Department of Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Benchmarking crop response to soil amelioration with yield maps and percent achieved yield potential

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Case study: lime, deep ripping and topsoil inclusion

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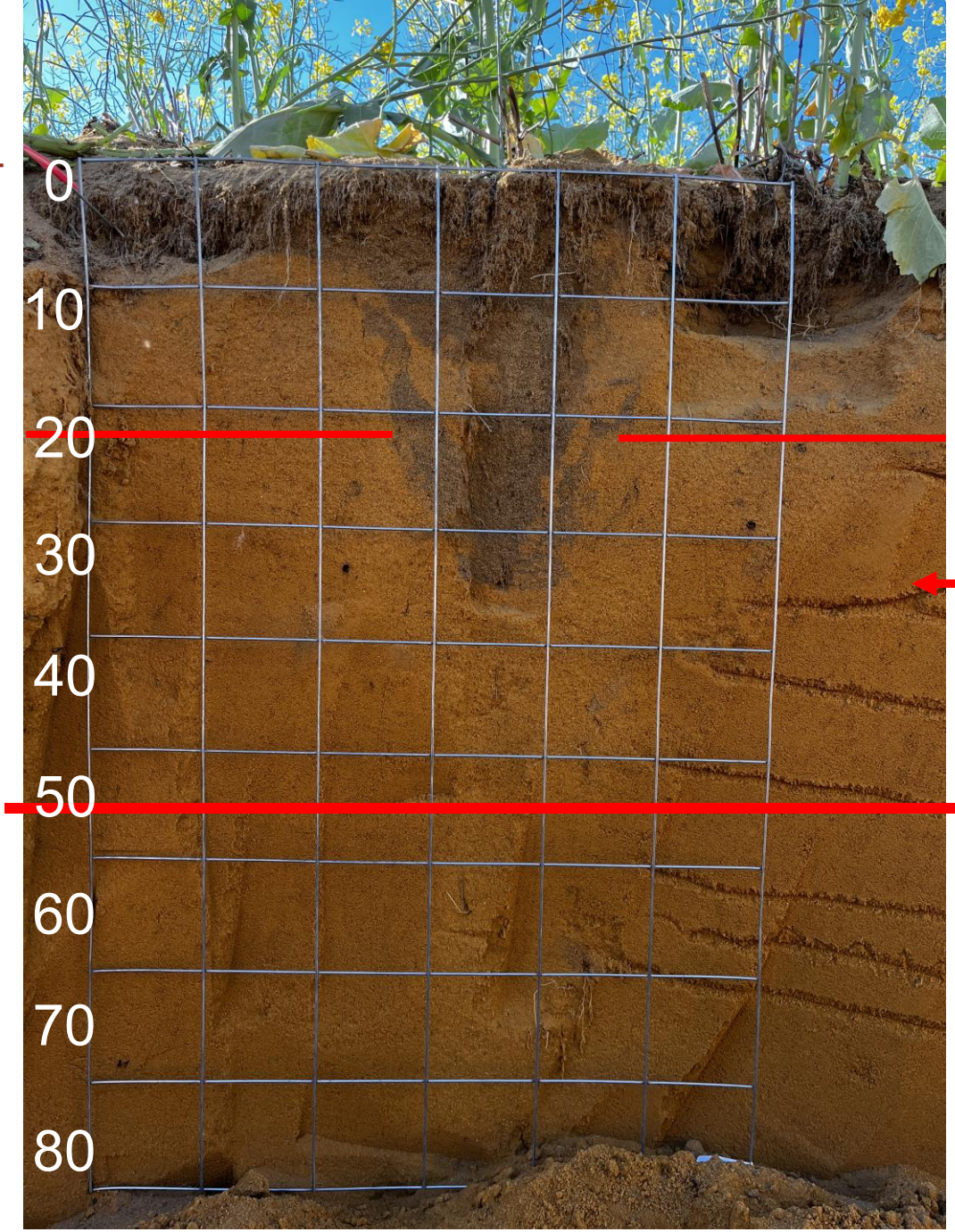
Acidic deep sand
Yellow Arenosol



Low water holding capacity

Compaction
Subsoil acidity
Aluminum toxicity

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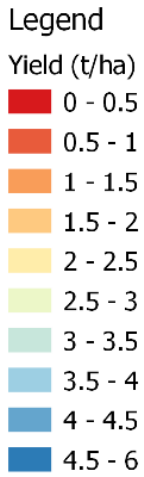
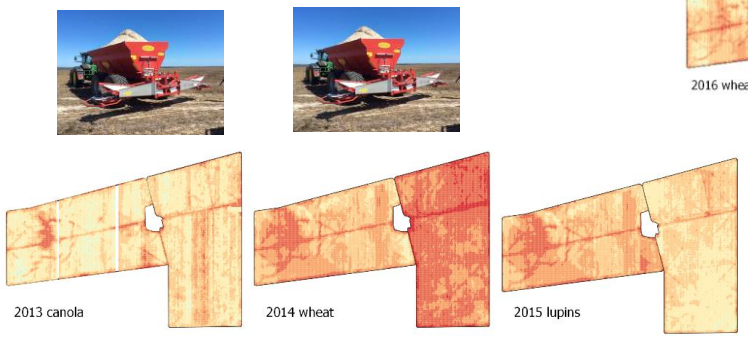
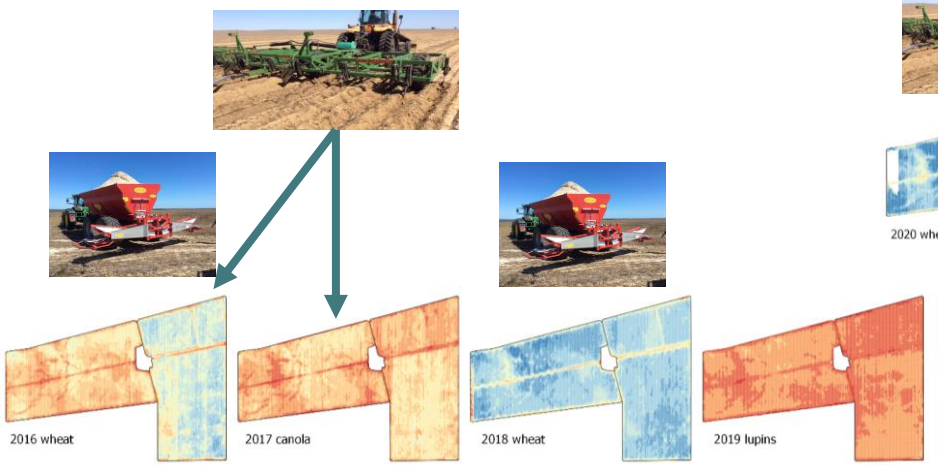
Farm yield data

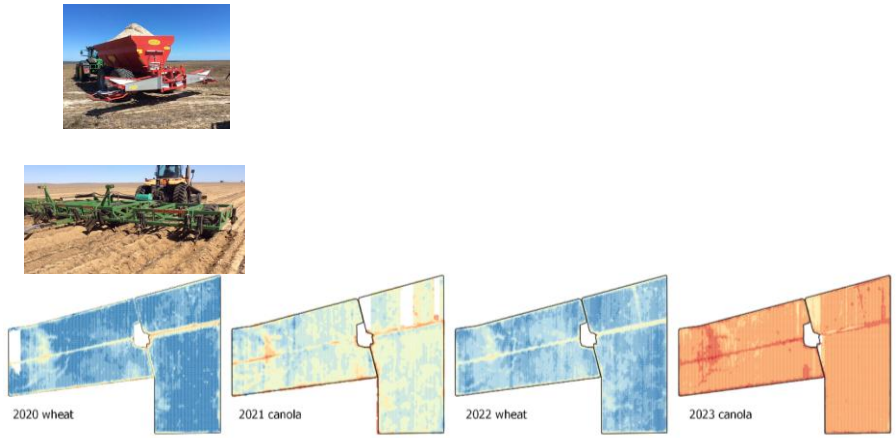




Pre-amelioration



Post amelioration 1



Post amelioration 2

2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

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Percent achieved yield potential

Hybrid version of equations is derived from Hunt and Kirkegard 2015 and Oliver et al 2009 methods

$$\% \text{ Est YP} = (\text{Yield}/((0.25*\text{SRF})+\text{GSR}-110)*\text{WUE})*100$$

\+

25% Summer rainfall
1 Nov – 31 March

\+

100% growing season rainfall
1 Apr – 31 Oct

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Evaporation
and runoff

WUE
kg/ha/mm
20 wheat
13 canola
15 lupins

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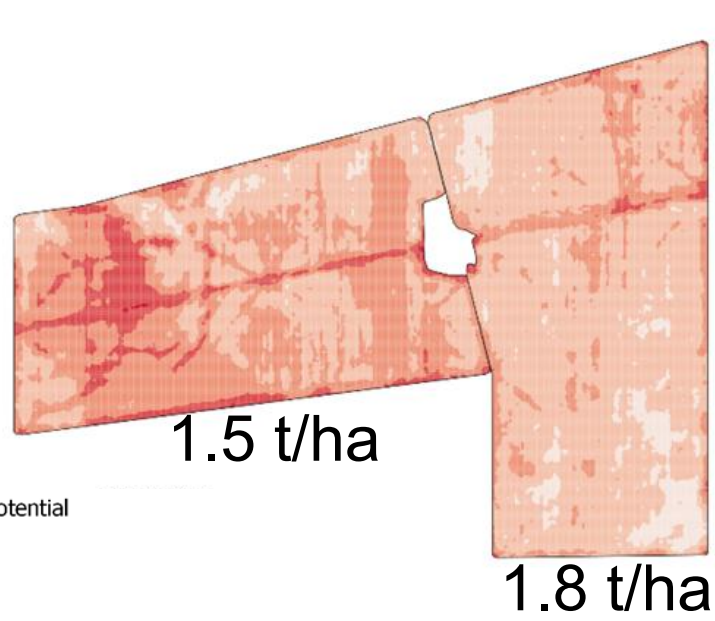
Deep ripping with topsoil inclusion increases % achieved yield potential

Three year average

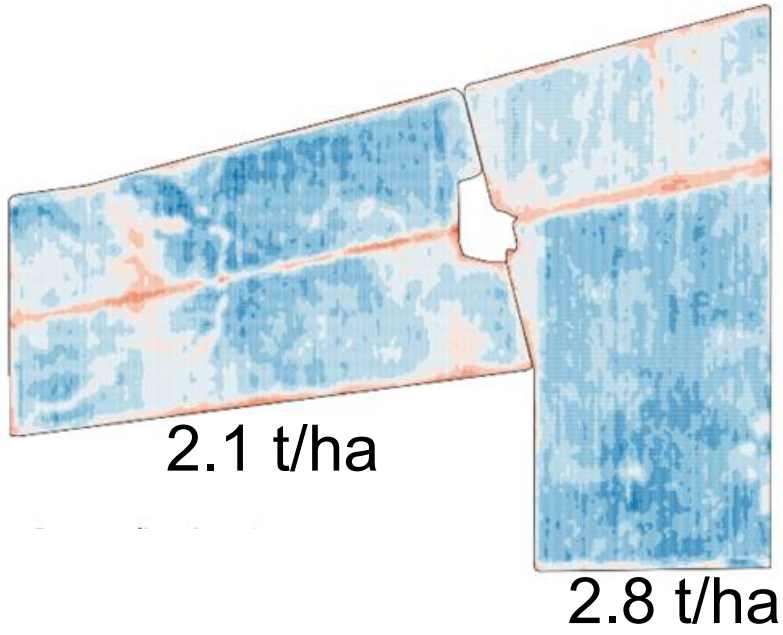
Pre-amelioration 2013-15



5% area >100% YP

233 mm Apr-Oct

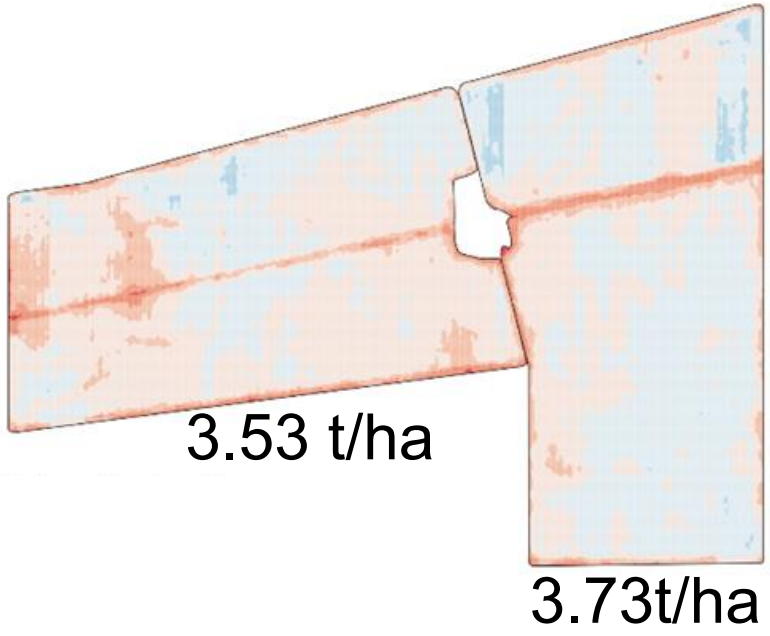
Post amelioration 1 2017-2019



95% area >100% YP

199 mm Apr-Oct

Post amelioration 2020-22



87% area >100% YP

293 mm Apr-Oct

Legend

% of yield potential

- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 125
- 125 - 150
- 150 - 175
- 175 - 200
- 200 - 225
- 225 - 250

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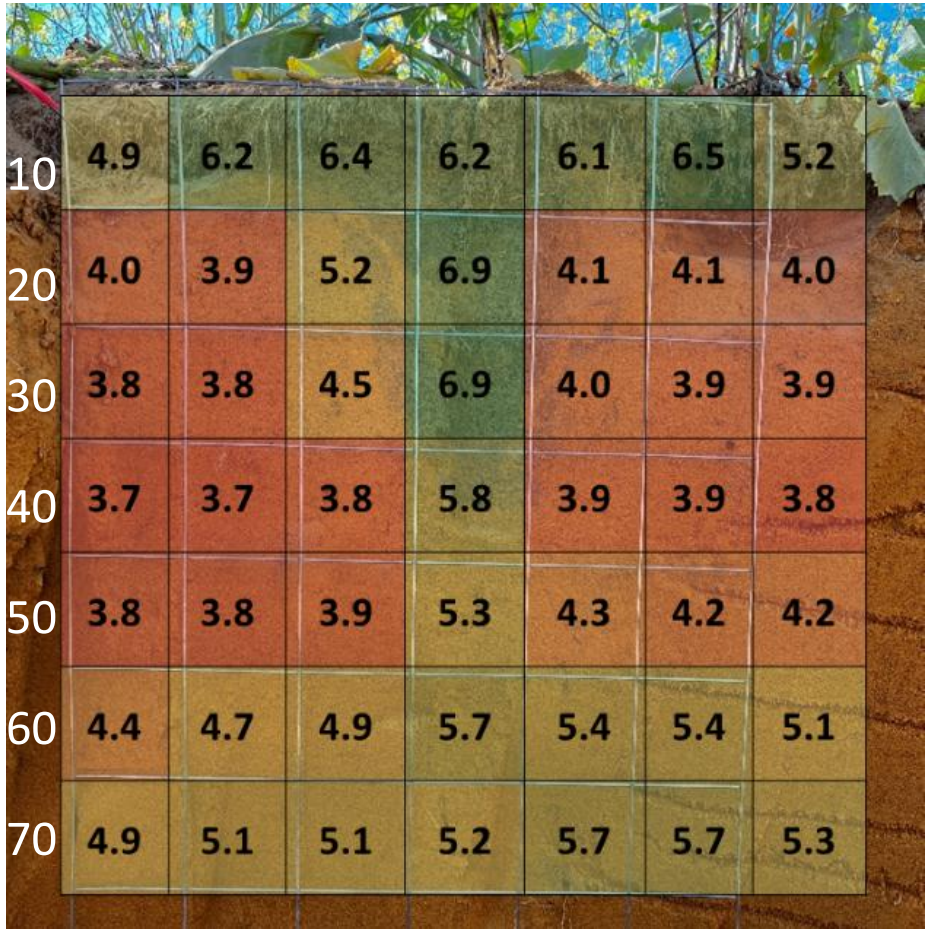
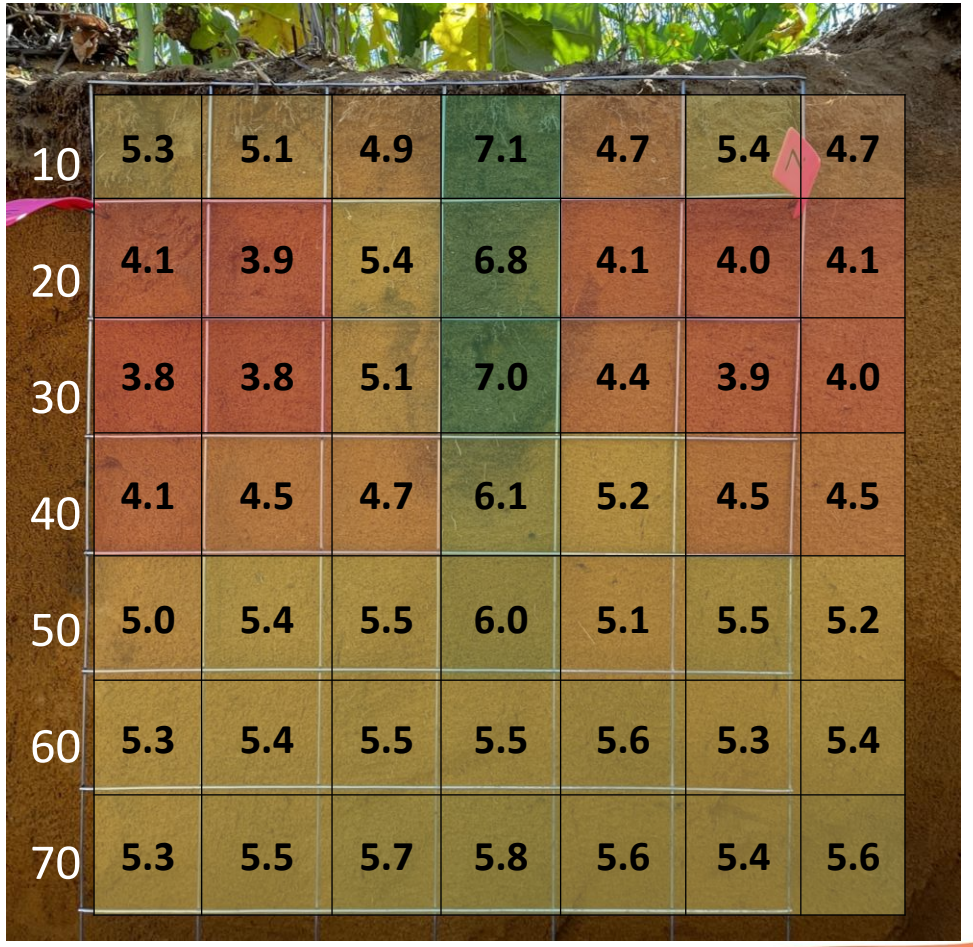
Coarse sand is more constrained

coarse sand – low yielding



Clay	Silt
4%	1%
4%	2%
5%	1%
5%	2%
6%	1%
6%	1%
5%	2%

fine sand – high yielding



Clay	Silt
4%	3%
6%	2%
7%	3%
9%	3%
13%	2%
14%	4%
12%	4%

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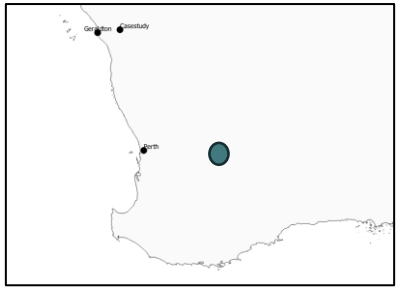
Case study: Lime incorporation & deep ripping

% Est YP = Yield/((0.3*SRF)+GSR-90)*WUE
Oliver et al 2009

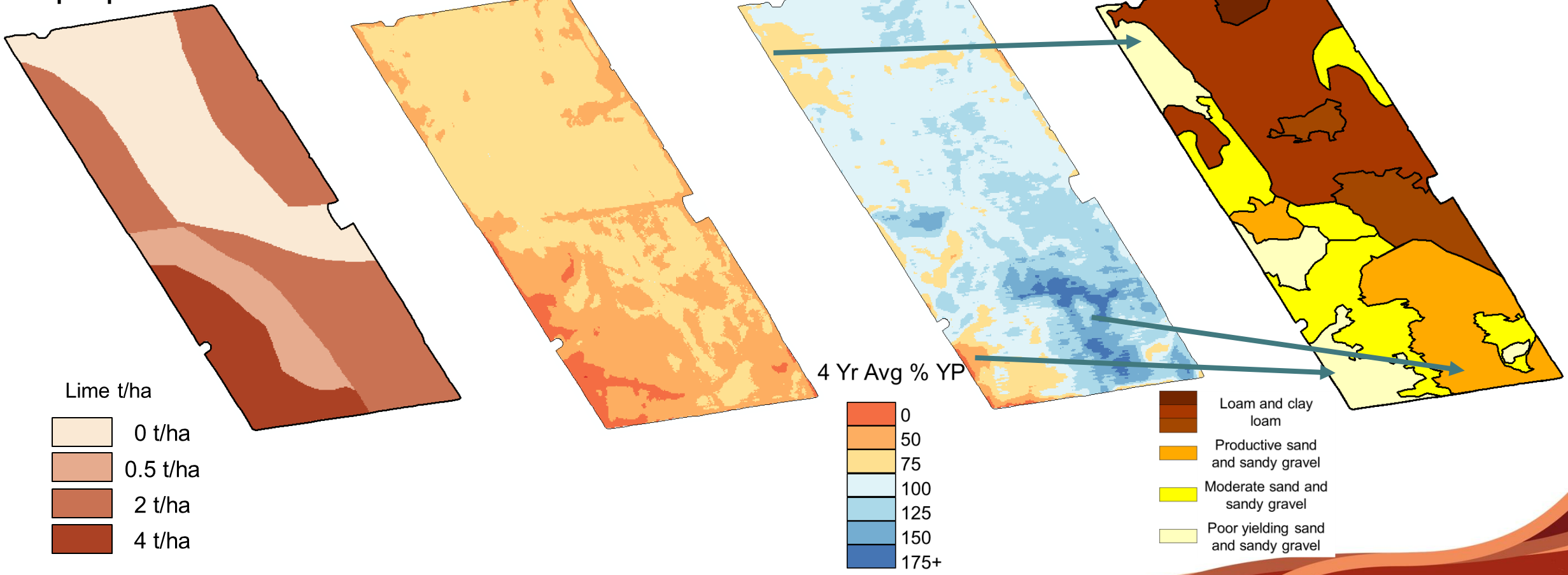


Lime, plough & deep rip 2015

Pre-amelioration

Post-amelioration

Soil types



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Conclusion

- Mapping percent achieved yield potential can be used for evaluating amelioration (spatial and temporal variation)
- Consider relative difference rather than absolute values due to equation not always reflecting true yield potential by soil type
- Case studies have provided insights to which soil types can be targeted for amelioration optimizing resources

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Thank you

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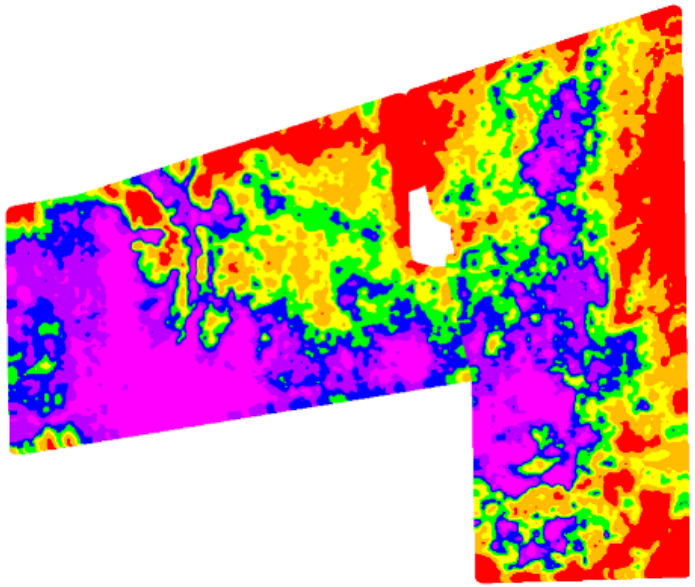
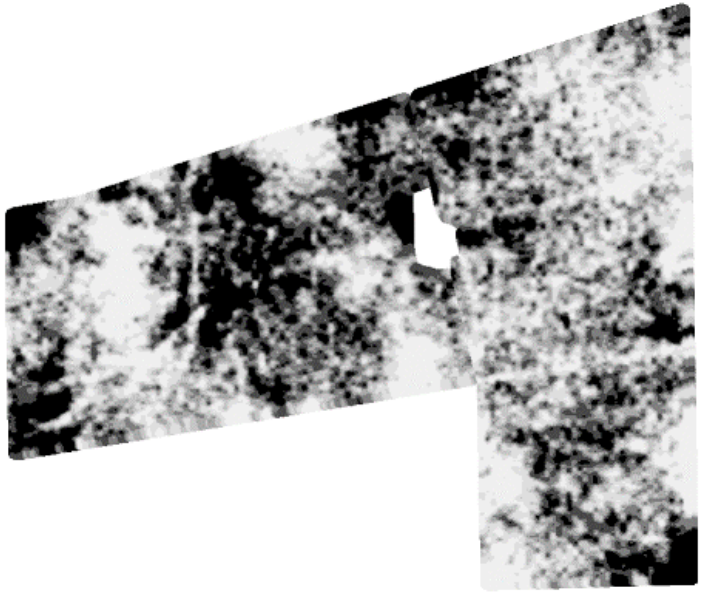
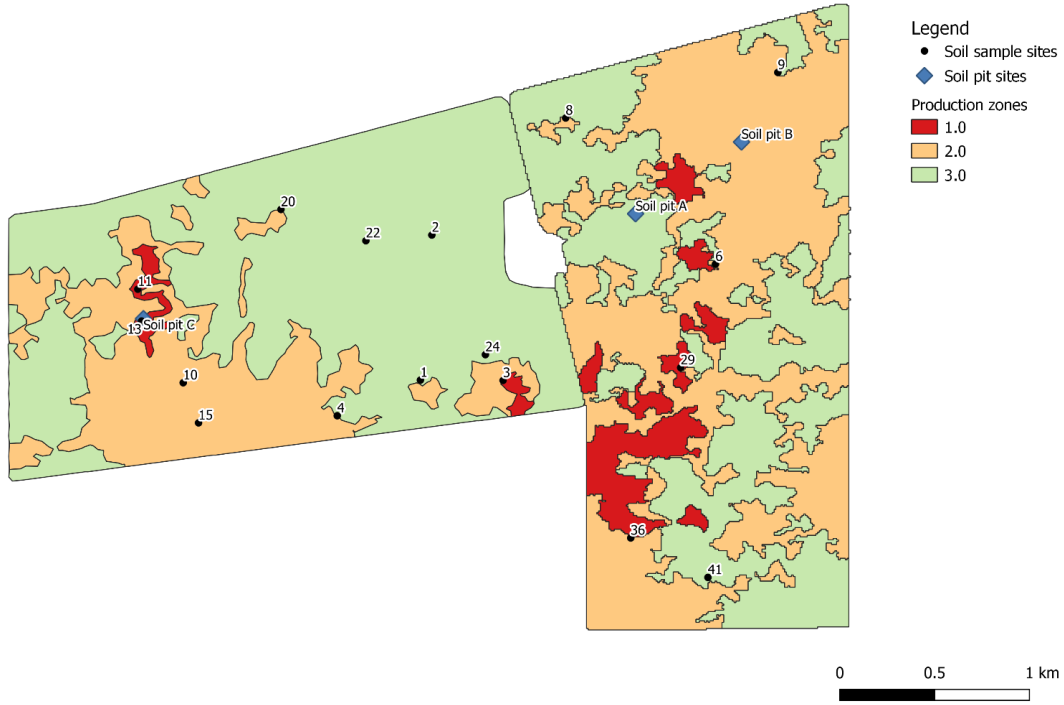
Spatial variation – zoned to soil type



EM 0 to 150cm
(mS/m)
5.43 - 7.39
5.07 - 5.43
4.85 - 5.07
4.67 - 4.85
4.49 - 4.67
4.32 - 4.49
3.80 - 4.32



Gamma TC cps
((1)/s)
178.01 - 206.59
174.29 - 178.01
171.47 - 174.29
168.98 - 171.47
166.33 - 168.98
162.72 - 166.33
140.15 - 162.72



GRDC and DPIRD co-investment project DAW1902-003RTX