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Demonstration of Precision Agriculture (PA) principles in the Great Southern of WA

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Precision Agriculture (PA)

“An integrated information- production-based farming system that is designed to increase long-term, site-specific and whole farm production efficiency, productivity and profitability while minimising unintended impacts on wildlife and the environment” US House of Representatives (1997)

“Tayloring inputs to crop quality and quantity while providing economic, environmental, social benefits” (Whelan, 2007)

“An all-encompassing term given to the use of a suite of technologies that promote improved management of agricultural production through recognition that the potential productivity of agricultural land can vary considerably” (Brambley 2009)

“Targeting your inputs where and when it is needed” (Bakker 2011)



Duinkerken

Oosterwolde

800 m

Legerpl Oldebroek

Oldebroek

© 2008 Tele Atlas

Image © 2008 Aerodata International Surveys

Google

52°27'29.28" N 5°54'49.77" E

elev 0 m

2005

Eye alt 3.04 km



800 m

© 2009 MapData Sciences PtyLtd, PSMA
Image © 2009 DigitalGlobe

©2008 Google™

50 H 582275.43 m E 6182108.38 m S

elev 180 m

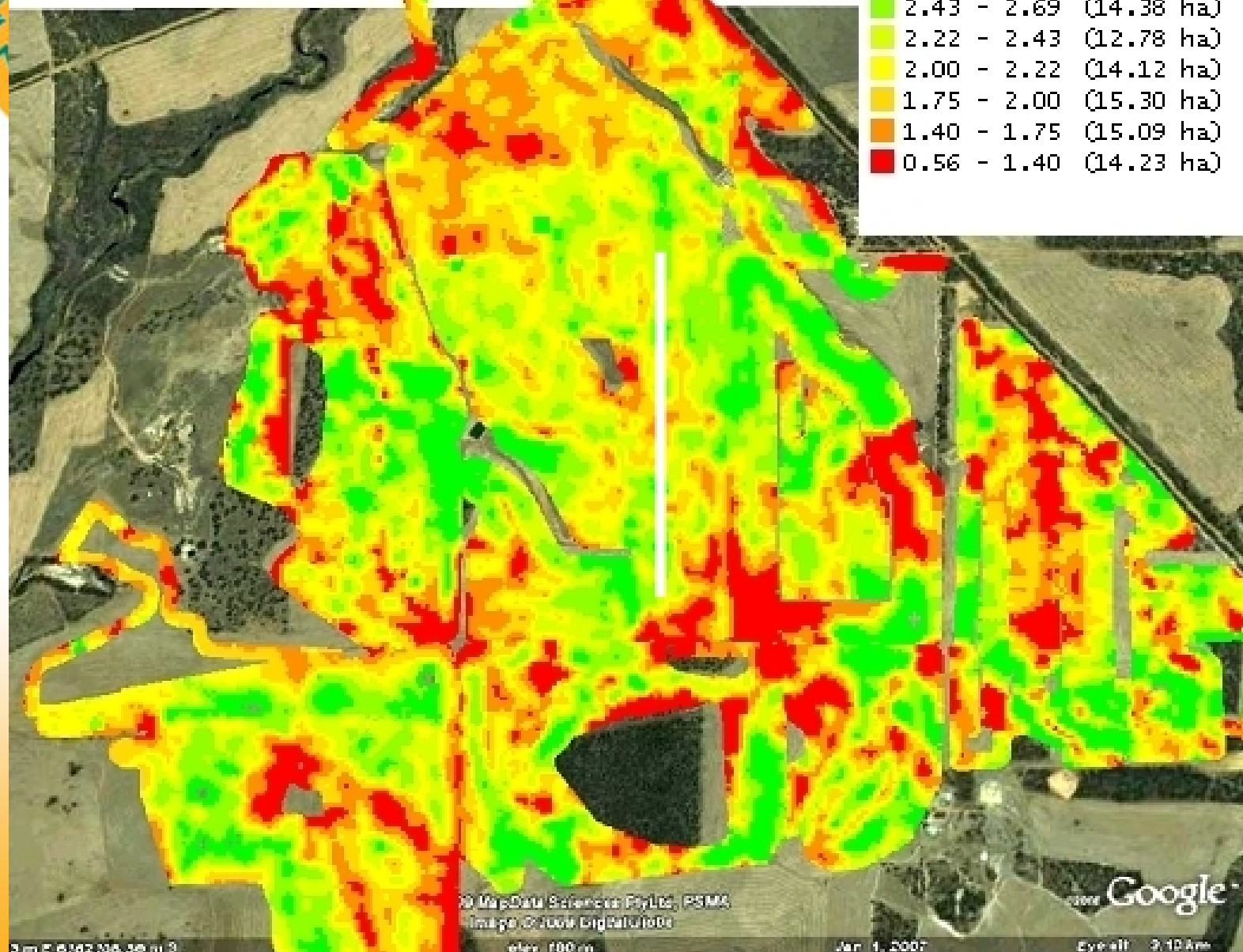
Jan 1, 2007

Eye alt 3.10 km



Yield Mass (Dry) (tonne/ha)

■	2.69 - 3.00	(7.04 ha)
■	2.43 - 2.69	(14.38 ha)
■	2.22 - 2.43	(12.78 ha)
■	2.00 - 2.22	(14.12 ha)
■	1.75 - 2.00	(15.30 ha)
■	1.40 - 1.75	(15.09 ha)
■	0.56 - 1.40	(14.23 ha)





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- PA is complicated and involves computers.
- Is there one area in agriculture that doesn't.
- PA is complicated and just makes useless colourful maps.
- Most things that are not being used are often “useless”.
- PA is expensive.
- Doesn't have to be, but need to spend money to make money.
- PA doesn't pay.
- Sometimes it doesn't, but mostly it does.

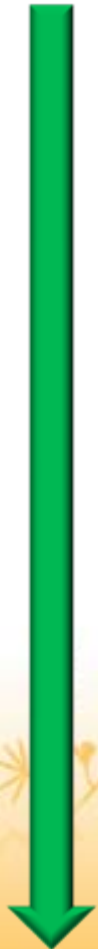


Aspects of PA have been adopted:

- Farm planning phase
 - Georeferenced soil sampling
 - Guidance (Visual/Autosteer)
 - Yield monitoring
 - Mapping (EM38/Radiometrics/NDVI)
 - Target spraying (Weed-seeker)
 - Variable rate (mapping)
 - Variable rate (On-the-go sensors)
 - Flying monitoring and detection platforms
 - Ag robots

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“Taking PA to the paddock - increasing the adoption of PA in the Great Southern of WA”

Training and demonstration of Precision Agriculture (PA) project *“Beyond guidance”*

**Through workshops and demonstration trials
in collaboration with grower groups in the Great Southern**





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Grower groups: Facey (Wickepin), Nyabing FIG, FBG (Jerramungup), Stirlings-to-Coast Farmers, NSP (Borden), Gillami (Cranbrook), Southern DIRT (Kojonup)

Workshops:

- 2009 "Demystifying PA" (general principles, trial coordination) (growers + Ag_b)
7 locations, 56 attended (1-19)
- 2010 Pre-harvest (Hands on PA software training) (growers)
5 locations, 40 attended (3 - 16)
"Making PA pay for your client" (Agri-business)
2 locations, 17 attended (7, 10)
- 2011 Post-harvest (Use of management zones, trial results, rate controllers)
5 locations, 42 attended (4 - 13)

Collaboration from various dealers: Green Line, Farmers Centre, Ratten and Slater and MacIntosh&Son



Shires from Brktn, Kent, Jer, Plnt, to Kjp

	<1000 ha	1000-2000 ha	2000-3000 ha	3000-4000 ha	4000-5000 ha	>5000 ha	Total
No. growers	2222	883	211	67	32	29	3444
Area (mill. ha)	1	1.2	0.5	0.22	0.142	0.19	3.252
No growers (%)	64	26	6	2	1	1	100
Area (%)	32	36	15	7	4	6	100

Q: Why is PA not adopted?

A: Not sure whether it is cost effective.

Use of PA	Guidance	Yield monitor	VRA	Controlled traffic	
%	60	33	3	2	
Issues causing problems (hardware)	Guidance	Monitors	Controllers	Data storage	Communication
%	22	22	19	19	19
Issues causing problems (software)	Uploading data	Cleaning maps	Making prescription maps	Uploading controllers	Backing up data
%	22	20	18	19	21

Average cropping program ha	How many years have you been yield mapping				
	No	<1	1-3 yrs	3-5 yrs	>5 yrs
1600	2	1	1	4	
2800	3	0	3		
2100	1	1	3		1
1000	1	2			1
2600	4	3	4	2	3
2020	28%	18%	28%	15%	13%

- Supply training and equipping of growers in a small group training format.





Demonstration trials



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Main aim: Is matching inputs to soil types profitable?

Determine: Production zones (“mud maps”, yield maps, EM38)

Soil sample zones: 0-10, 10-30, 30-60cm.

Fertiliser requirements.

Treatments:

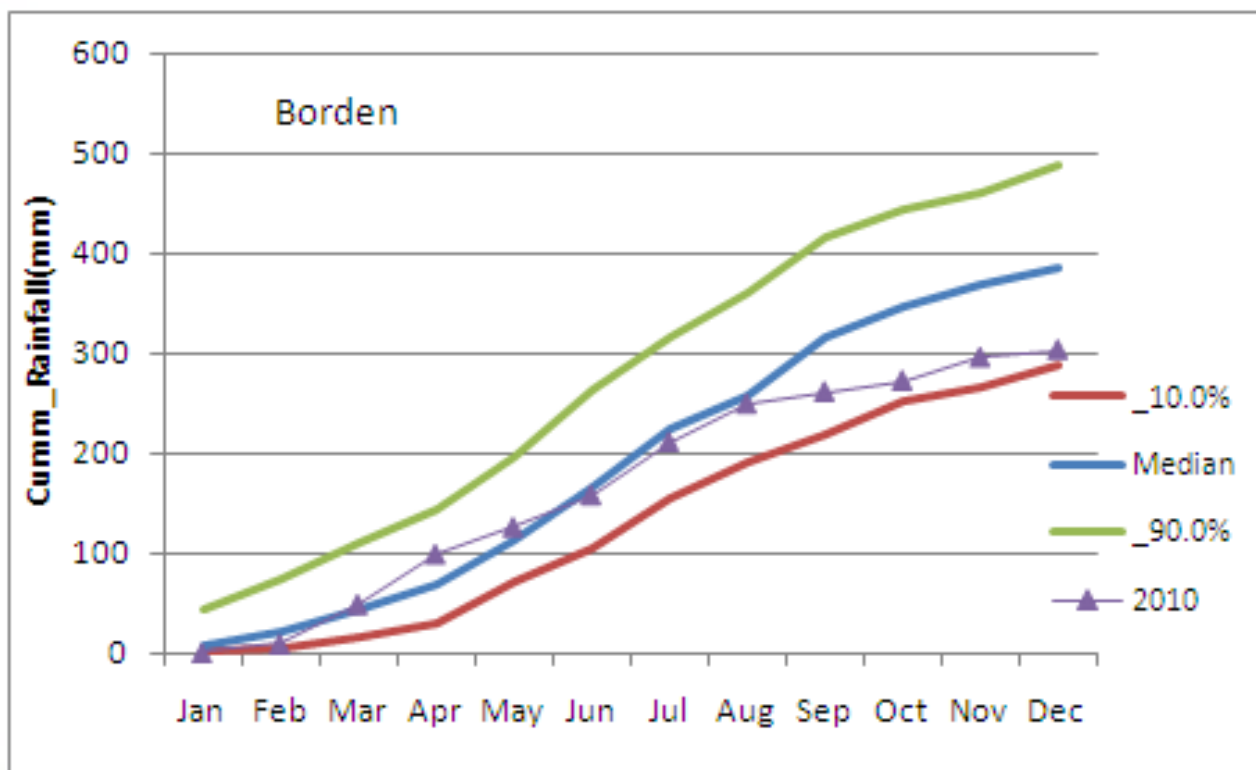
Low, normal, high rates of fert. at seeding (11)

Low, normal and high rate of N after seeding (5)

Gypsum (1), Lime (4), Ripping (1)

Applied treatments across the zones by growers (1-3 passes).

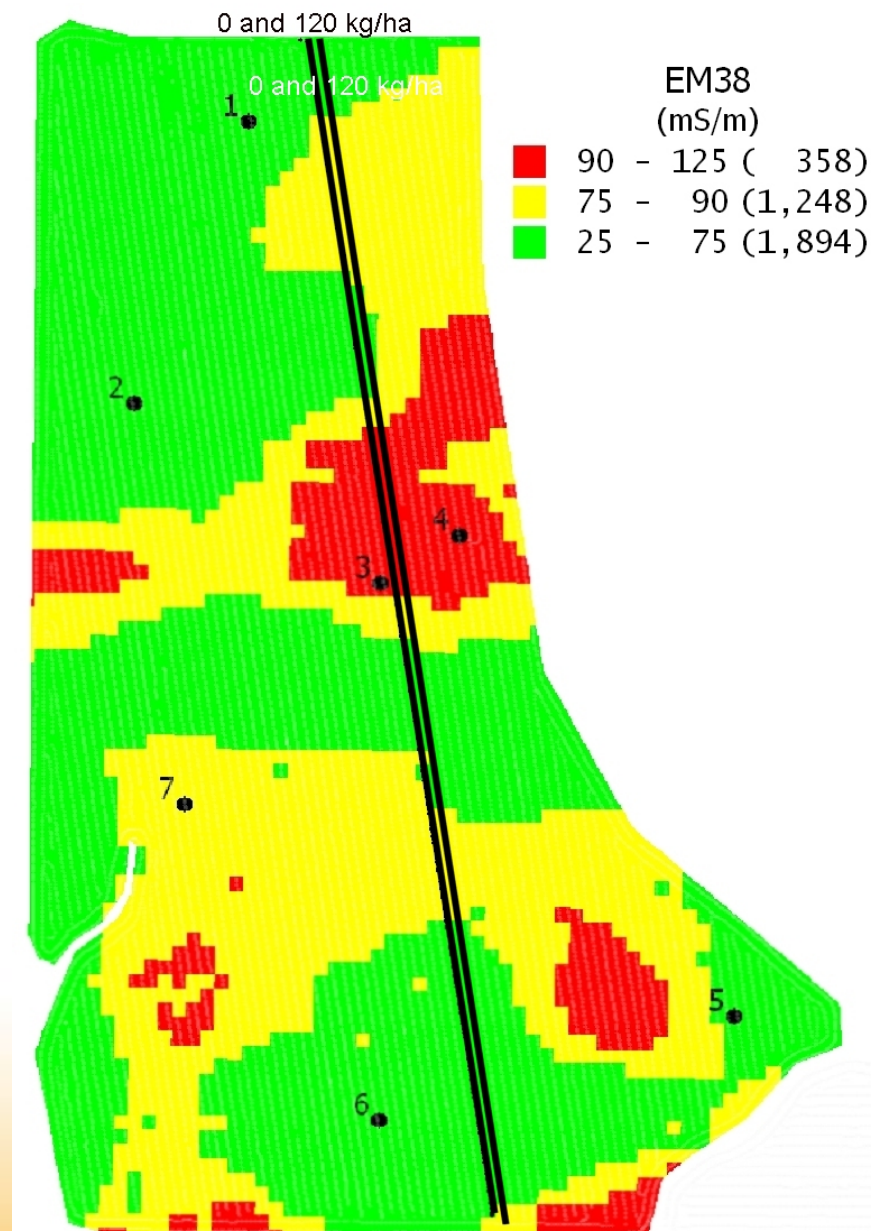
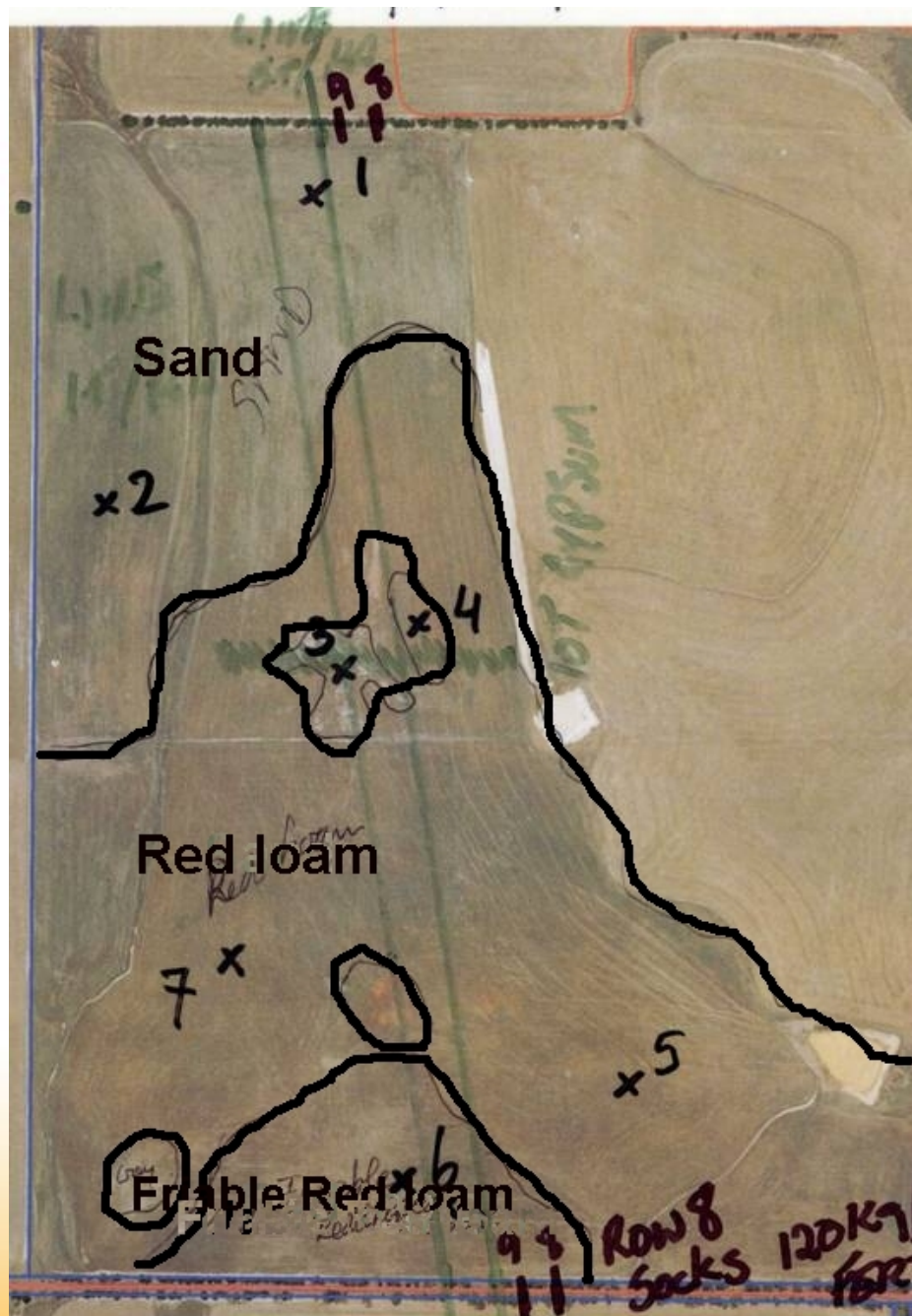
Observations: Germination, Green seeker (July), Biomass (PCD)
(October), Yield (+ quality)



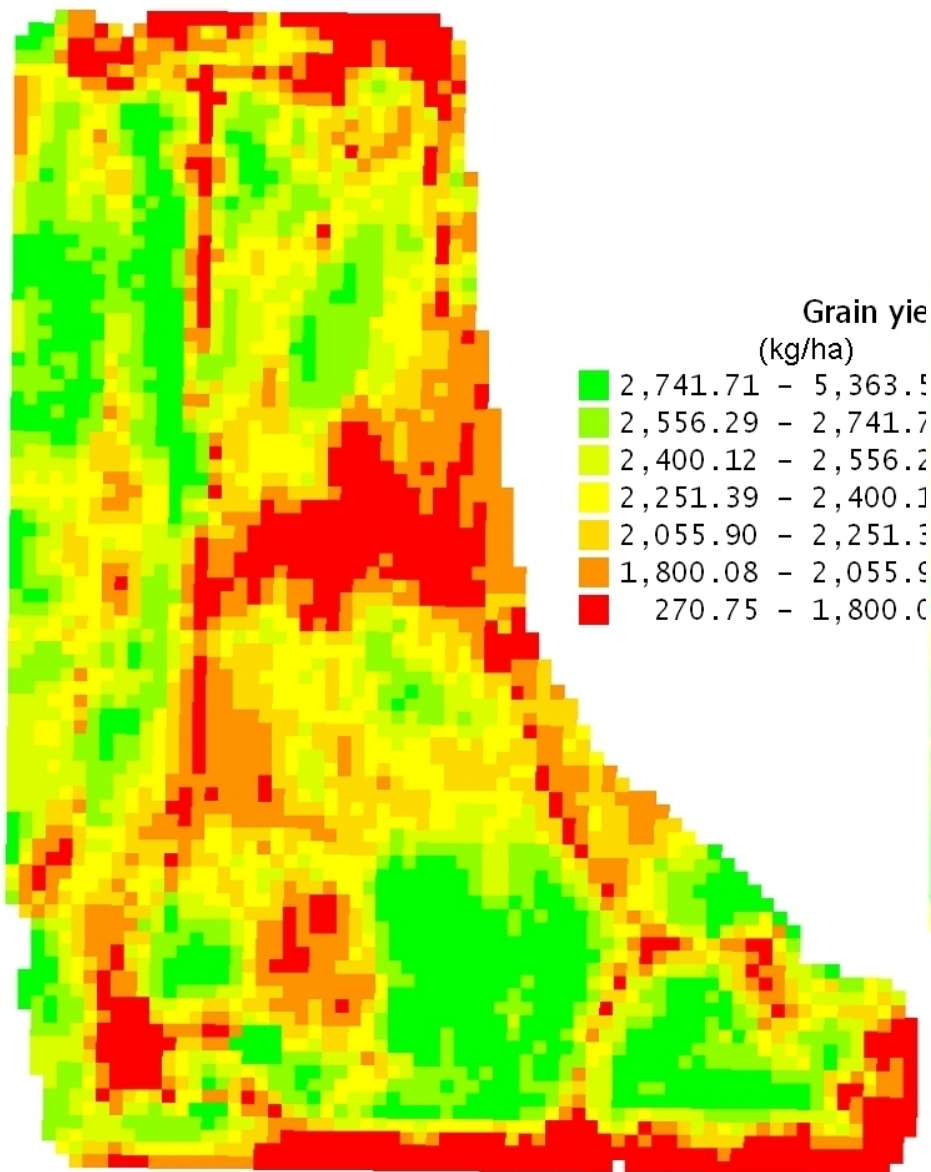
Cumulative rainfall 2010 in relation to the median, decile 1 and 9



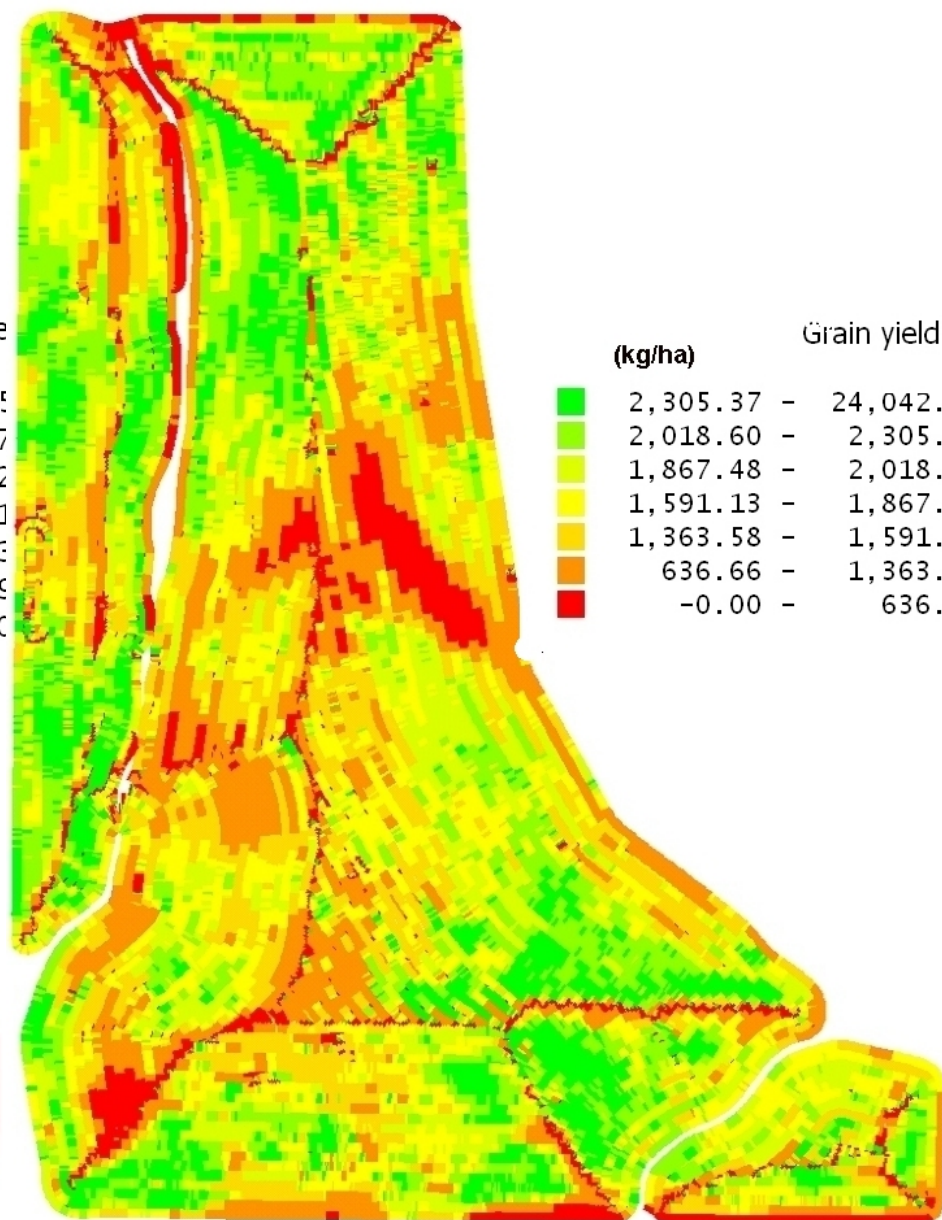
Case study 1

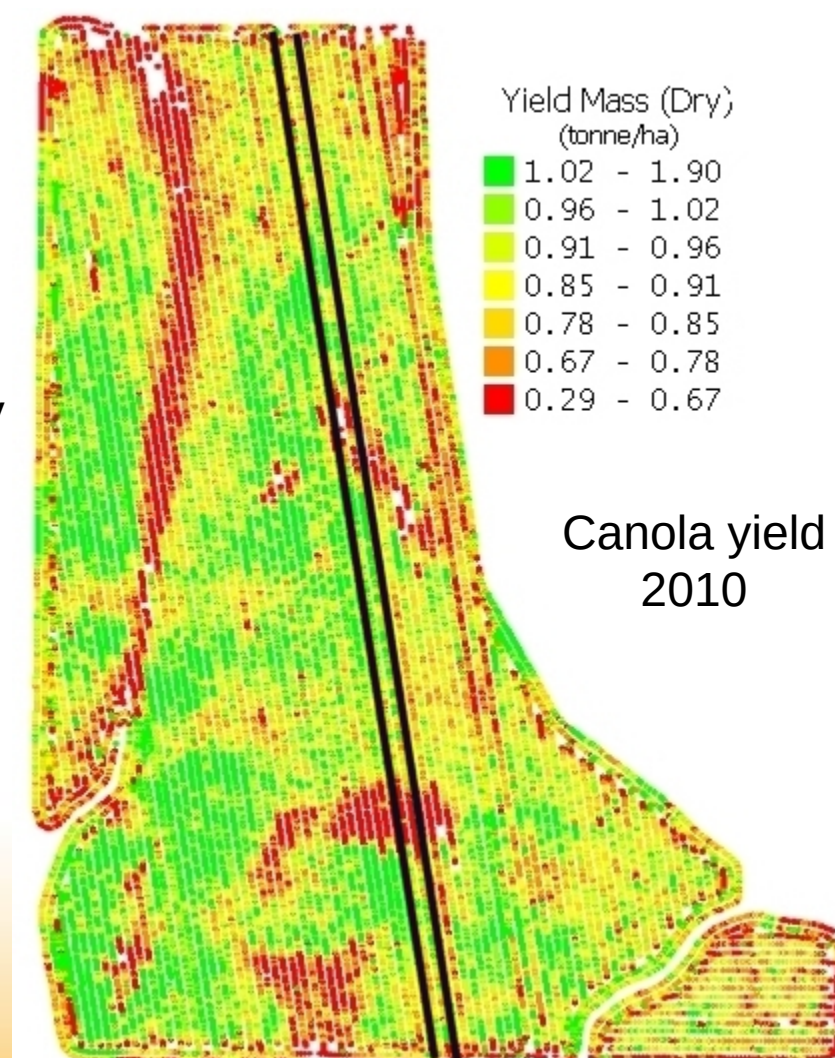
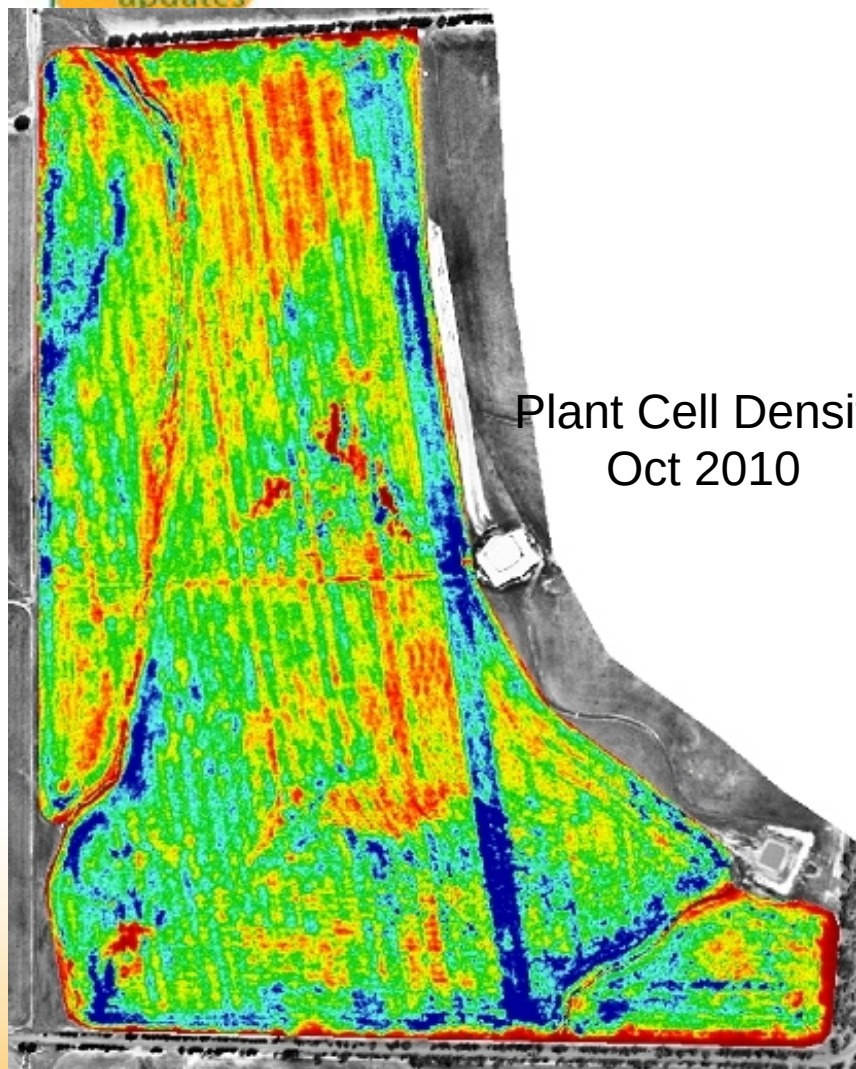


Grain Harvest 2008



Grain Harvest 2009







Sample	Zone	Texture	P mg/Kg	K mg/Kg	S mg/Kg	OC %	EC mS/m
1	Green	1.5	48	69	6	1.3	7
2	Green	1.5	47	127	12	1.8	10
3	Red	2	62	176	123	1.5	50
4	Red	2.5	97	399	962	1.4	627
5	Yellow	3	55	273	18	2.3	13
6	Green	3	50	389	6	1.7	13
7	Yellow	2	130	329	43	3.7	30

EM38 (mS/m) and total area of the zone	Rate (kg/ha)	Yield (t/ha)	Income yield (\$)	Cost DAP (\$)	Net of fert (\$)	Diff. from 80 kg/ha	Total difference when using most economical rate per zone (\$)	Total for the paddock when using most economical zone compared to 80 kg/ha (\$)
<60	0	0.84	523	0	523	0	6	1863
16	80	0.95	590	68	523	0	0	0
	120	0.74	457	101	356	-167	-2667	-7990
60-80	0	0.83	513	0	513	24	905	
38	80	0.90	557	68	489	0	0	
	120	0.85	530	101	428	-61	-2314	
80-100	0	0.85	525	0	525	34	830	
24.3	80	0.90	558	68	491	0	0	
	120	0.77	478	101	376	-114	-2780	
>100	0	0.66	412	0	412	94	122	
1.3	80	0.62	385	68	318	0	0	
	120	0.39	243	101	142	-176	-229	



Target Rate(Mass)
(kg/ha)

- 45.00 (26.75 ha)
- 32.00 (34.90 ha)
- 26.00 (26.84 ha)



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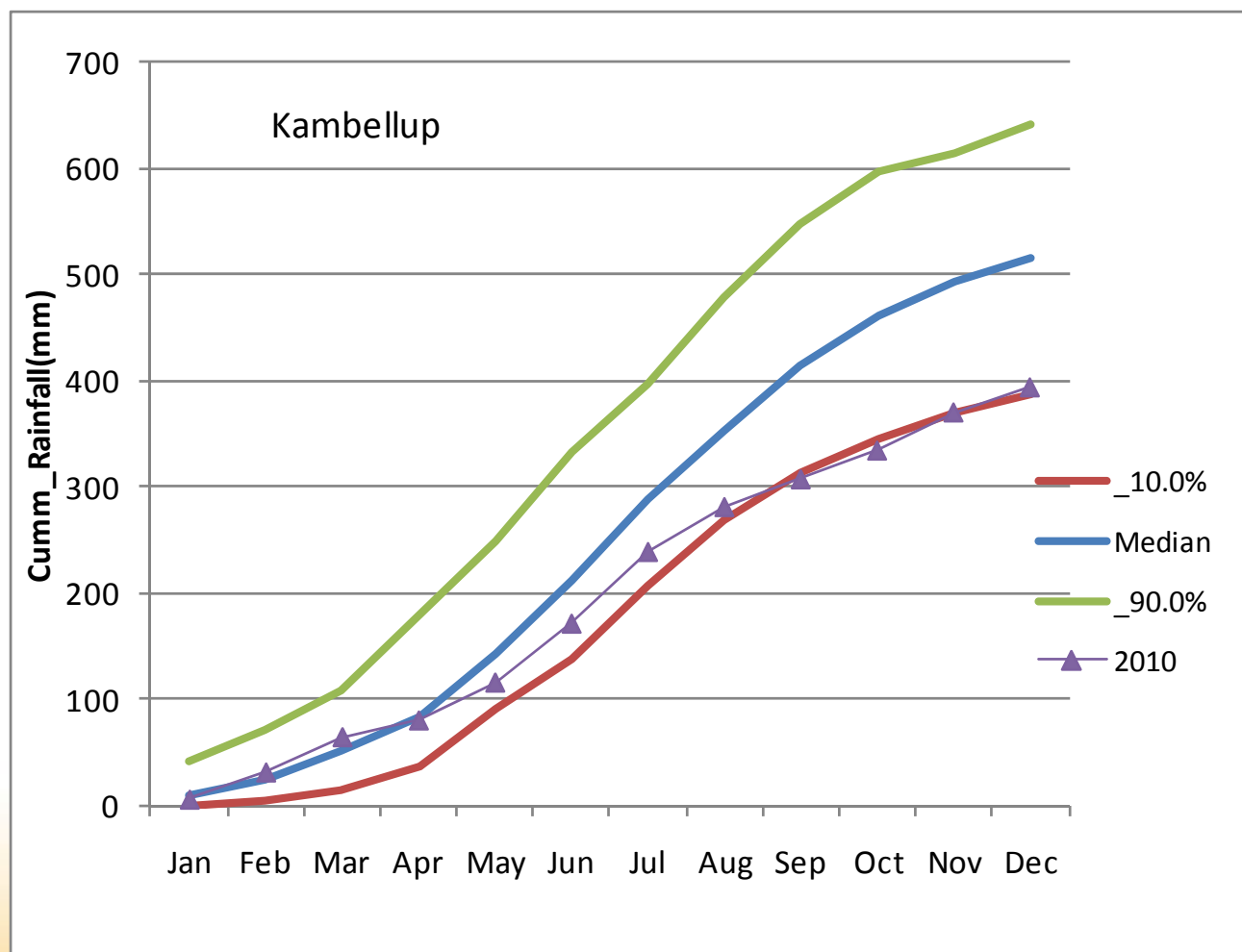
Prescription map based on P-replacement

Product removal @ 6.5 kg/tonne of canola grain removed

Canola (t/ha)	DAP (kg/ha)	Area (ha)	Total (kg)	Normal rate (kg/ha)
0- 0.8	26	27	702	80
0.8 -1.0	32	34	1088	80
1.0 - 1.4	45	27	1215	80
Total		88	3005	7040
Cost DAP @ \$850/tonne (\$)			\$2,554	\$5,984
			\$3,430	

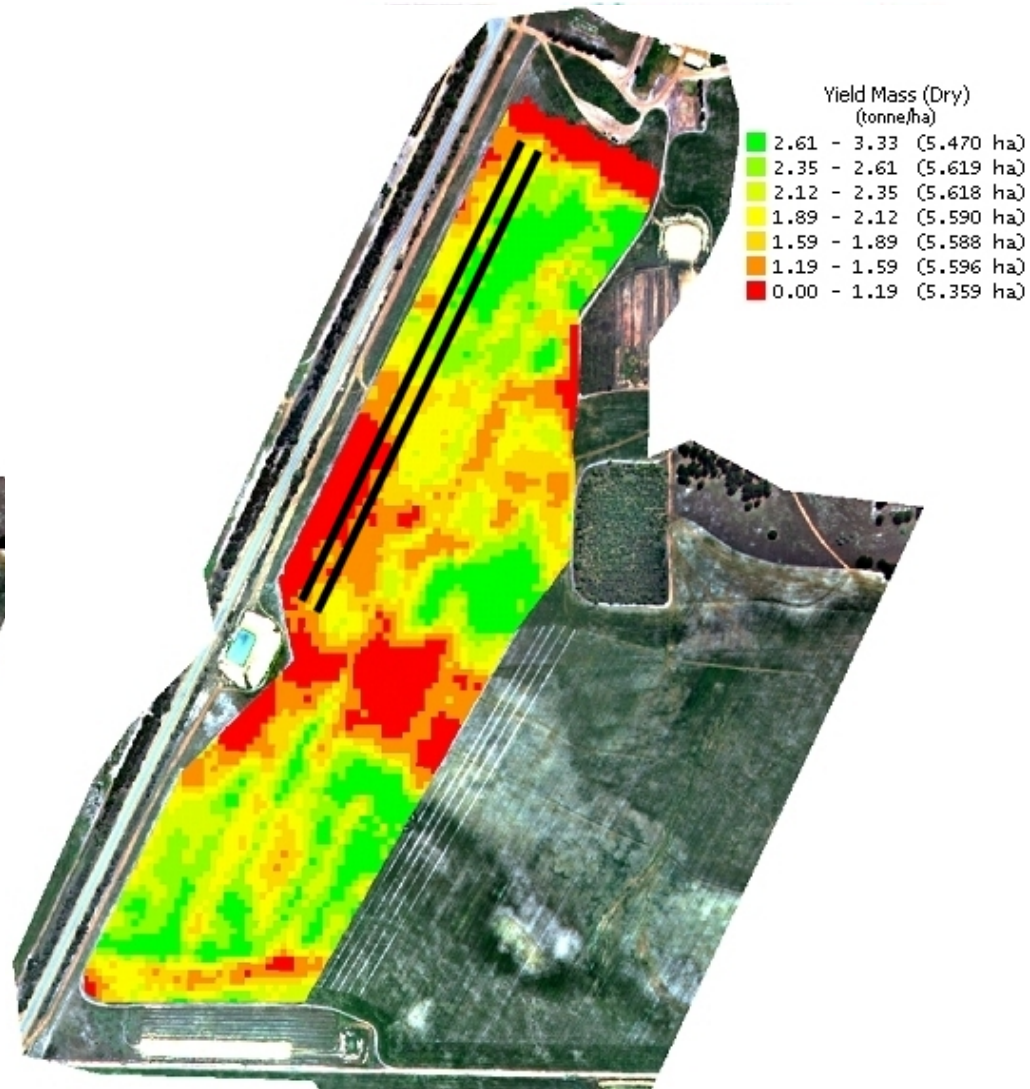
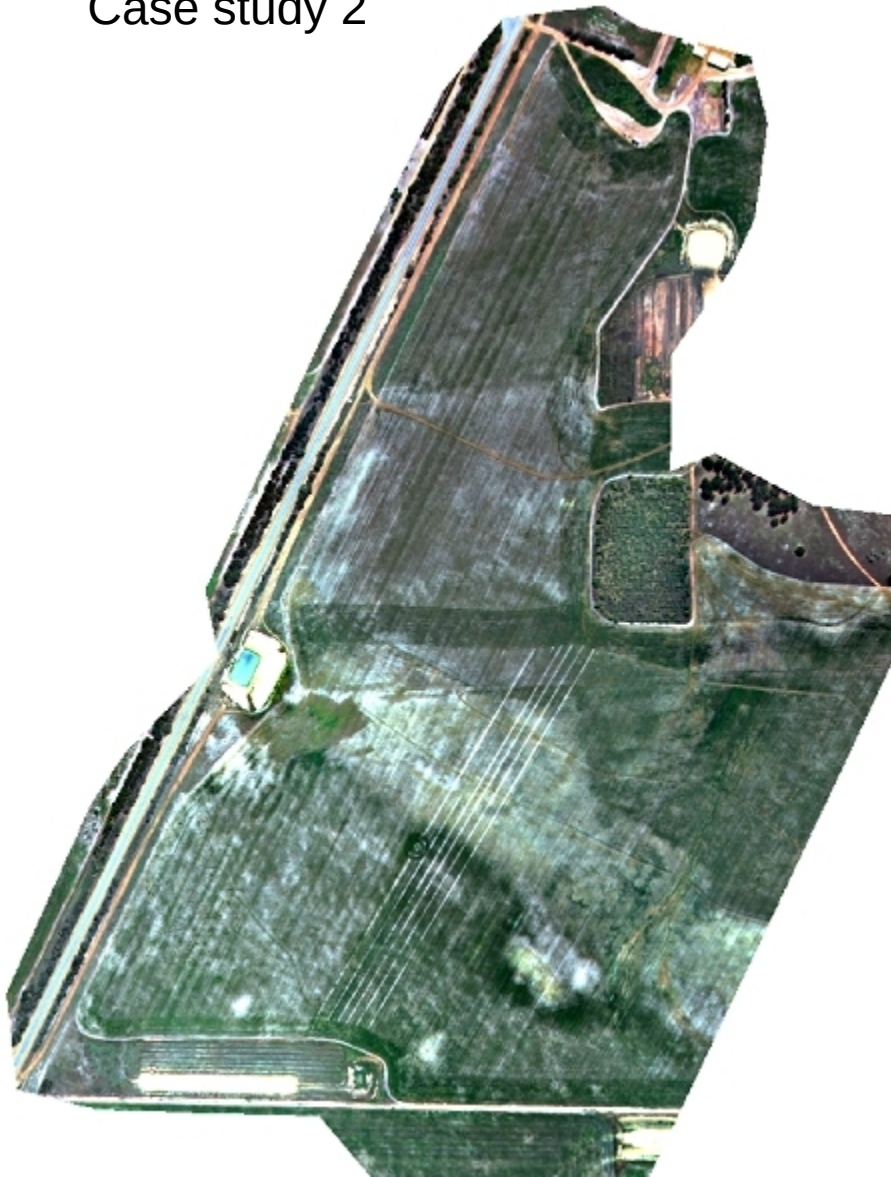
Flat rate of 45 kg/ha: \$811 more





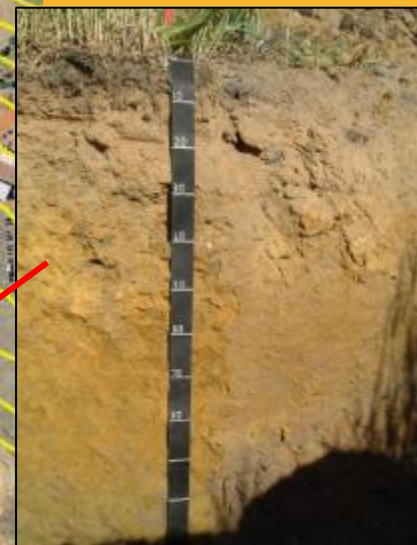
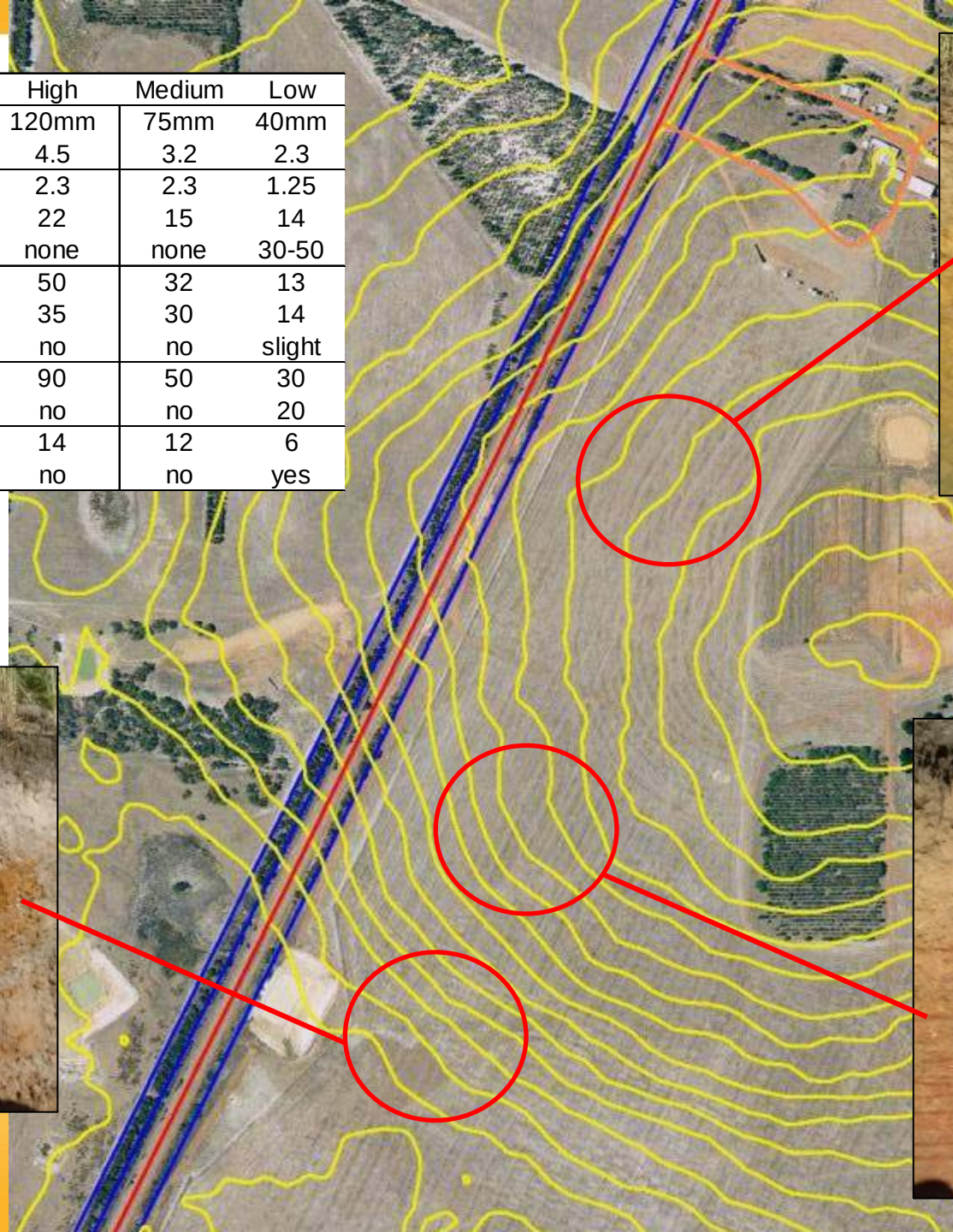
Cumulative rainfall 2010 in relation to the median, decile 1 and 9

Case study 2

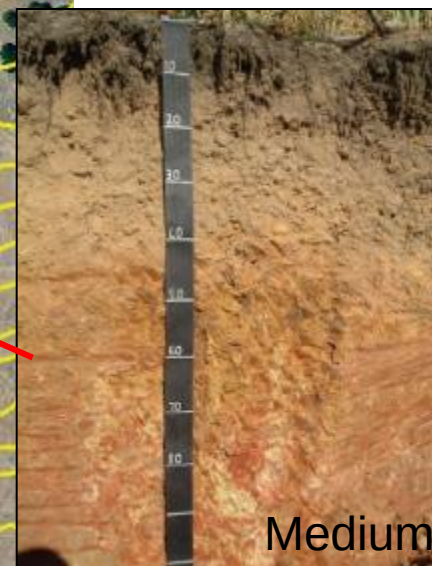


N-strips (0, 90, 175 and 350 kg/ha) across high, medium and low yielding zones

Property	High	Medium	Low
est PAWC	120mm	75mm	40mm
PY max t/ha	4.5	3.2	2.3
OC%	2.3	2.3	1.25
mineral N (ppm)	22	15	14
N response (ppm)	none	none	30-50
P (ppm)	50	32	13
PRI	35	30	14
P response	no	no	slight
K (ppm)	90	50	30
K required	no	no	20
S (ppm)	14	12	6
S needed	no	no	yes



High



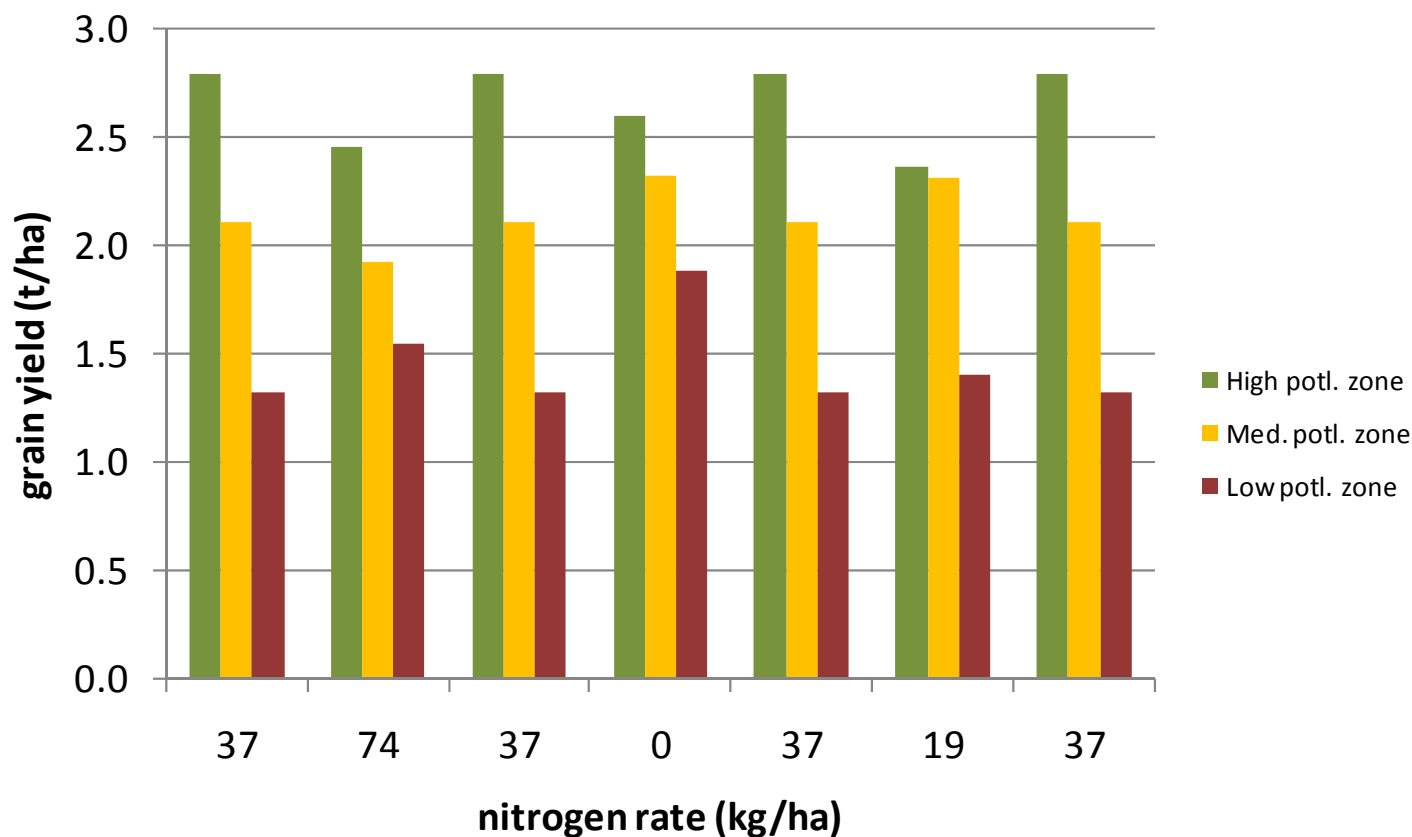
Medium



Low



2010 barley yield response to N by zones - Kamballup

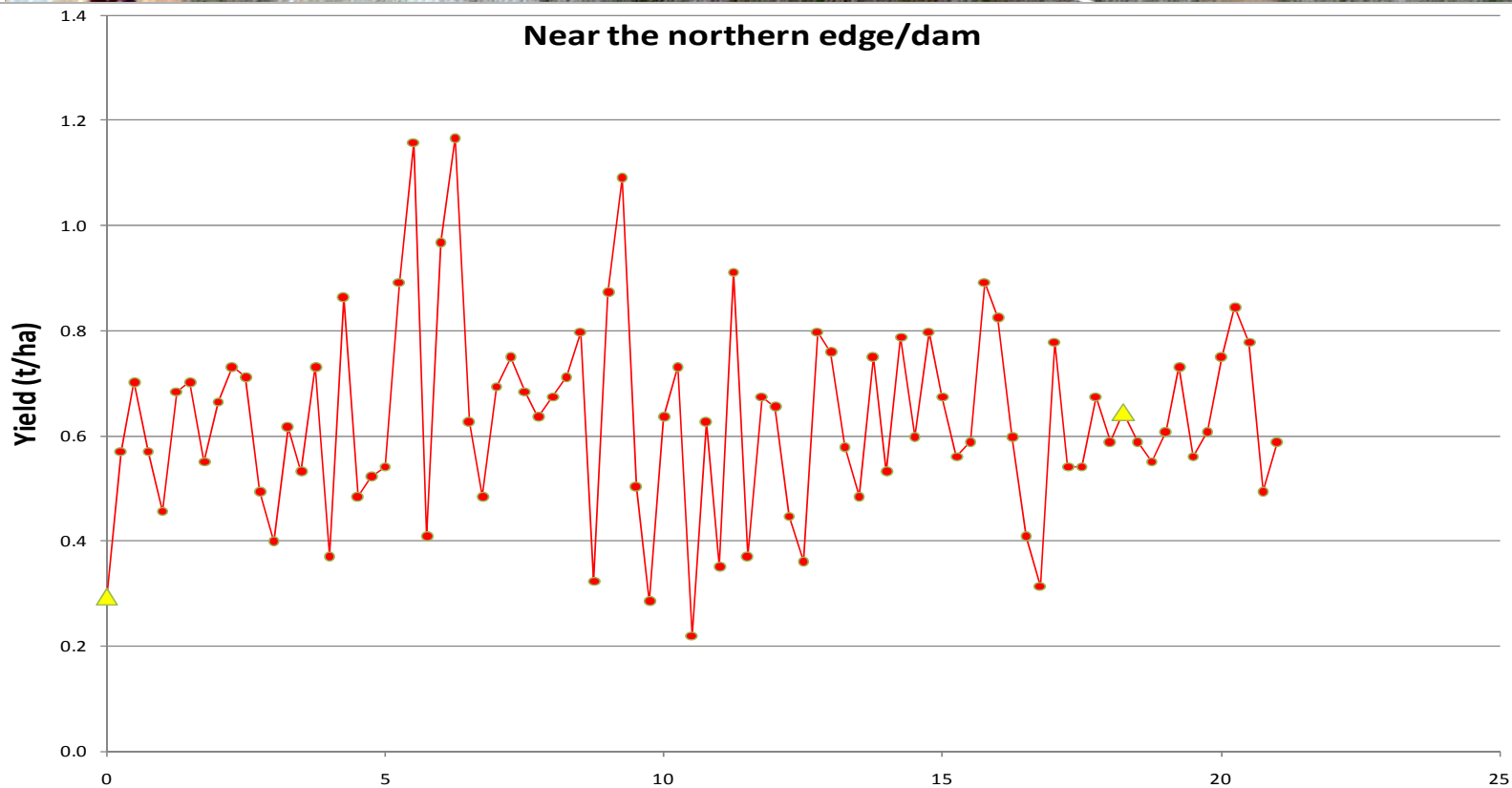


Net of fert. return (\$)	Blanket rate, 175 kg/ha	VRT rate (0, 0, 175 kg/ha)	Blanket rate, 0 kg/ha
Zone			
High (1/3)	643	650	650
Medium (1/3)	472	580	580
Low (1/3)	276	276	470
Total	1391	1506	1700





Near the northern edge/dam



Yield (t/ha)





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In summary:

- There is a general interest in PA but VRA is still far from mainstream adoption.
- Workshops have been used for training purposes but this needs to be extended to smaller groups for more effective training.
- The demonstration trials have shown so far that reduced inputs can be very profitable but these need to be extended to multiple years to obtain a more realistic response.
- From a basis of sufficient supply the use of P- replacement is a good start for the use of Variable Rate Applications.





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Thank you

