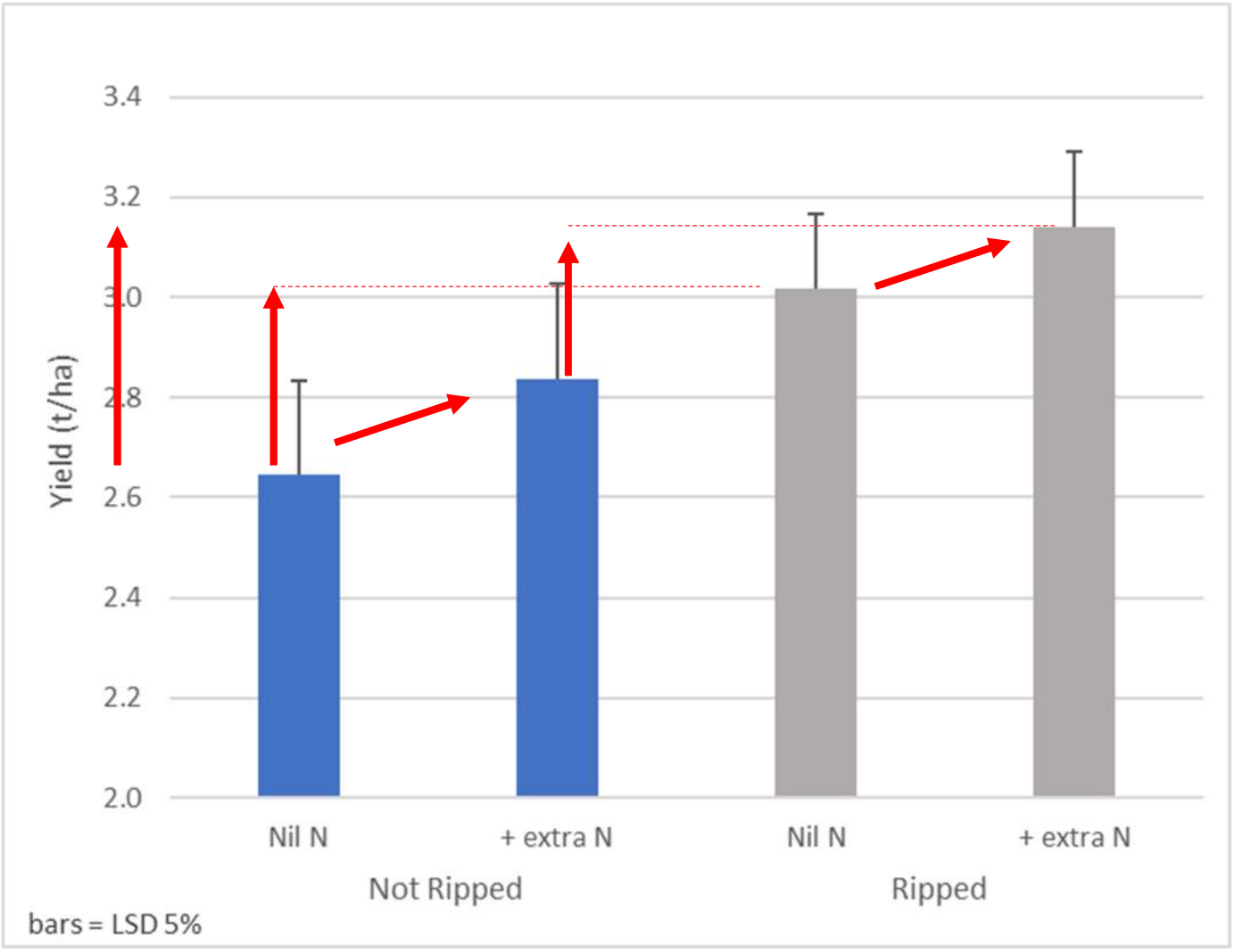
- Sown 10 June 2021 → canola



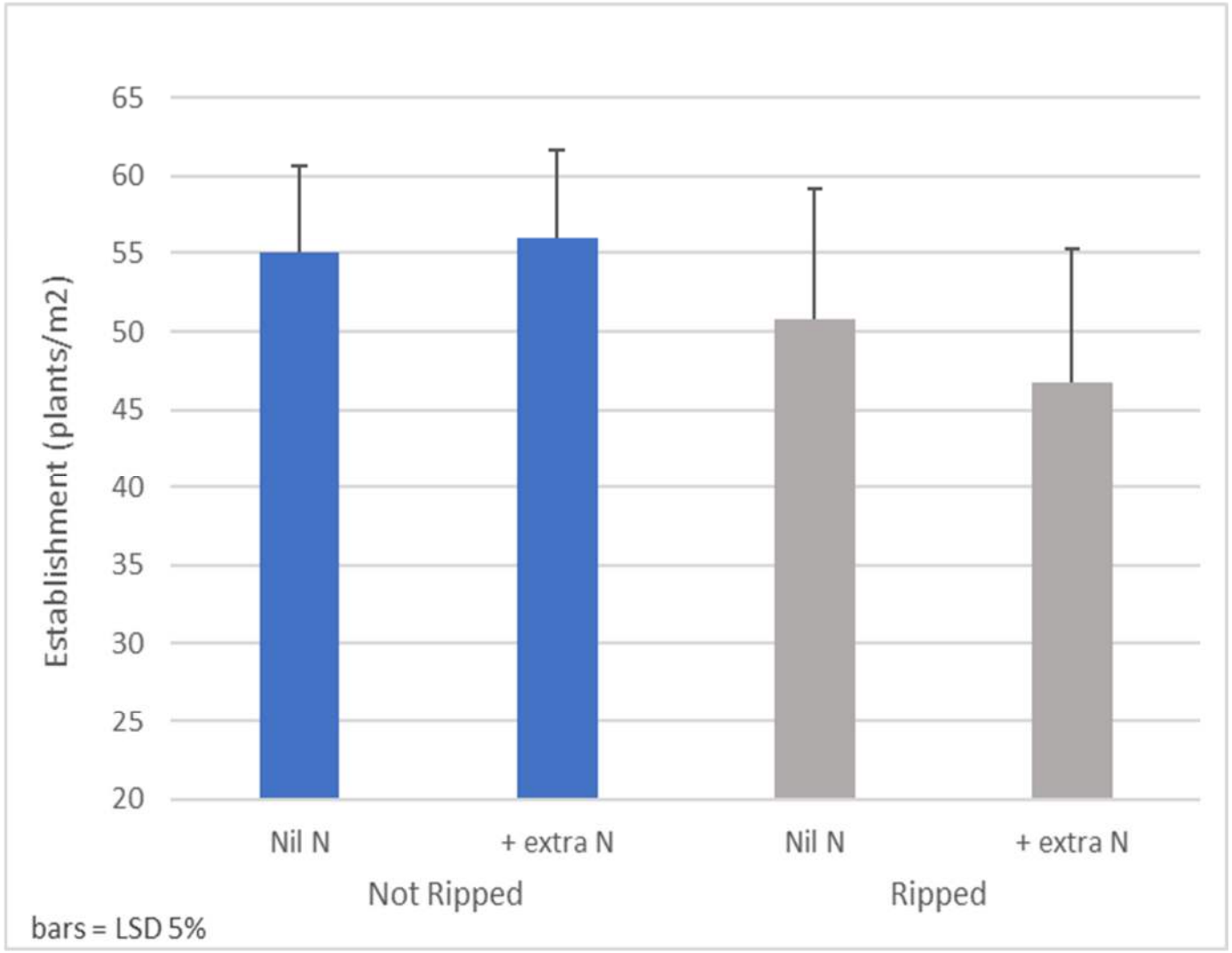
Grain yield - canola

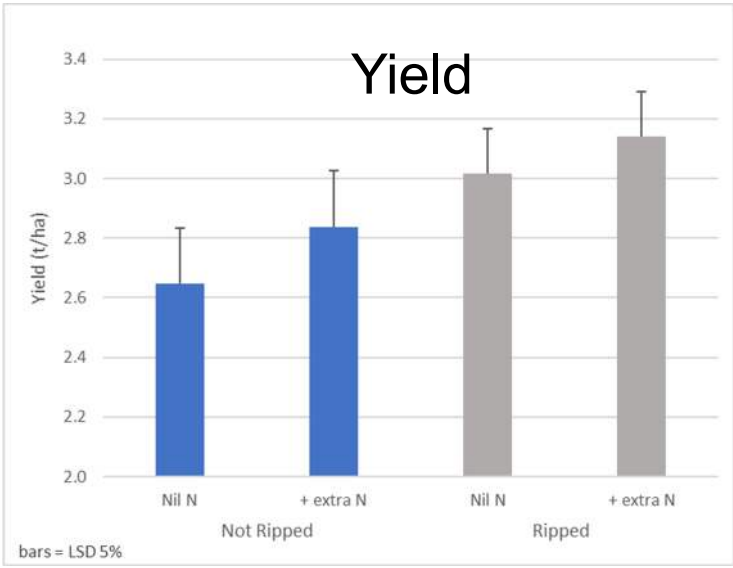


Grain yield

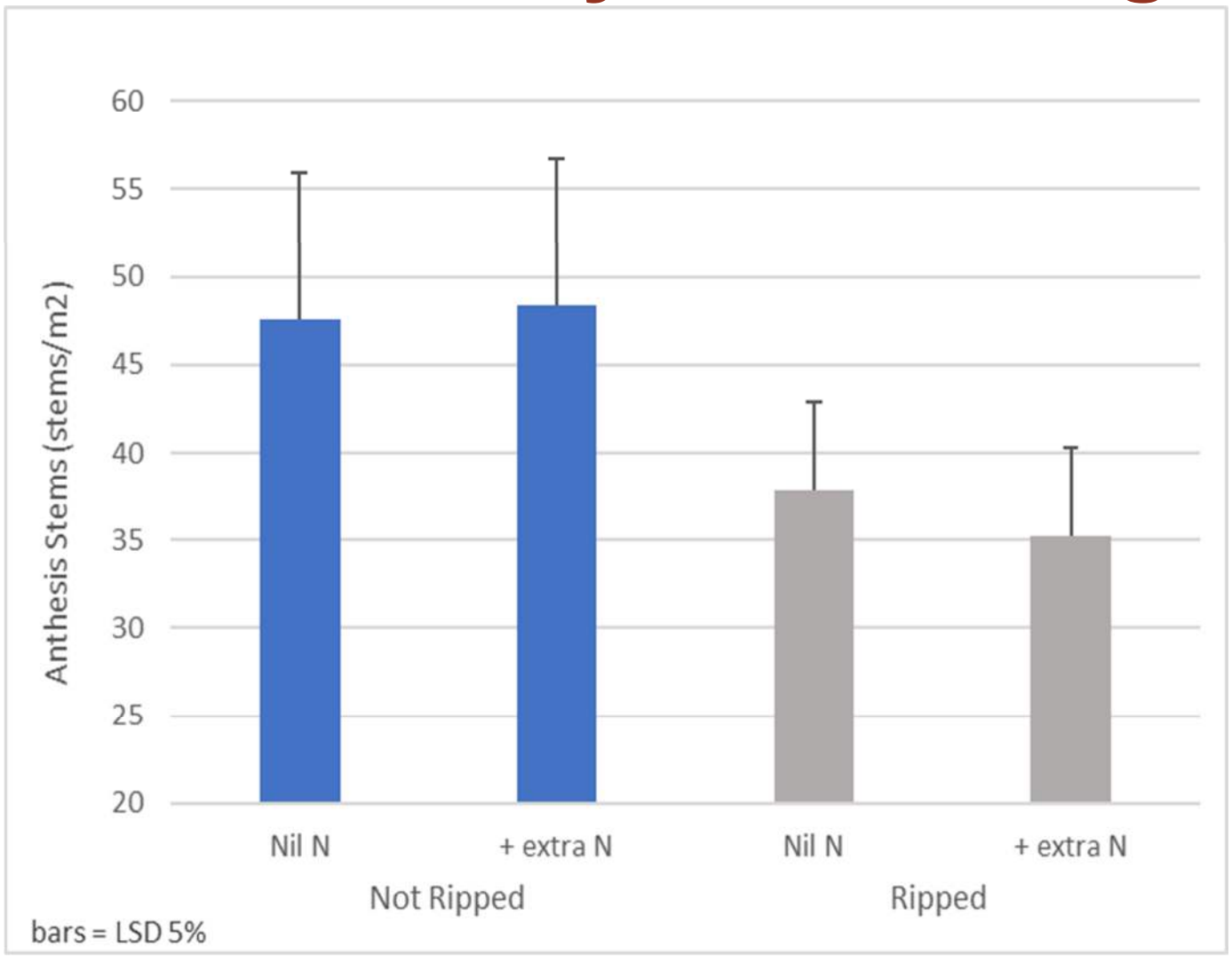

3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
Yield (t/ha)
Nil N
+ extra N
Nil N
+ extra N
Not Ripped
Ripped
bars = LSD 5%

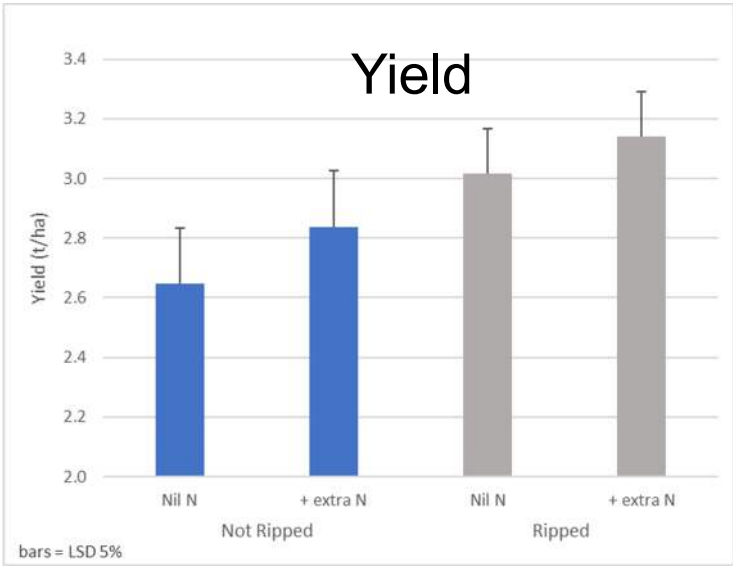
Crop establishment



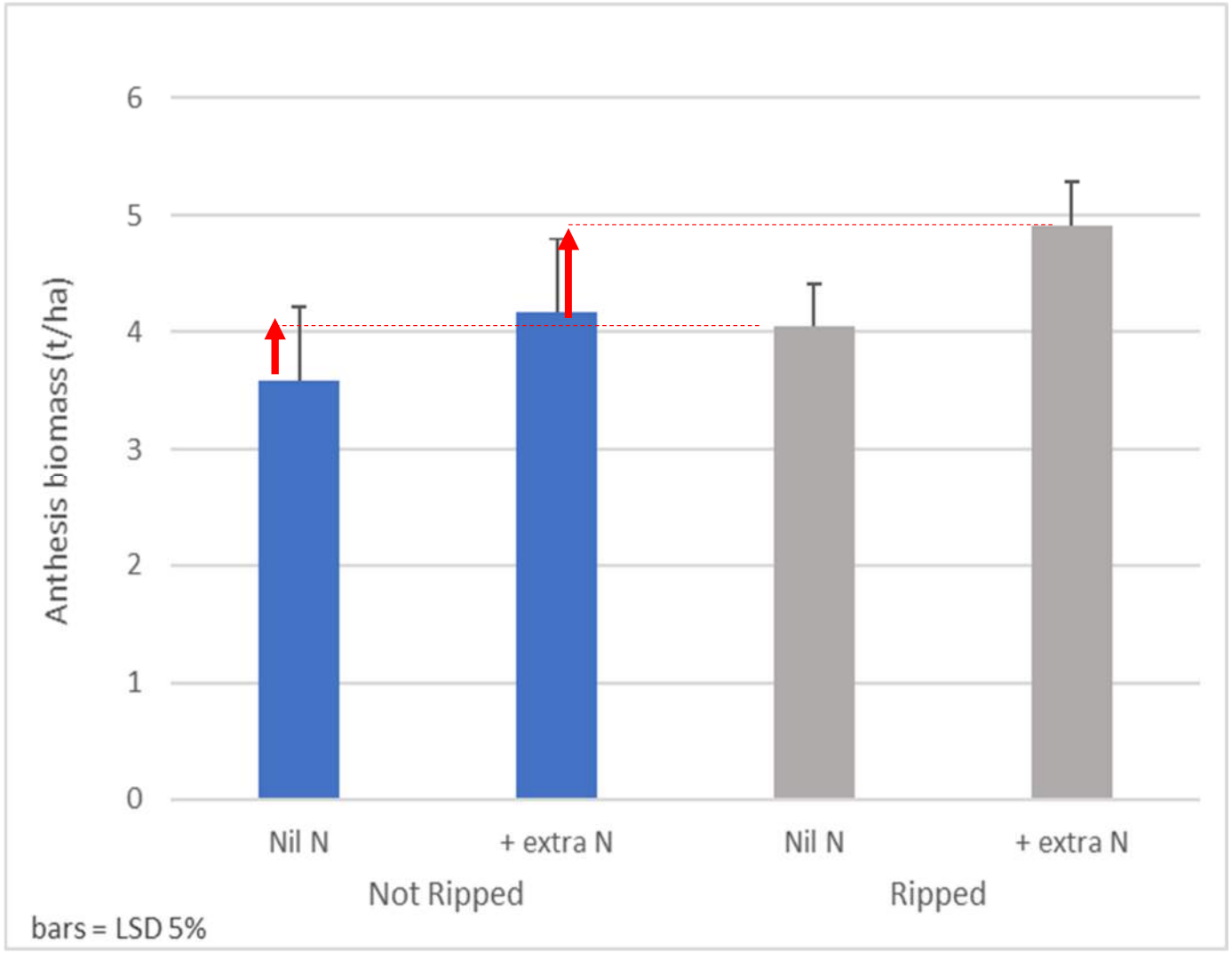


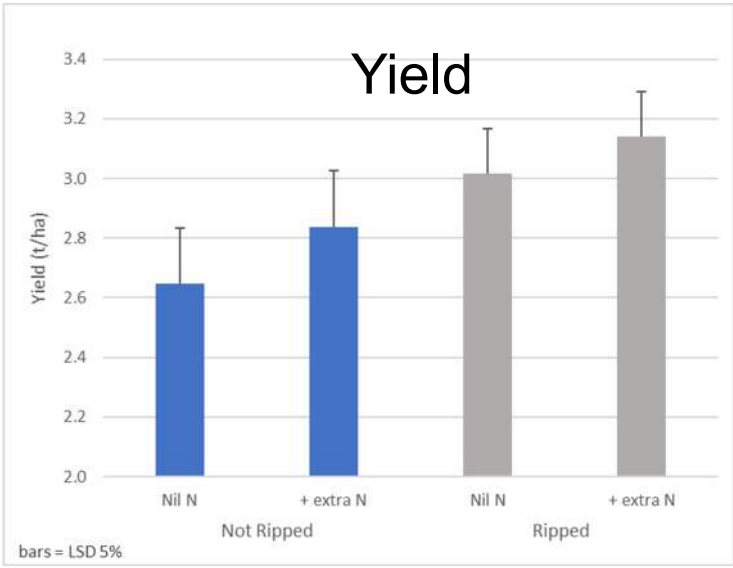
Stem density at flowering



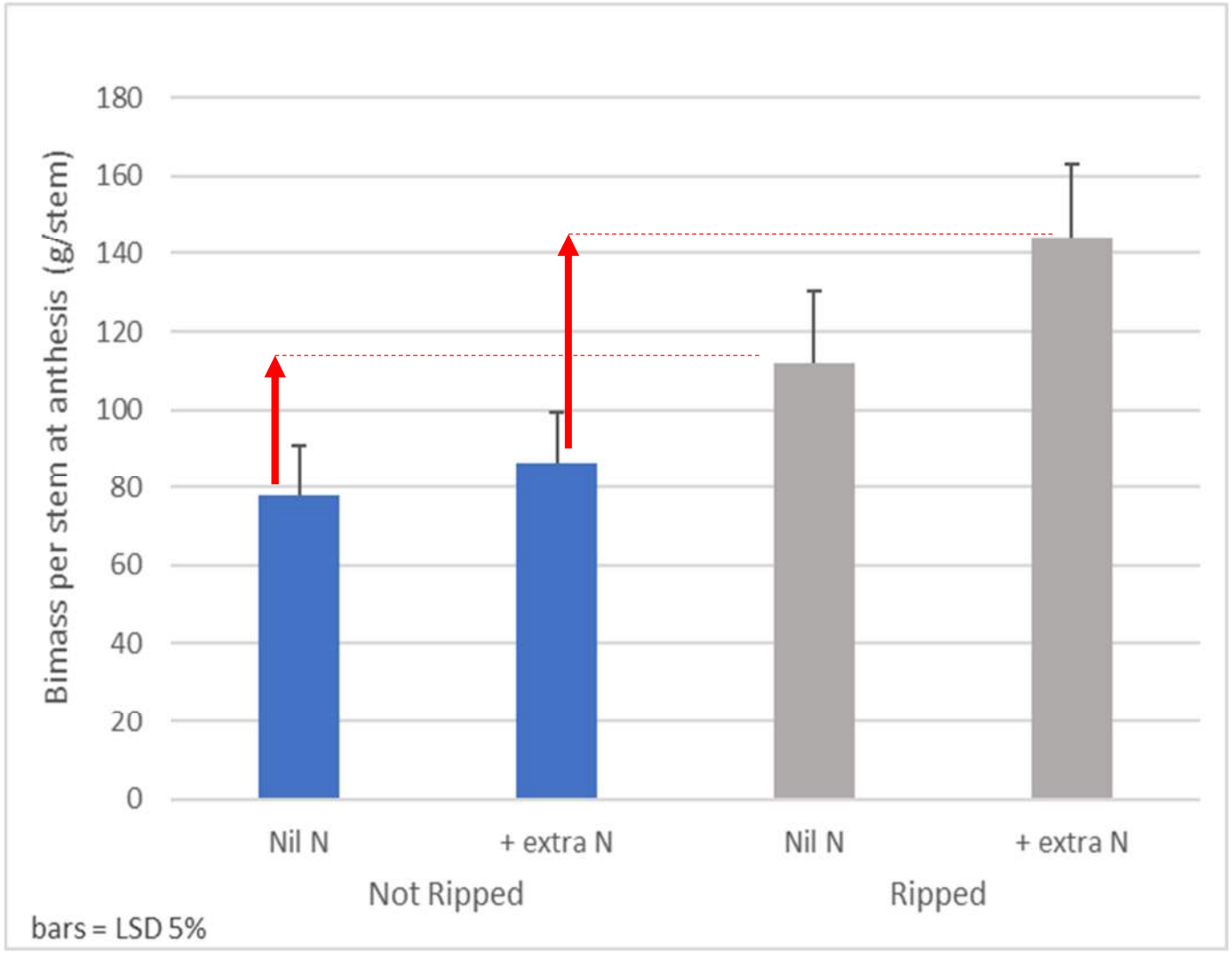


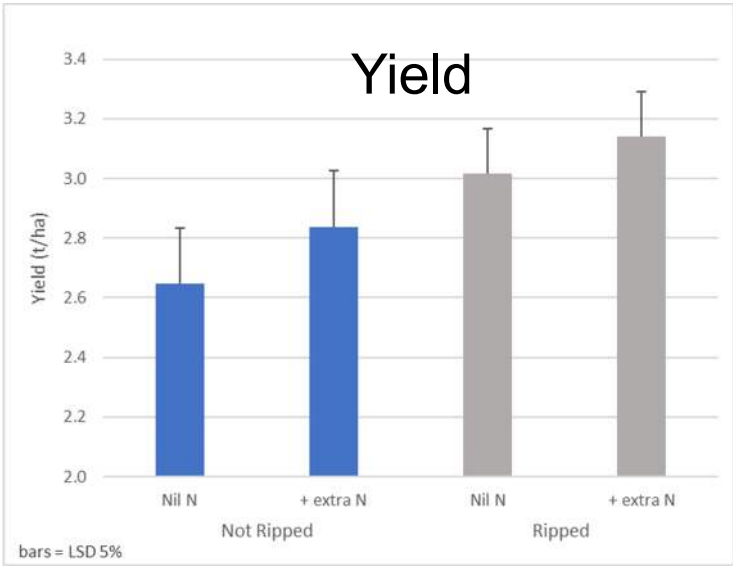
Crop biomass at flowering



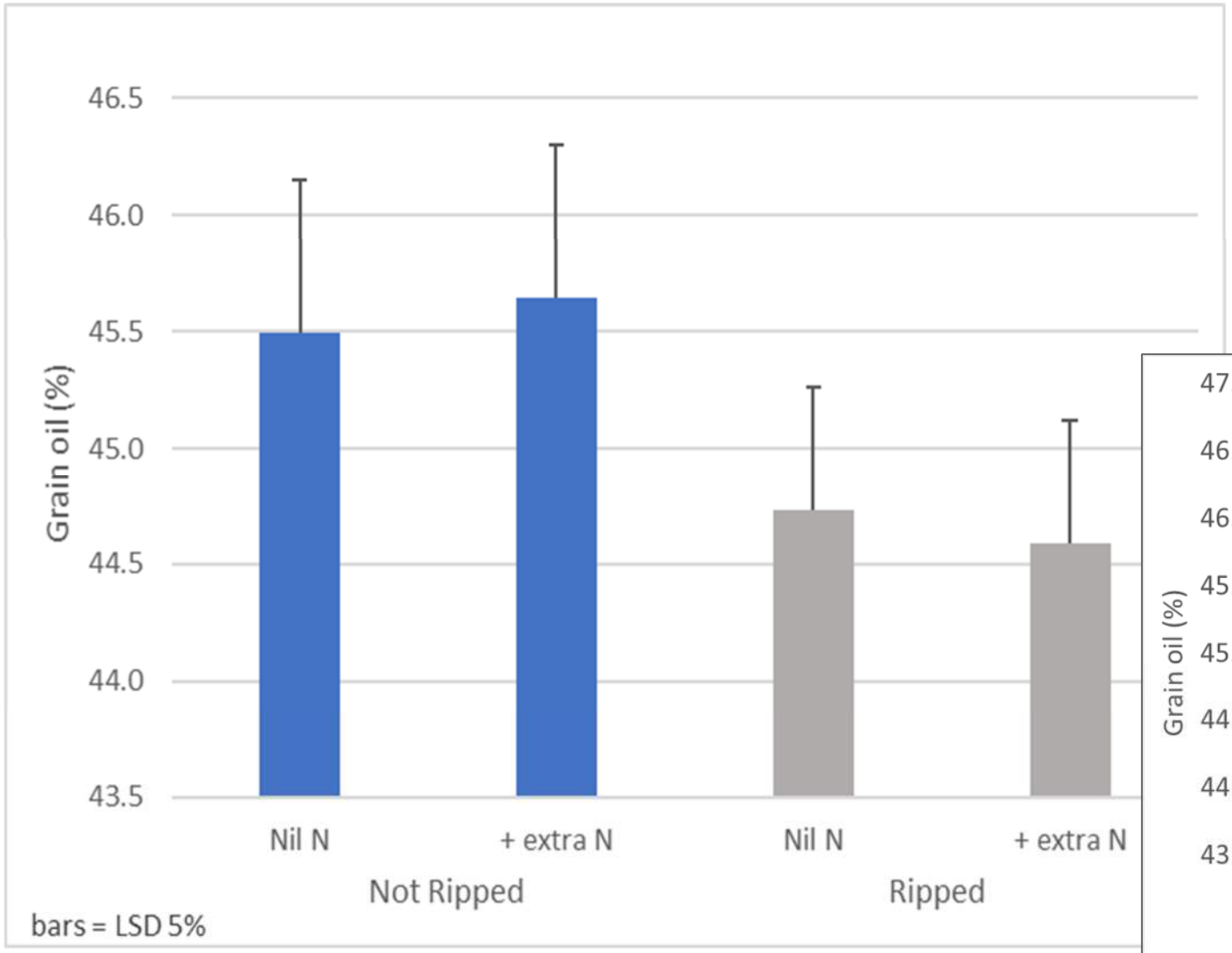


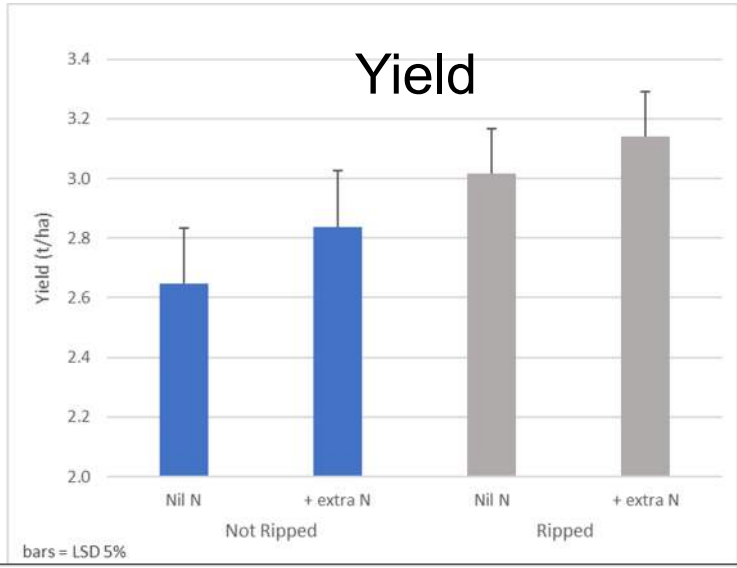
Stem biomass at flowering

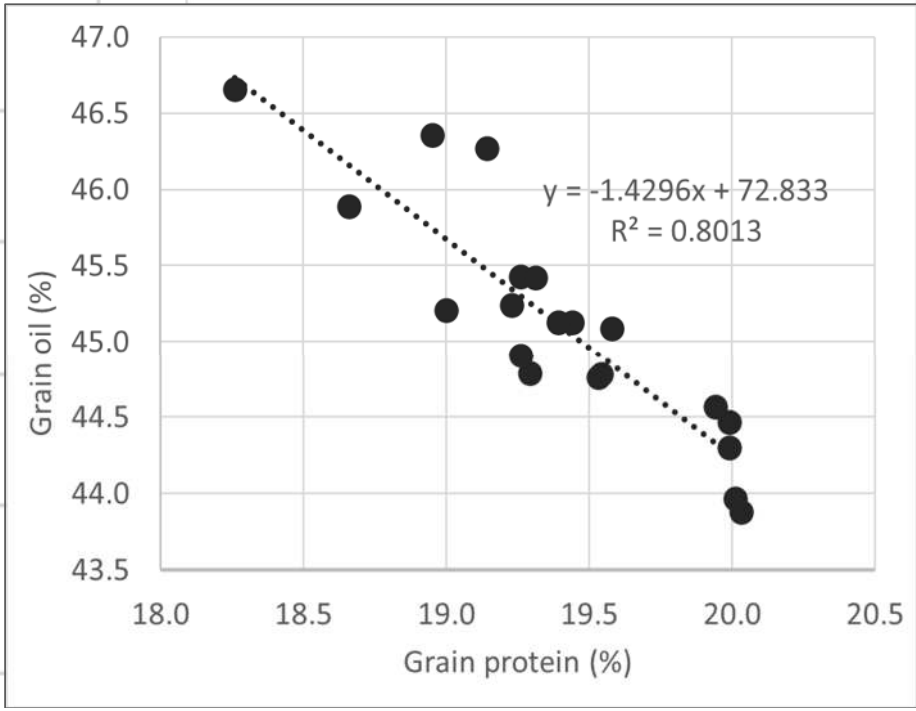




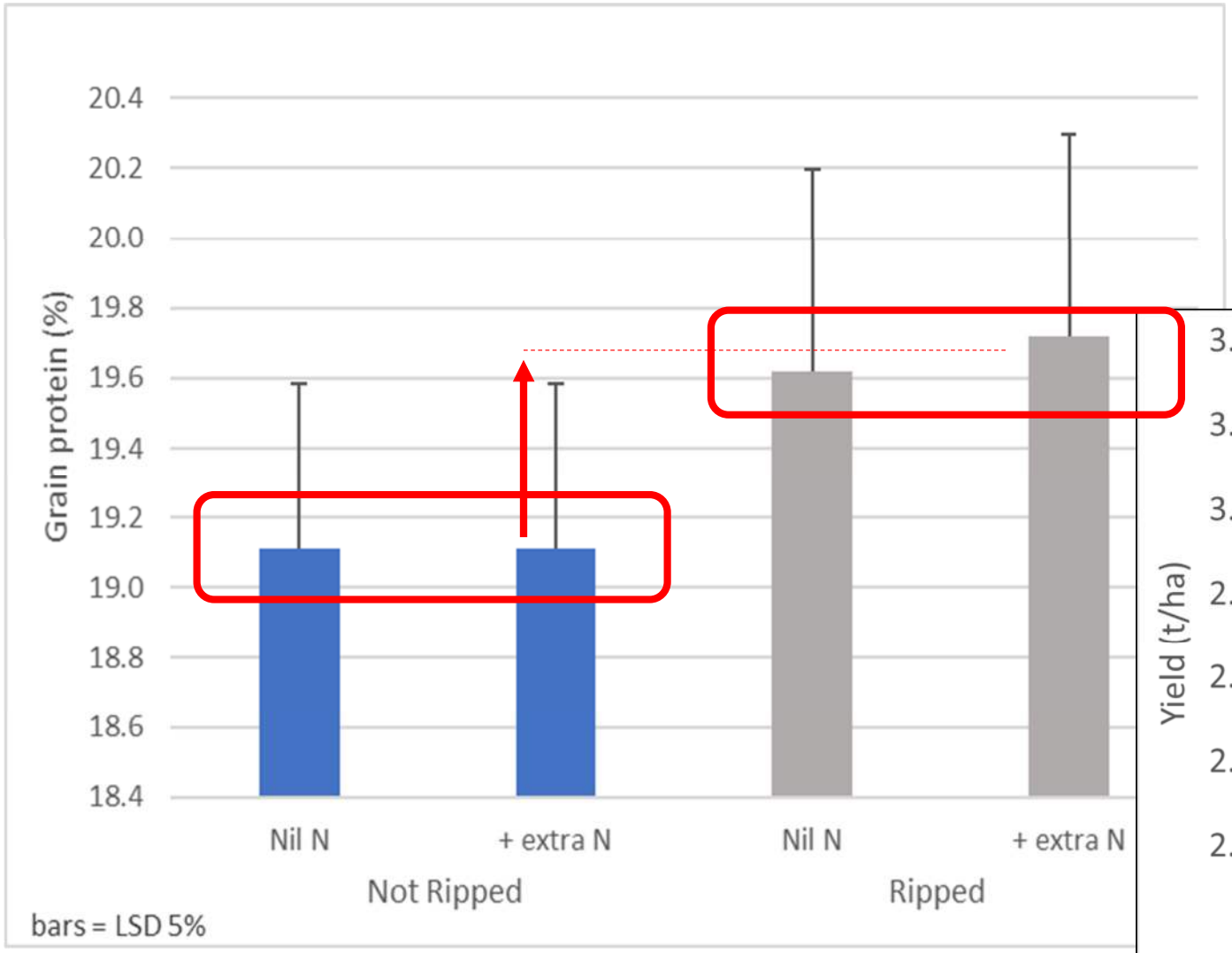
Grain oil content

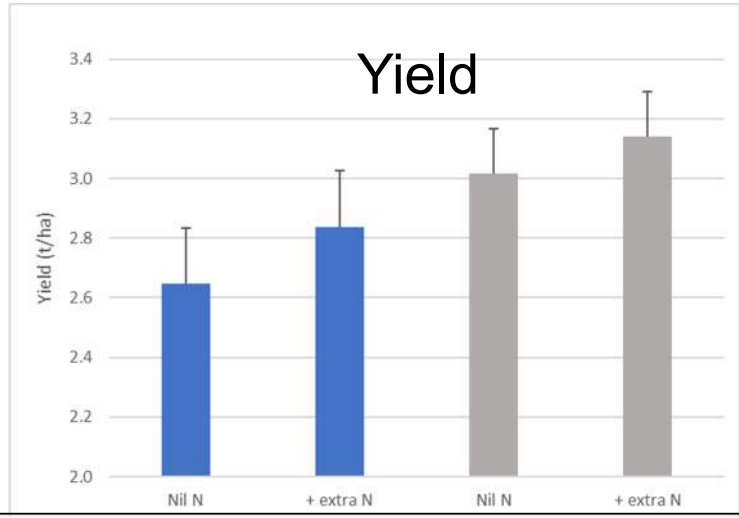


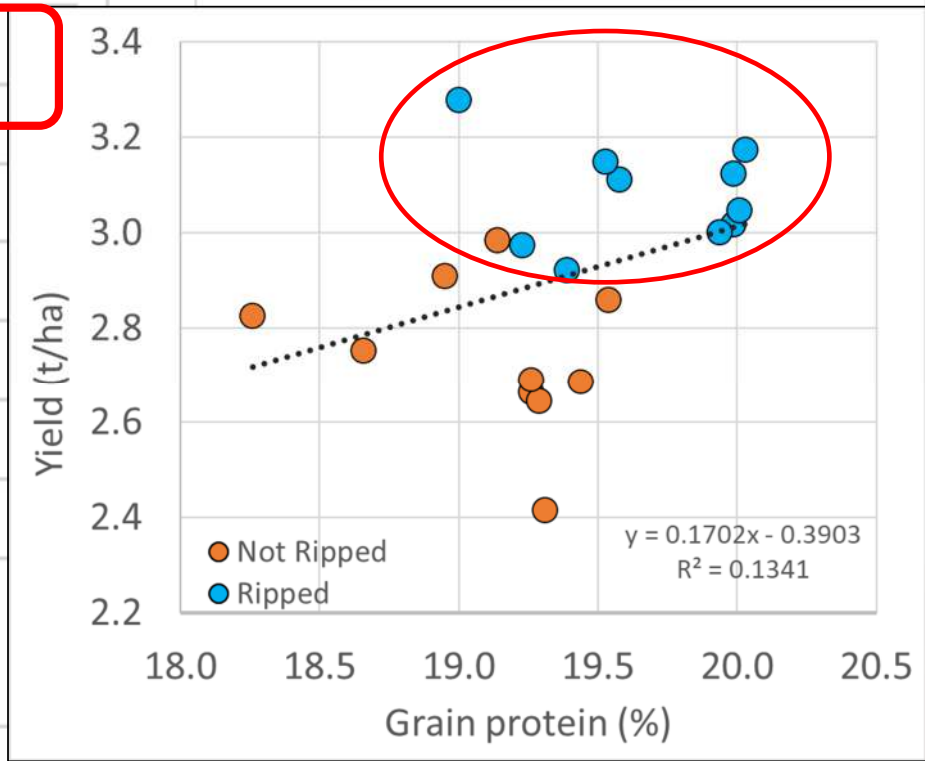




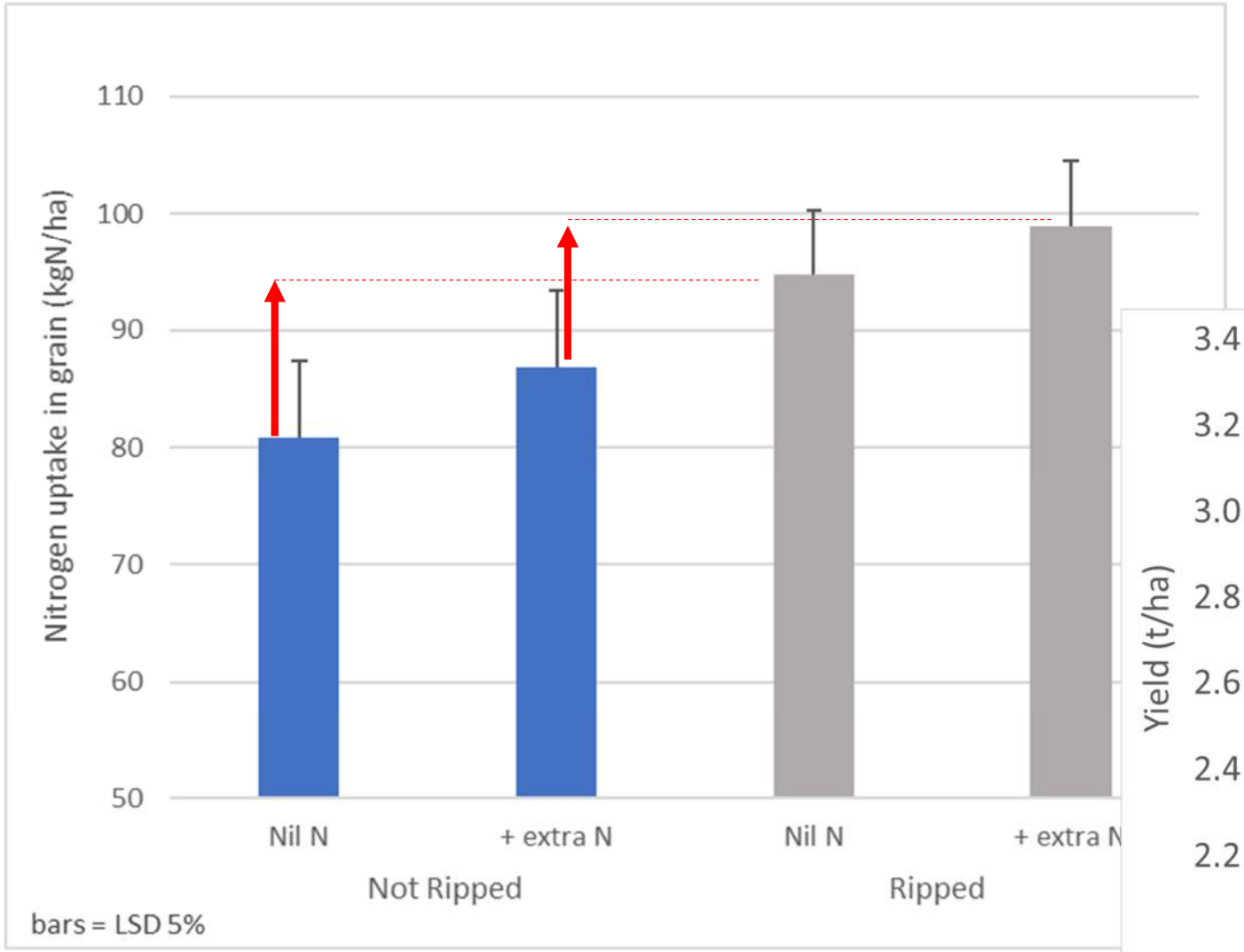
Grain protein content

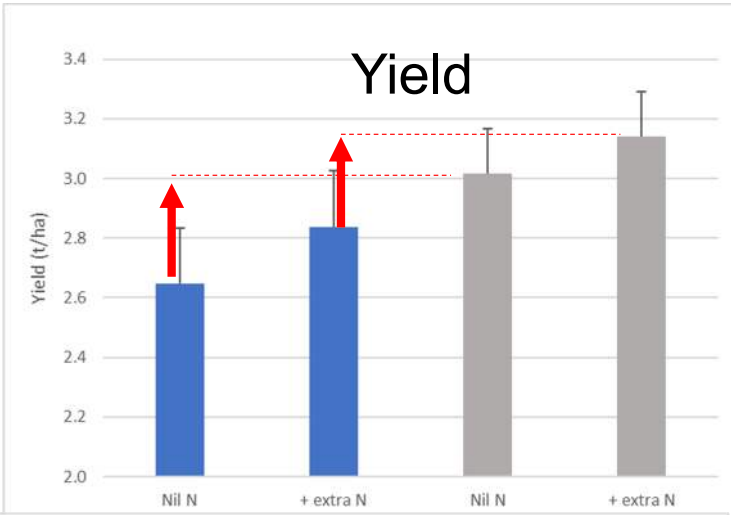


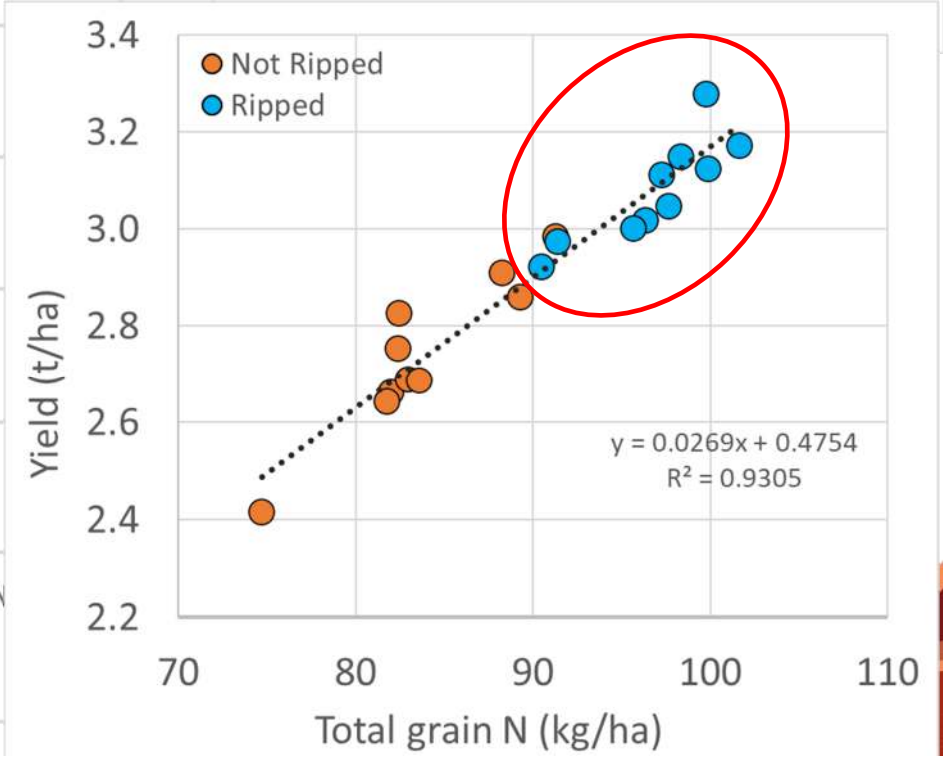




Total grain nitrogen







Summary

- Deep soil mixing increased yield
- Possibly more if sown earlier (8 wks)
- This yield was driven by increased plant biomass (access to soil water/nutrients, especially N)
- Extra N increased yield but not protein
- Deep soil mixing increased protein → increased supply of Org N from soil (buried topsoil) and increased root volume = more nutrients & water
- Anticipate these growth & yield responses to ripping/mixing will translate to cereals

Thank you

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Justin “Herb” Elliott – host

Grey Poulish – Technical support

DAW1902_003RTX: Re-engineering soil