Soil amelioration

Chad Reynolds - DPIRD

GRDC UPDATES

Soil issues and management

Soil acidity (*Most severe - $1.6 billion/yr loss in potential across WA*)

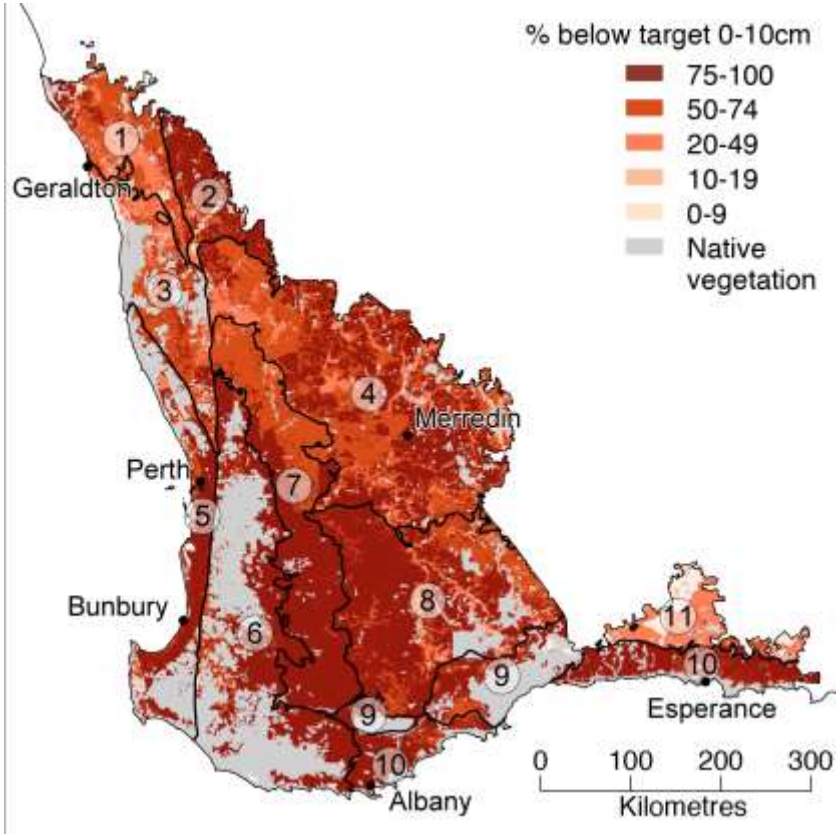
Soil compaction (*$0.9 billion/yr*)

Non-wetting soils

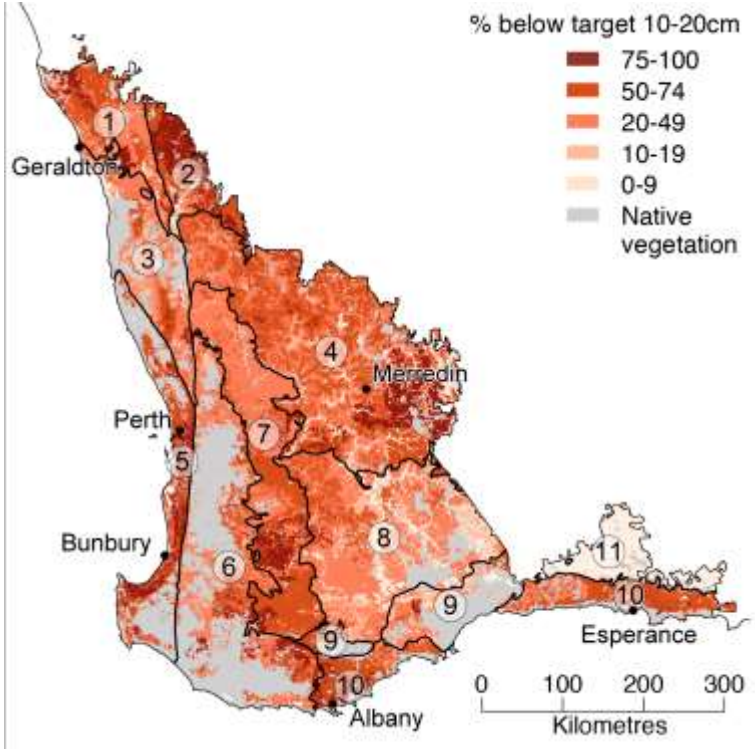
“Killing two birds with one stone” through the use of suitable lime application followed by suitable tillage implements

Extra benefits such as weed control

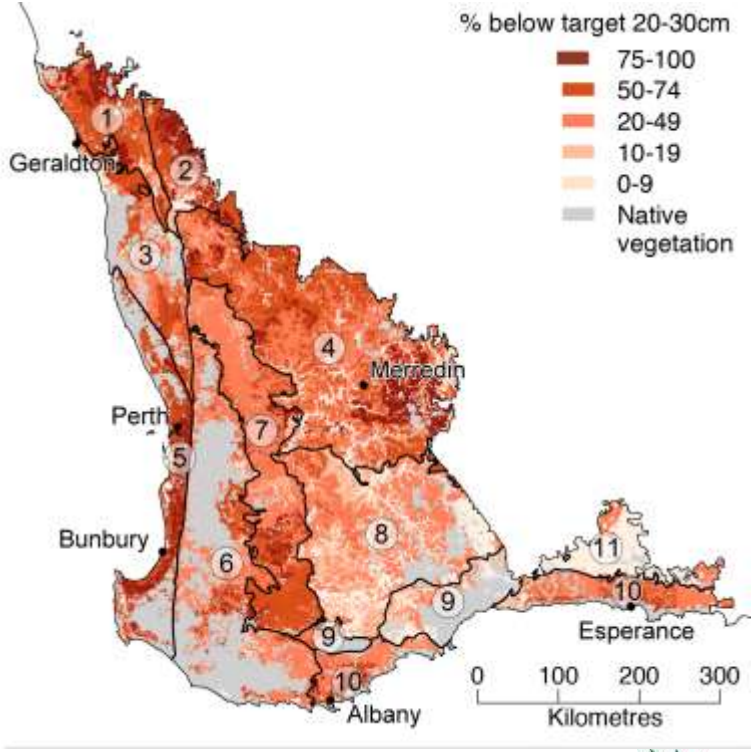
Topsoil (pH<5.5)



Midsoil (pH<4.8)



Subsoil (pH<4.8)

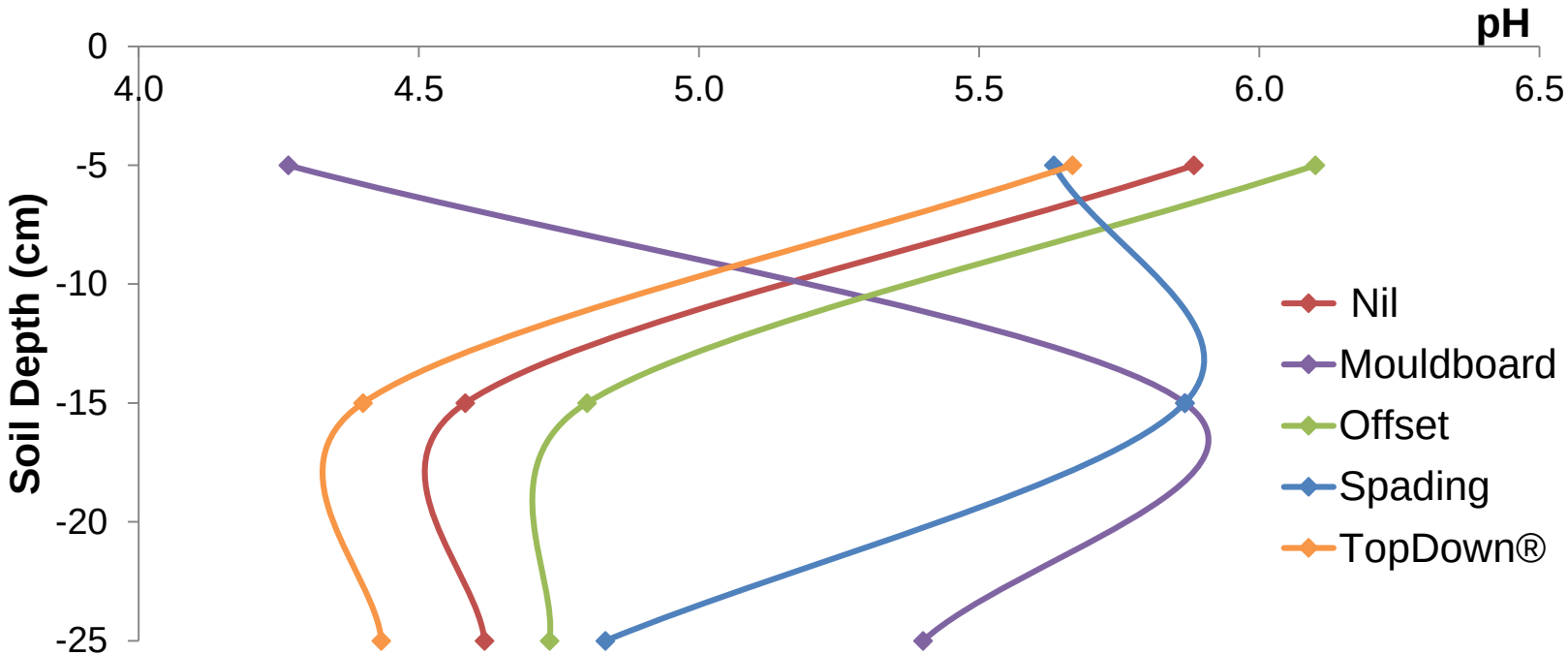


GRDC UPDATES

Incorporation implement	Approximate cost range ($/ha)	Typical working depth (cm)	Depth of lime incorporation achieved (cm)
Offsets	$40/ha	10-15	10-15
Deep ripping	$45-55/ha	30-40	10-15, variable
Shallow-leading tyne ripping	$40-50/ha	40-50	10-15
One-way plough	$30-40/ha	15-25	15-25
Ripper with inclusion plates	$45-55/ha	30-40	20-25
TopDown® plough	$100-150/ha?	20-35	20-25
Large offsets	$50-60/ha	24-25	24-25
Deeper ripper	$60-70/ha?	40-60	23-25
Rotary spader	$120-150/ha	28-35	28-35
Mouldboard plough	$100-150/ha	28-35	28-35

Deep yellow sandy earth

2 t/ha lime incorporated in deep yellow loamy sand



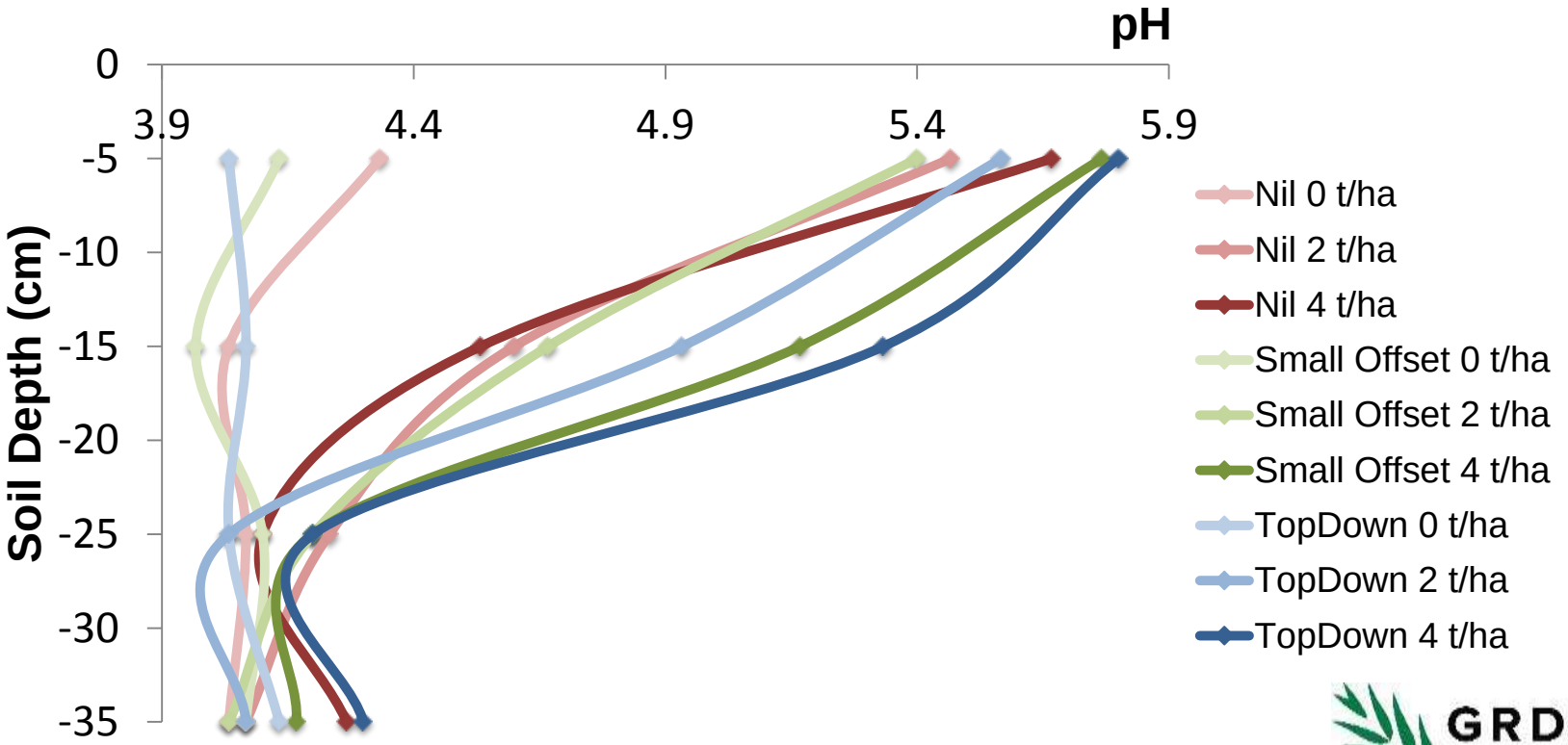
Return on Investment after 1 year (2014 - $300/t)

Tillage Treatment	Cost ($/ha)	Yield (t/ha)	ROI ($/ha)	Net Benefit ($/ha)
Nil	0	1.06	0	**0**
Mouldboard	125	1.51	1.08	**10**
Spading	135	1.56	1.11	**15**
TopDown®	125	1.66	1.44	**55**
Offset	40	1.29	1.72	**29**
+2 t/ha Lime	*100*	*1.42*	*1.08*	***8***

GRDC UPDATES

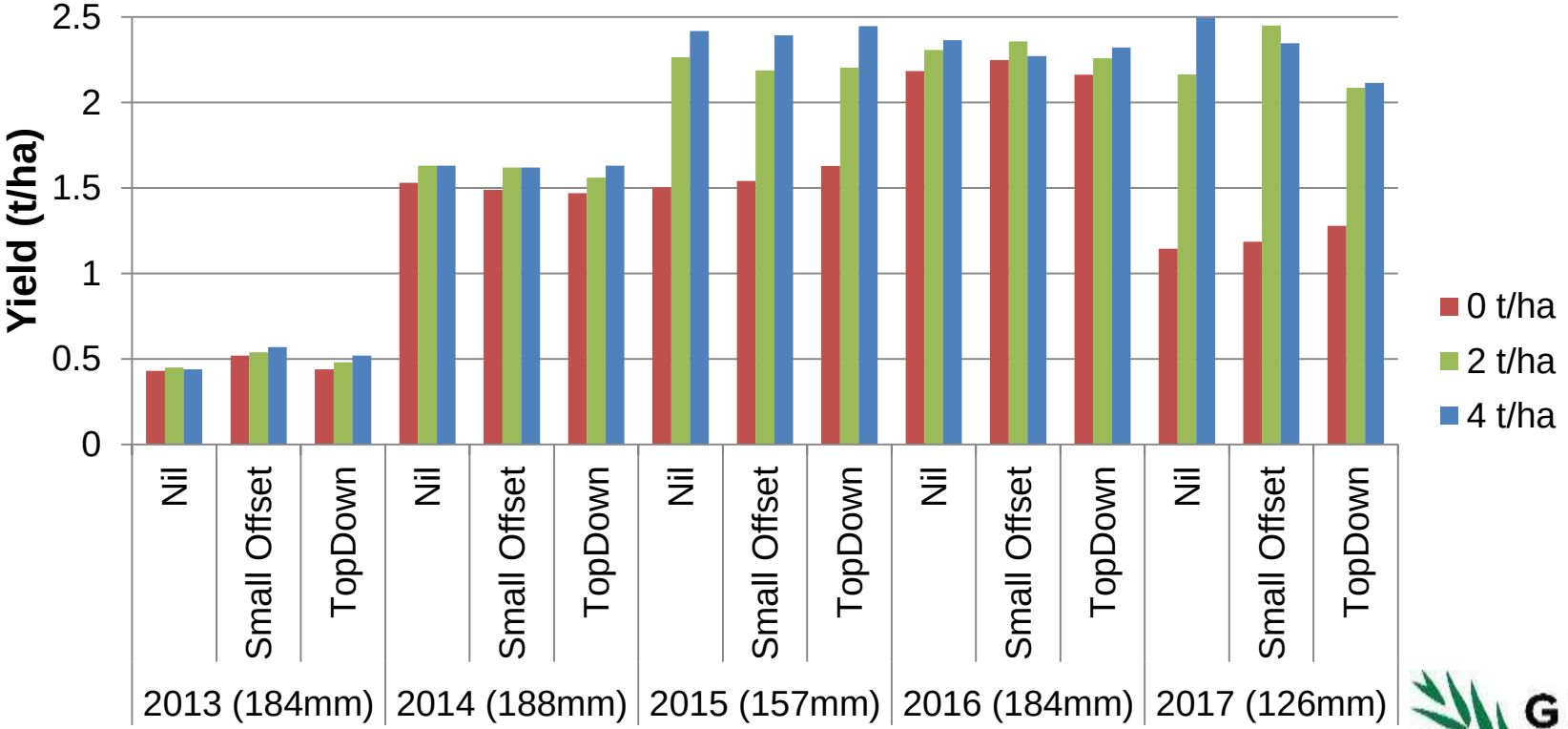
- **Shallow gravel**
- **Loamy sand over gravel**
- **Red sandy loam with clay increasing with depth**

Two years after lime incorporation (Tardun)

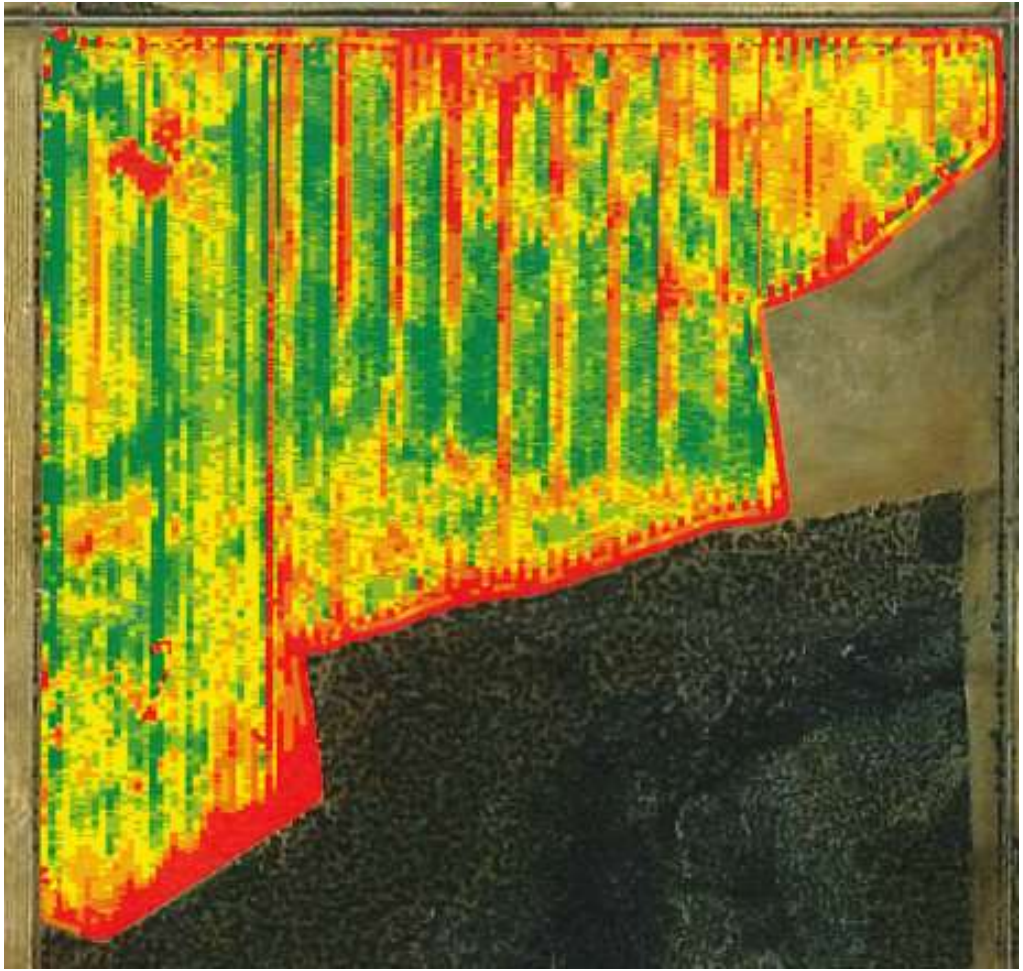


GRDC UPDATES

Annual Wheat Yields (Tardun)



GRDC UPDATES

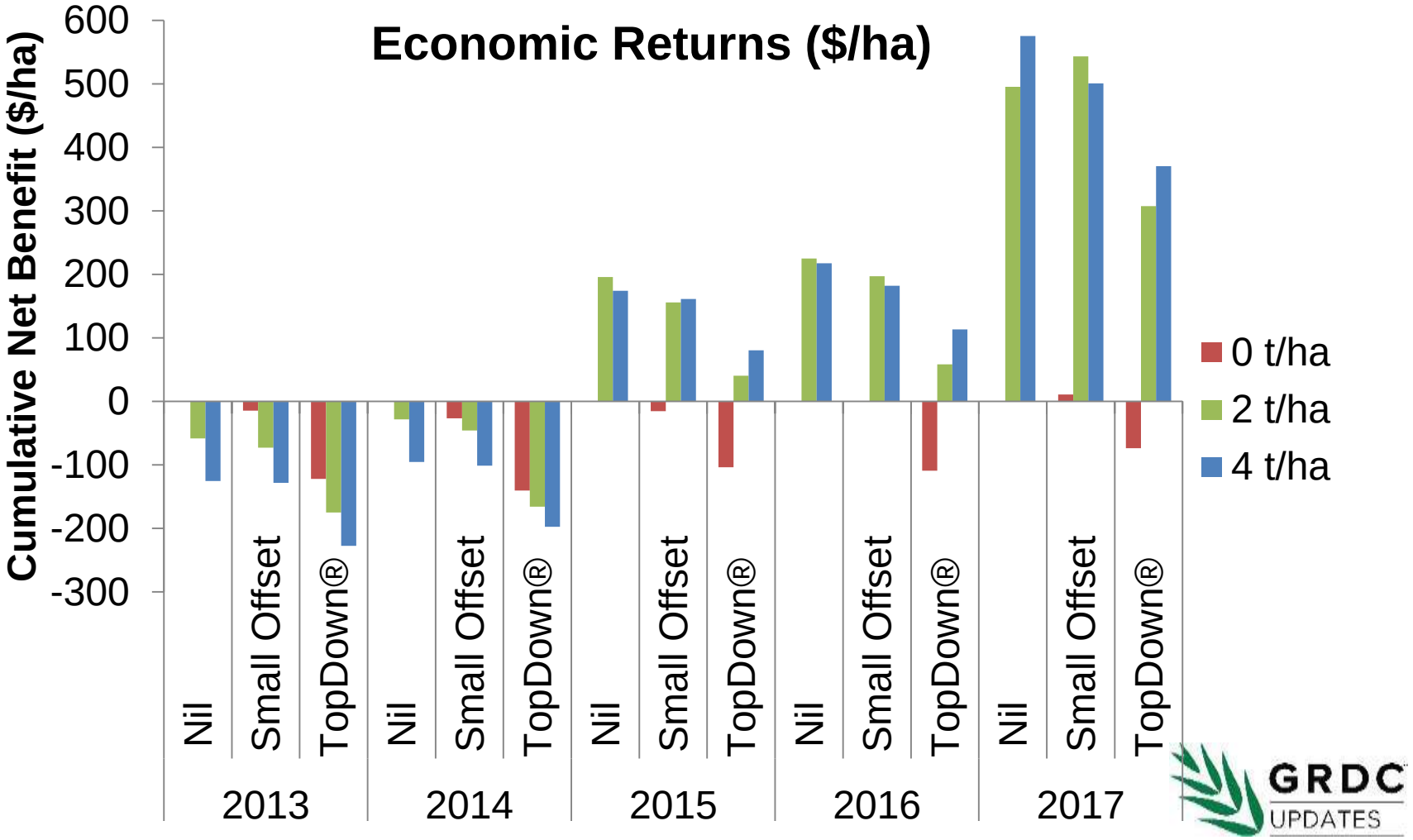


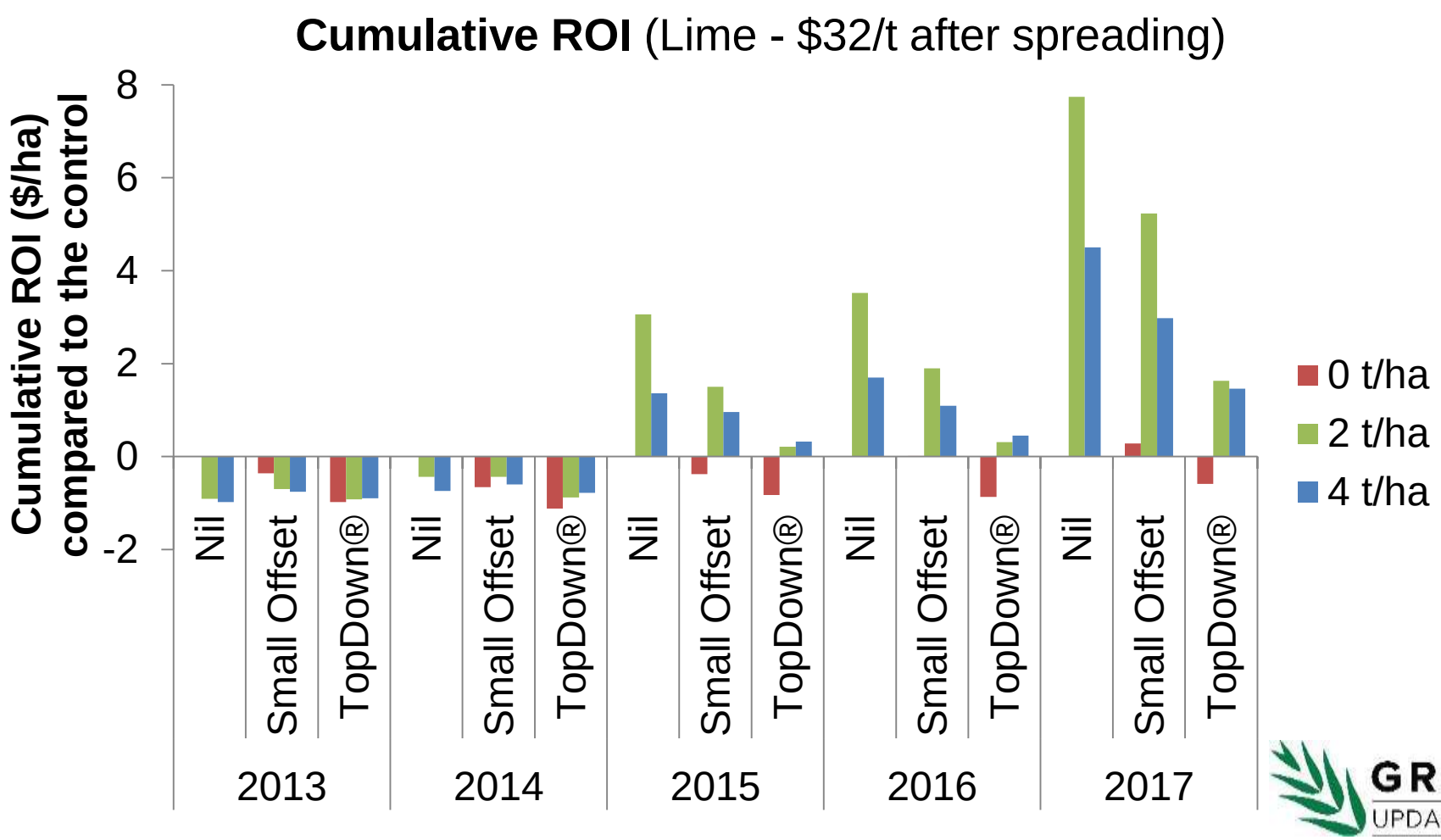
AGRONOMIC DATA	
DRY WEIGHT 239.41 t	**AREA WORKED** 152.94 ha
AVG. DRY WEIGHT 1.57 t/ha	**WET WEIGHT** 239.41 t
AVG. MSTR 10.97 %	**AVG. WET WEIGHT** 1.57 t/ha
AVG. SPEED 14.64 km/h	

LEGEND

2.41	10 %
2.06	15 %
1.73	18 %
1.4	18 %
1.05	14 %
0.65	12 %
0	13 %

GRDC UPDATES


Economic Returns ($/ha)
Cumulative Net Benefit ($/ha)
600
500
400
300
200
100
0
-100
-200
-300
Nil
Small Offset
TopDown®
2013
2014
2015
2016
2017
0 t/ha
2 t/ha
4 t/ha
GRDC
UPDATES


Cumulative ROI (Lime - $32/t after spreading)
Cumulative ROI ($/ha) compared to the control
8
6
4
2
0
-2
Nil
Small Offset
TopDown®
2013
2014
2015
2016
2017
0 t/ha
2 t/ha
4 t/ha
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UPDATES

Tillage Issues

- Too dry – *Mouldboard*
- Too wet – *Deep ripping*
- Seeding depth
- Erosion risk

- What is coming to the surface?

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Surface drying out forming a crust

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Tillage implements coming into play

- Large Offset (Grizzly)
- Helirippper
- Terraland
- Plozza plough (Larger discs for one-way plough)

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Effective rotation

- Lime incorporation during a fallow year
- Canola giving a ‘double fallow’ effect
- Canola paying off lime incorporation quicker

Estimated Yield Increase Required

Tillage Treatment	Lime + Tillage Cost ($/ha)		Breakeven Wheat Yield ($275/t)		Breakeven Canola Yield ($500/t)	
	2 t/ha	4 t/ha	2 t/ha	4 t/ha	2 t/ha	4 t/ha
Nil	120	240	**0.44**	**0.87**	**0.24**	**0.48**
Small Offset ($40/ha)	160	280	**0.58**	**1.02**	**0.32**	**0.56**
Deep Rip ($50/ha)	170	290	**0.62**	**1.05**	**0.34**	**0.58**
Large Offset ($55/ha)	175	295	**0.64**	**1.07**	**0.35**	**0.59**
Spader ($125/ha)	245	365	**0.89**	**1.33**	**0.49**	**0.73**

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Summary

- Soil tests need to be carried out (Add it to the budget)
- Soil acidity needs to be addressed (Lime)
- Timing of tillage

Key message

- **If carrying out tillage for whatever reason then spread lime first to address subsoil acidity faster**

Thank you

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