



Department of  
Agriculture and Food



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# Conserving and measuring soil moisture: summer weeds, probes, Prophets and EM

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February 25<sup>th</sup> 2014



**PRECISION**  
AGRONOMICS AUSTRALIA



# Outline

- Spraying summer weeds
- Management zones and yield potential



# Introduction

- Soil moisture & yield



# Introduction

- Soil moisture & summer weeds



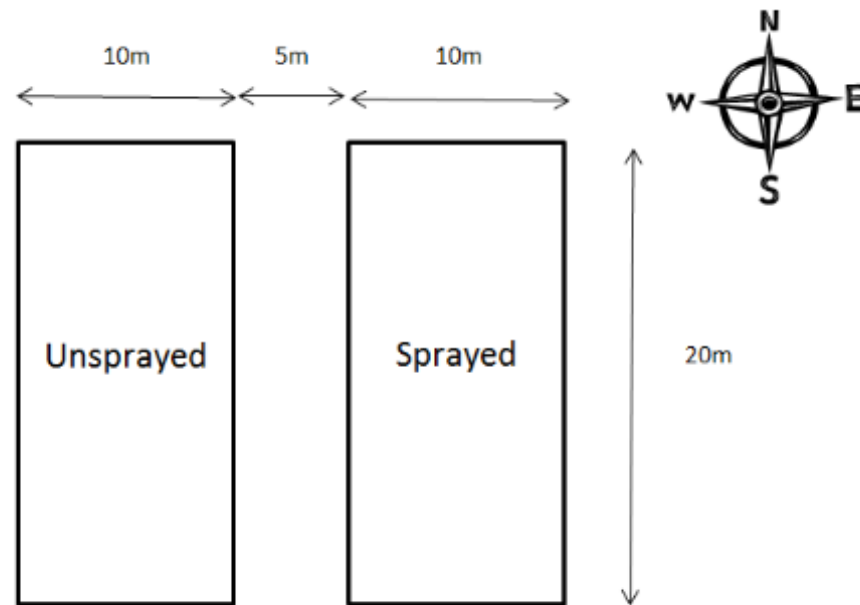
# Objective

- Investigate the effect of summer weed spraying on soil moisture and grain yield.



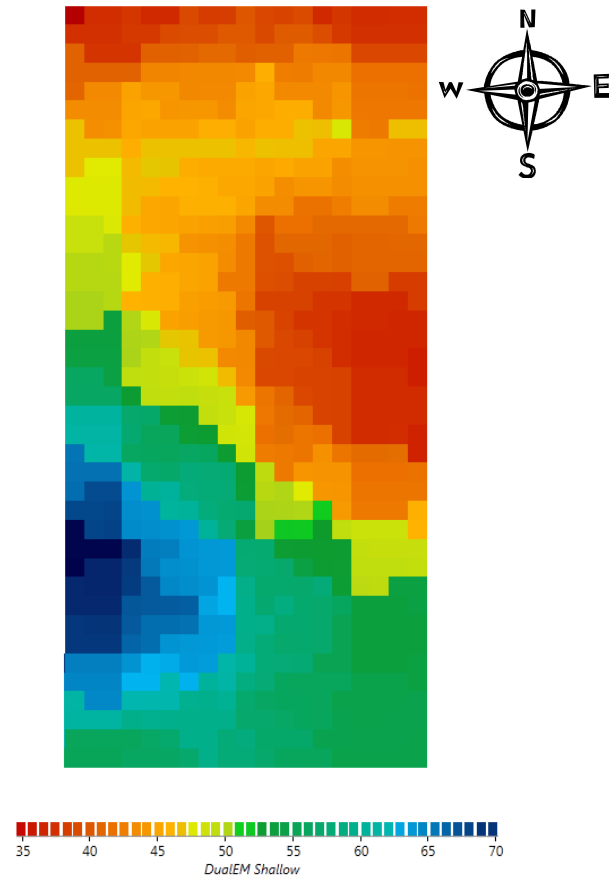
# Set-up

- 7 sites
- No replicates



# Method

- Data available:
  - EM
    - 2 dates





# Method

- Data available:
  - EM
  - Soil moisture (oven-dried)
    - December, January & February



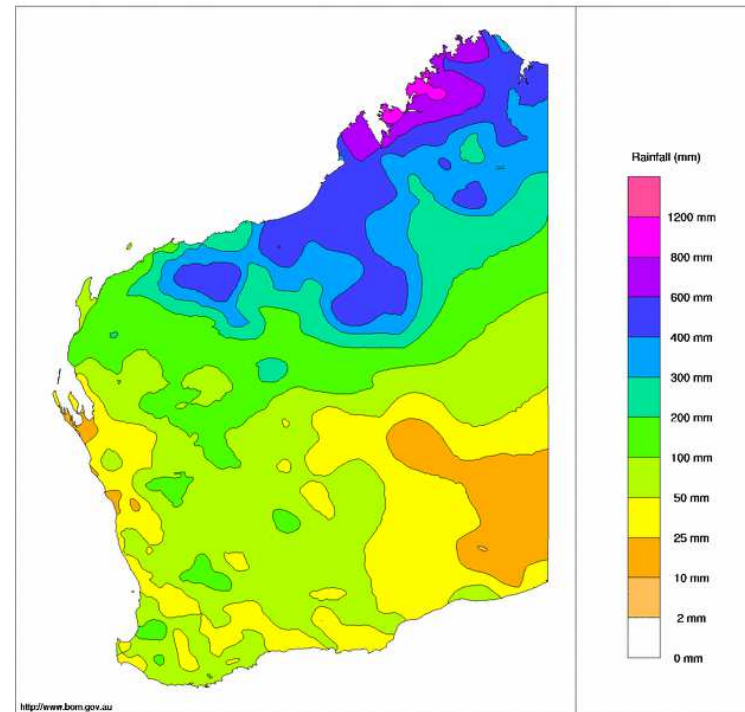


# Method

- Data available:
  - EM
  - Soil moisture
  - Rainfall data
    - Bureau of Meteorology
    - Grower's data

## Western Australia Total Rainfall

1 December 2012 – 28 February 2013



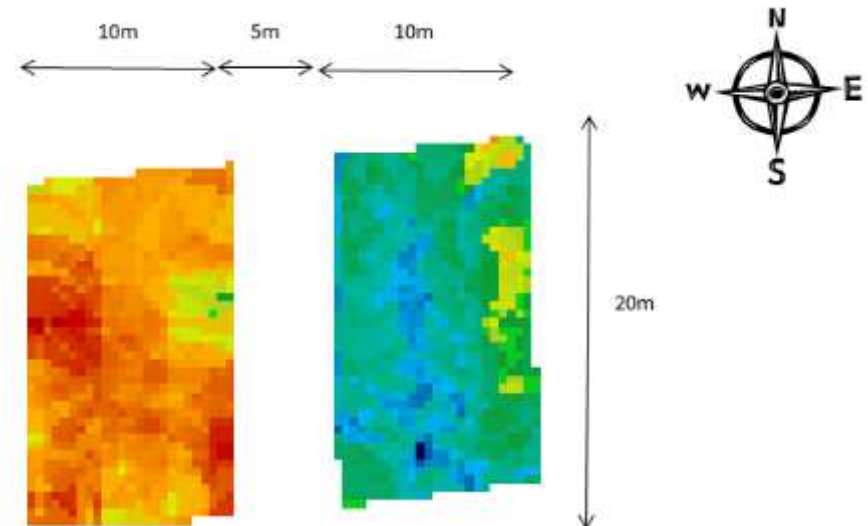
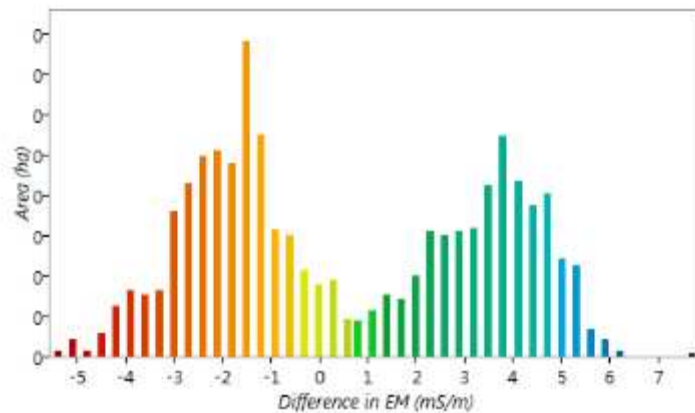
# Method

- Data available:
  - EM
  - Soil moisture
  - Rainfall data
  - Yield
    - DAFWA handcuts
    - Grower's data



# Results

- Bodallin

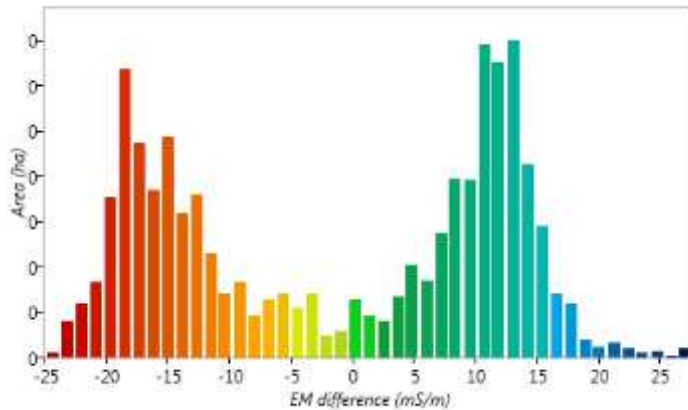
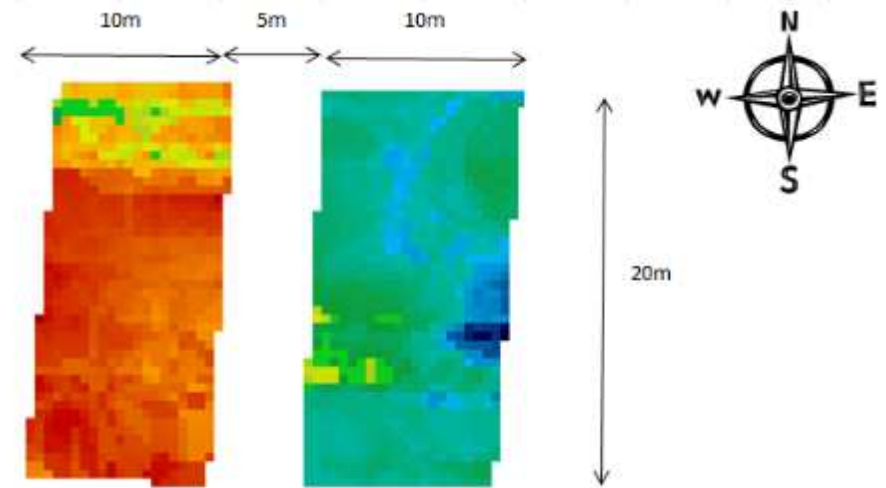


	Unsprayed	Sprayed
Soil moisture (February)	56 mm	70 mm
Yield	1.5 t/ha	1.6 t/ha



# Results

- Nungarin

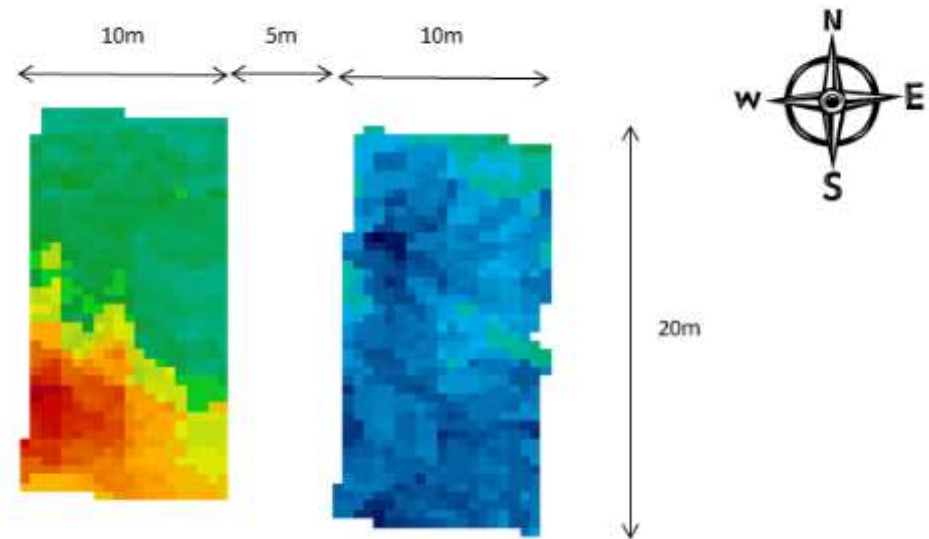
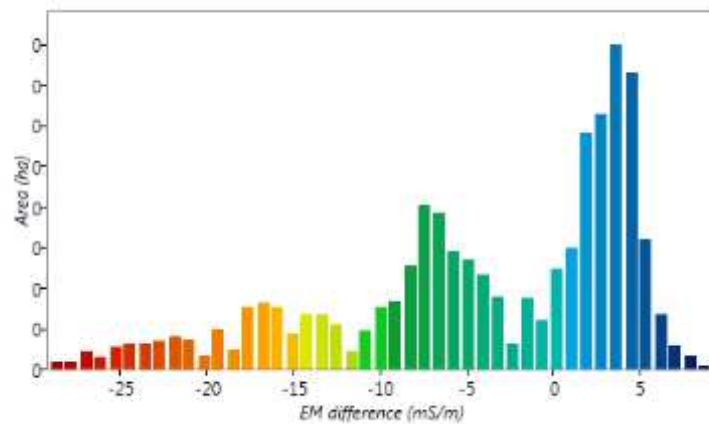


	Unsprayed	Sprayed
Soil moisture	65 mm	91 mm
Yield	1.55 t/ha	3.16 t/ha



# Results

- Southern Cross (loam)

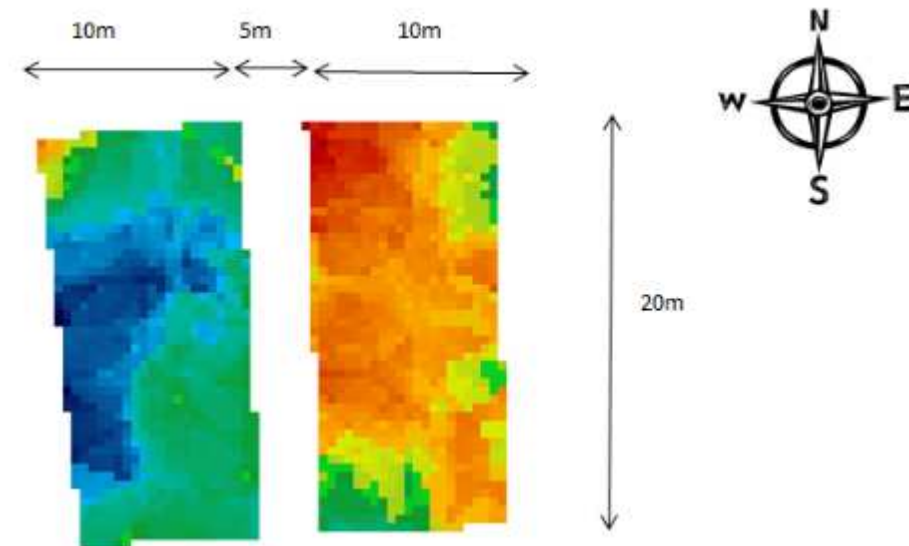
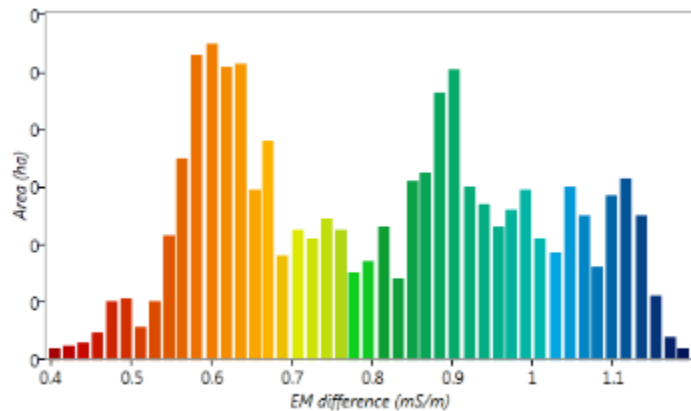


	Unsprayed	Sprayed
Soil moisture (February)	50 mm	112 mm
Yield	0.8 t/ha	1.03 t/ha



# Results

- Southern Cross (gravel)

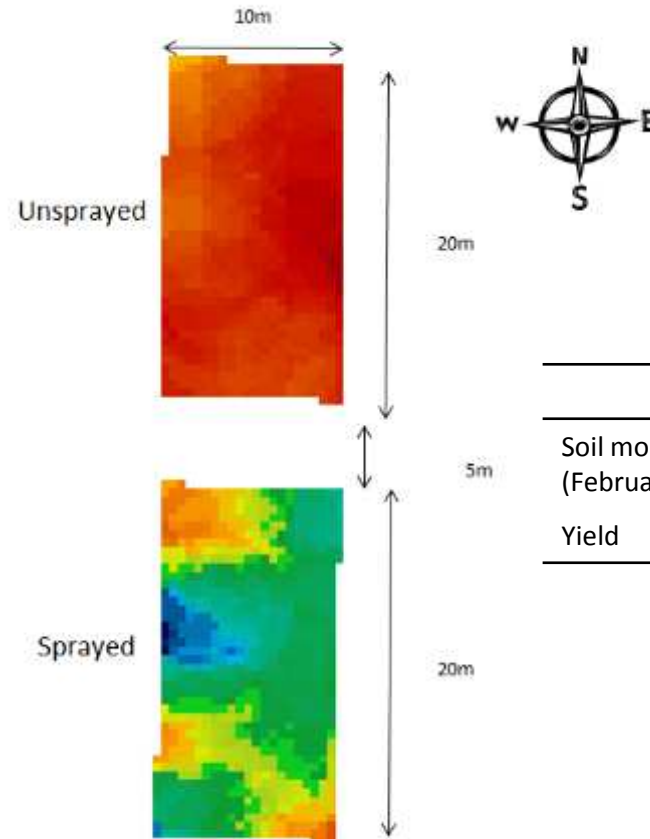
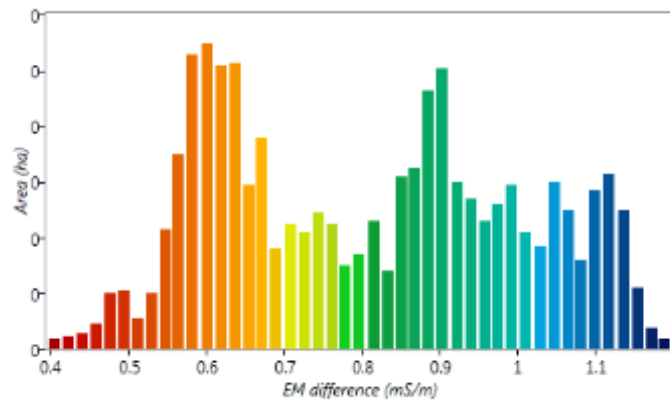


	Sprayed	Unsprayed
Soil moisture (February)	37 mm	21 mm
Yield	1.13 t/ha	0.72 t/ha



# Results

- Beacon South



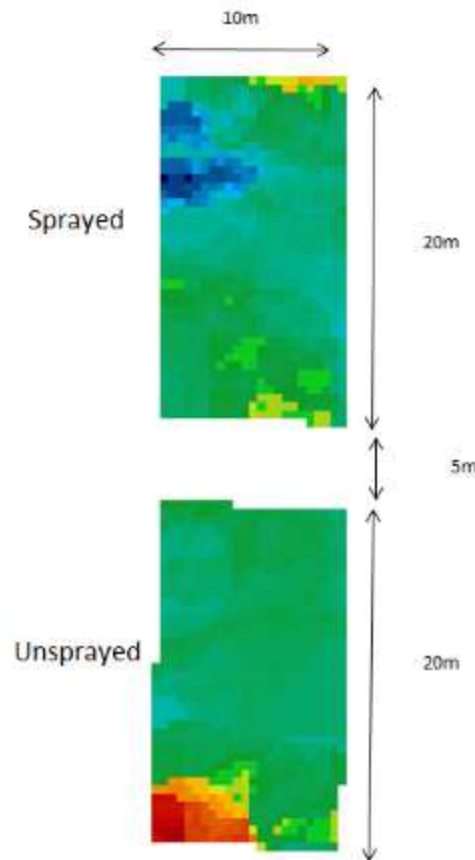
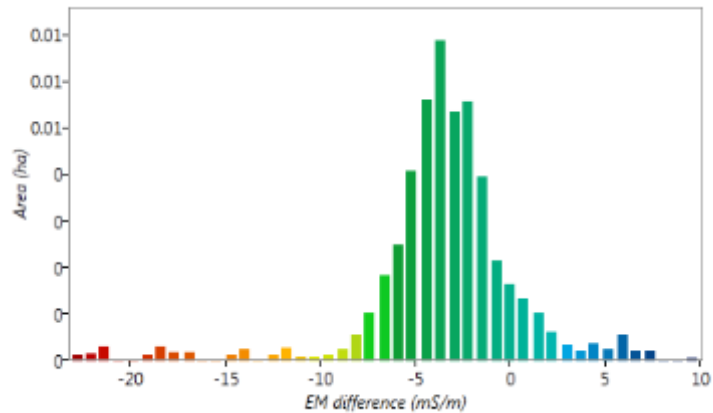
	Sprayed	Unsprayed
Soil moisture (February)	107 mm	91 mm
Yield	1.06t/ha	0.86 t/ha





# Results

- Beacon North

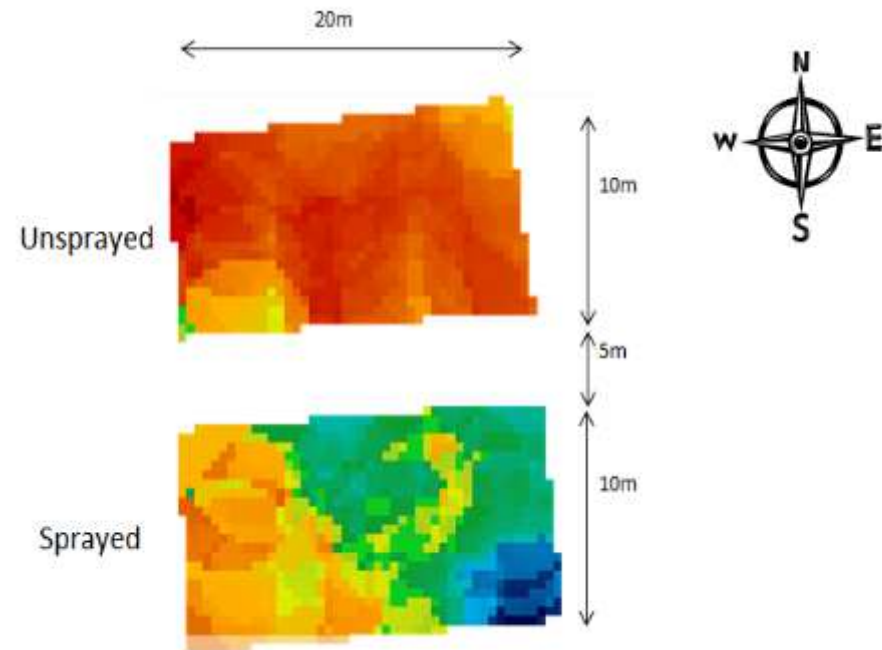
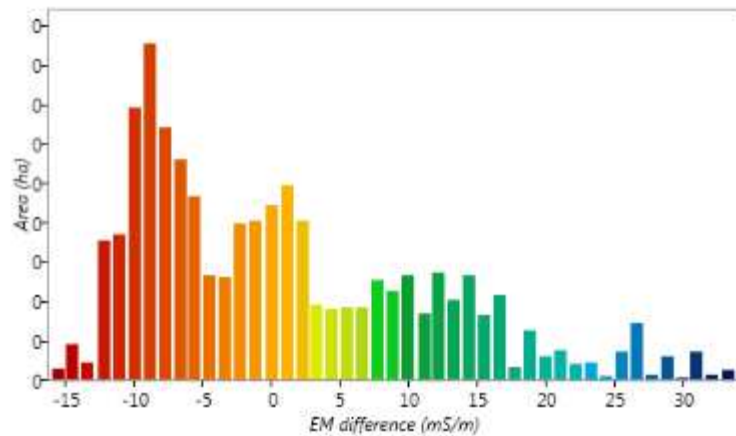


	Sprayed	Unsprayed
Soil moisture (February)	69 mm	63 mm
Yield	1.68t/ha	1.73 t/ha



# Results

- Narembreen



	Sprayed	Unsprayed
Soil moisture (February)	90 mm	52 mm
Yield	2.8t/ha	2.2 t/ha



# Results

- Soil Moisture

	December		February	
	Unsprayed	Sprayed	Unsprayed	Sprayed
Average Soil Moisture (mm)	71	68	57	82



# Results

- Yield

	Unsprayed	Sprayed
Average Yield (t/ha)	1.3	1.8



# Key findings

- Spraying summer weed increased soil moisture at sowing

Average +25 mm



# Key findings

- Spraying summer weed increased 2013 yield

Average +0.5 t/ha



# Key findings

- Little effect on soil moisture & yield for low rainfall (<20mm)



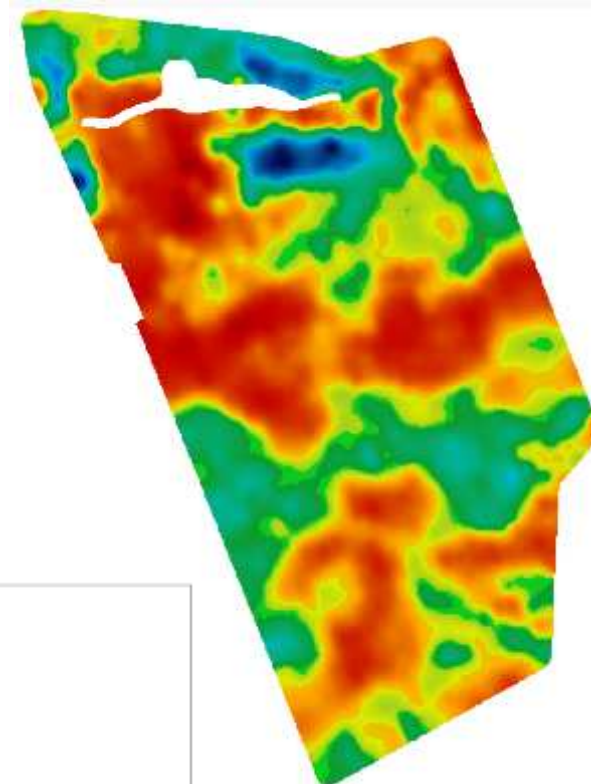
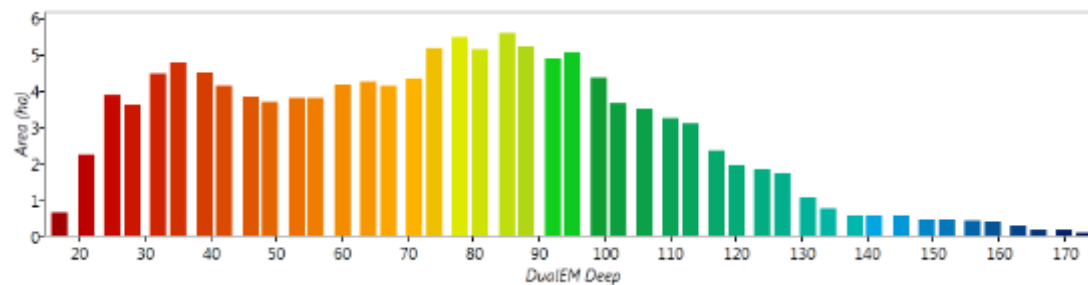


# Management zones and yield potential



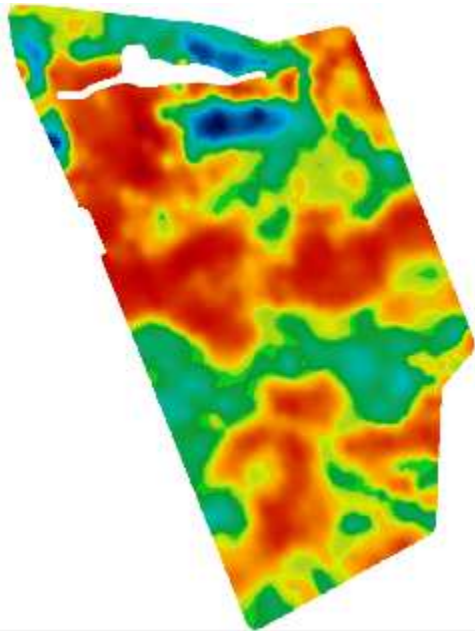
# Introduction

- In-field soil variation



# Introduction

- Soil type → Yield potential



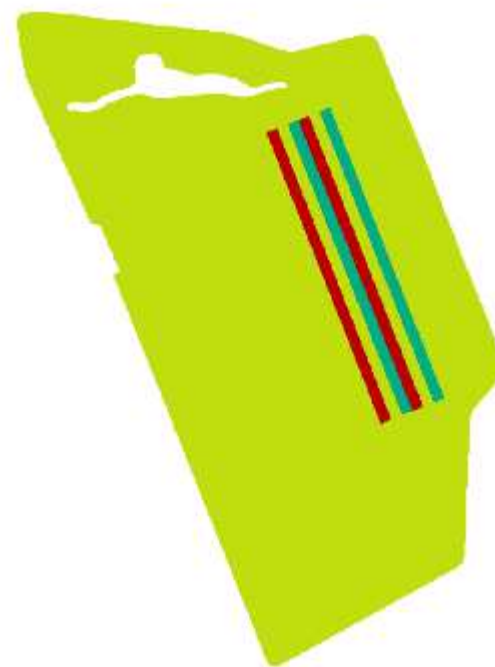
# Objective

Investigate the effect of Variable Rate (VR) application of Nitrogen to yield potential



# Experimental set-up

- 3 N-treatments
- 2 strips per treatment



# Method

- YieldProphet for determining in-season N-applications

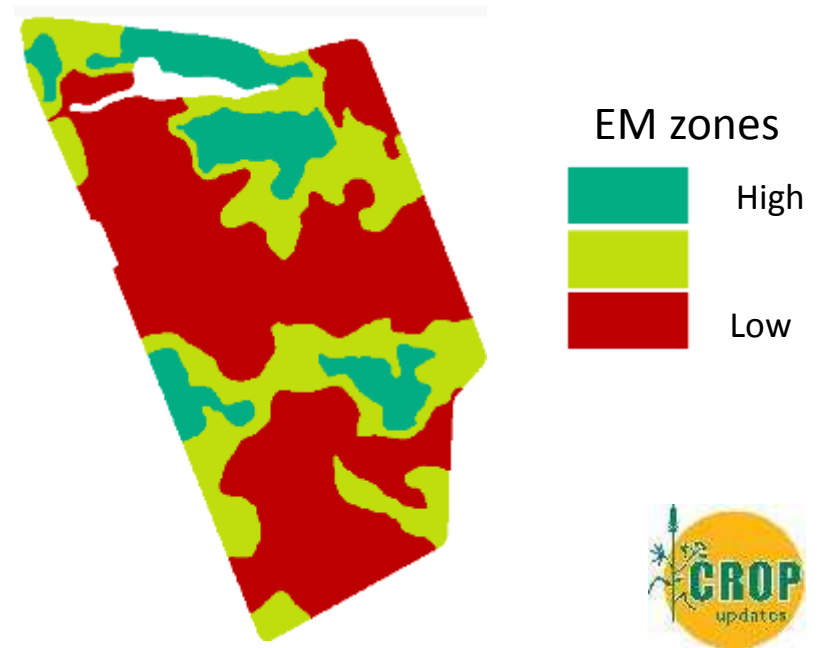


Nitrogen strip trails



# Method

- EM zones





# Method

- Soil cores



High EM

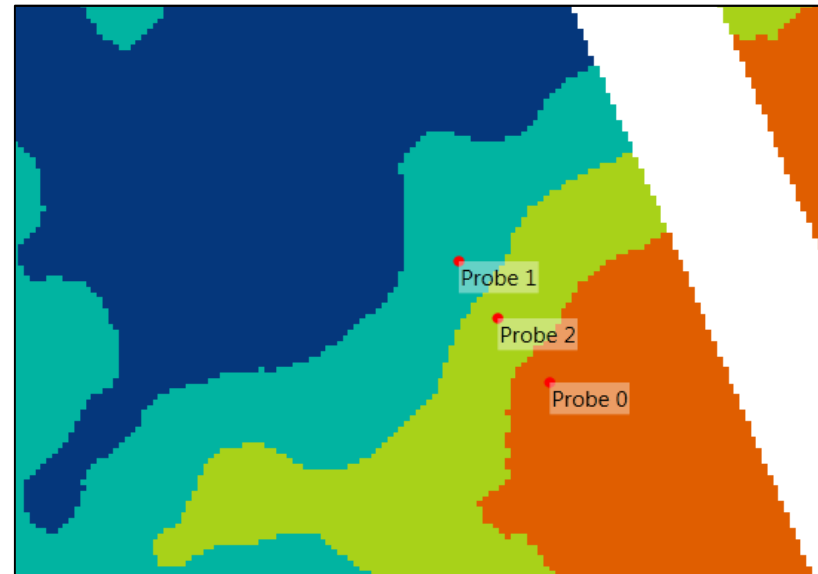


Low EM



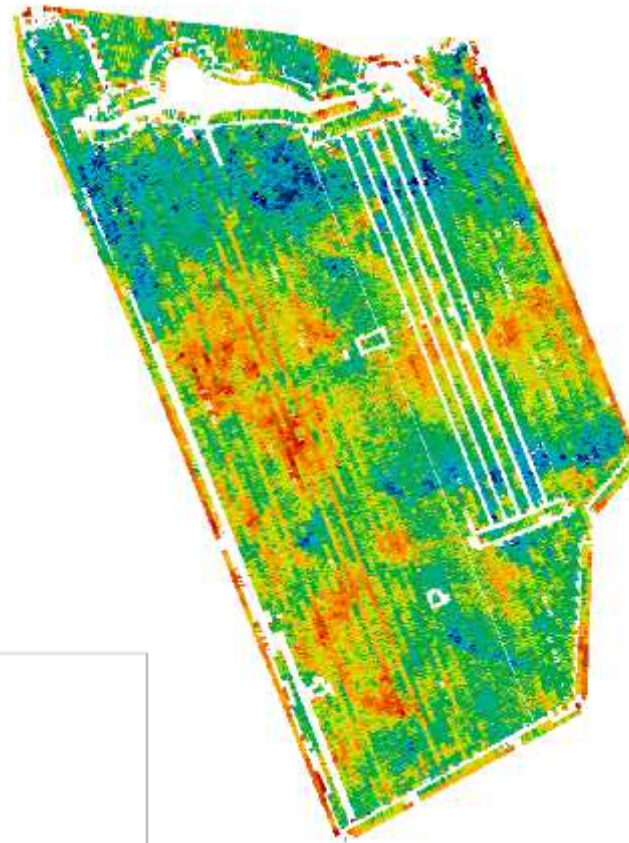
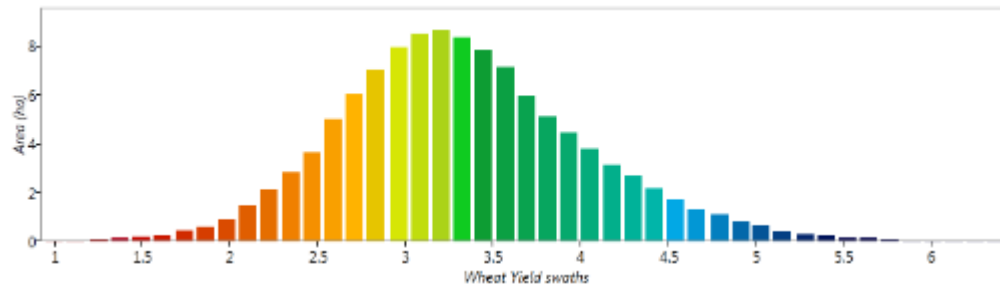
# Method

- Soil moisture probe per EM zone
- Measurement per 10 cm



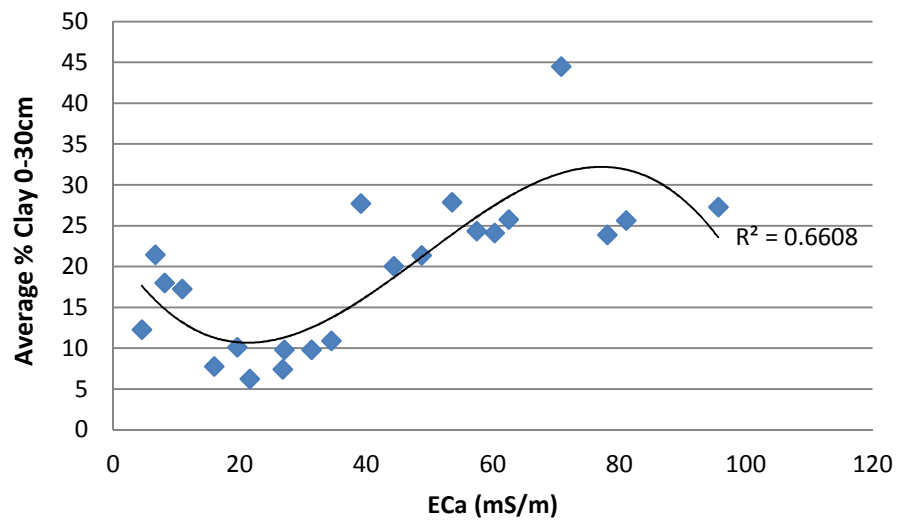
# Method

- Yield data



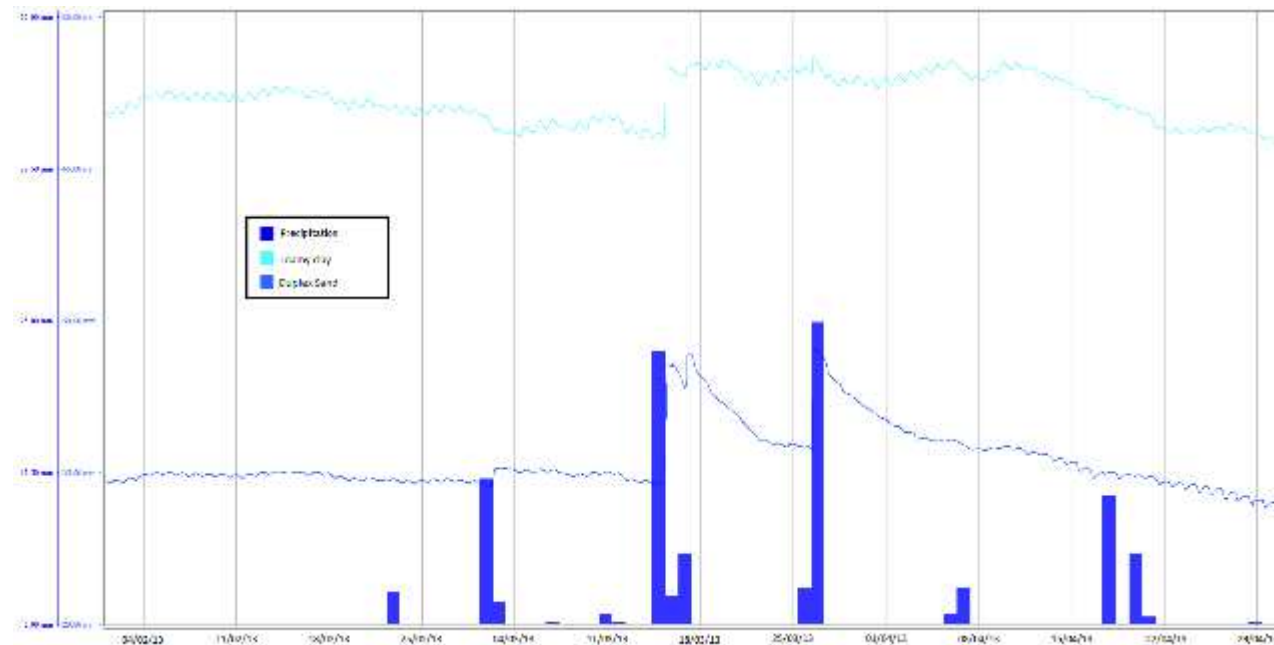
# Results

- Correlation EM – Clay content



# Results

- Total soil moisture per EM zone



# Results

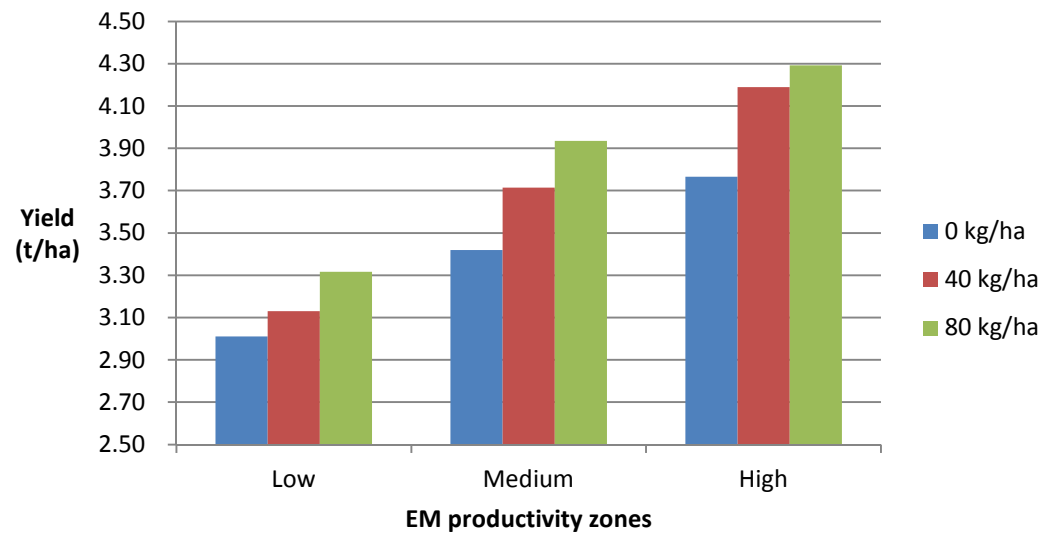
- Average total soil moisture 2013

	Soil moisture
Low EM zone	139 mm
High EM zone	170 mm



# Results

- Nitrogen - yield response





# Results

- Yield increase (t/ha) compared to zero N

	Fertilizer applied	
	40 kg/ha	80 kg/ha
Low EM	0.12	0.31
Medium EM	0.29	0.52
High EM	0.42	0.53



# Results

- Net profit (\$/ha) compared to zero N

	Fertilizer applied	
	40 kg/ha	80 kg/ha
Low EM	\$ 17.86	\$ 60.50
Medium EM	\$ 70.40	\$ 123.86
High EM	\$ 109.09	\$ 126.88

(300\$/t wheat, 0.34\$/kgN, 5\$/ha application)



# Discussion

- Relation: seasonal rainfall - N response



# Key messages

Variable rate N to yield potential pays





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# Thanks for your attention!

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