

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

Imagery
How useful is it really?

Why use imagery?

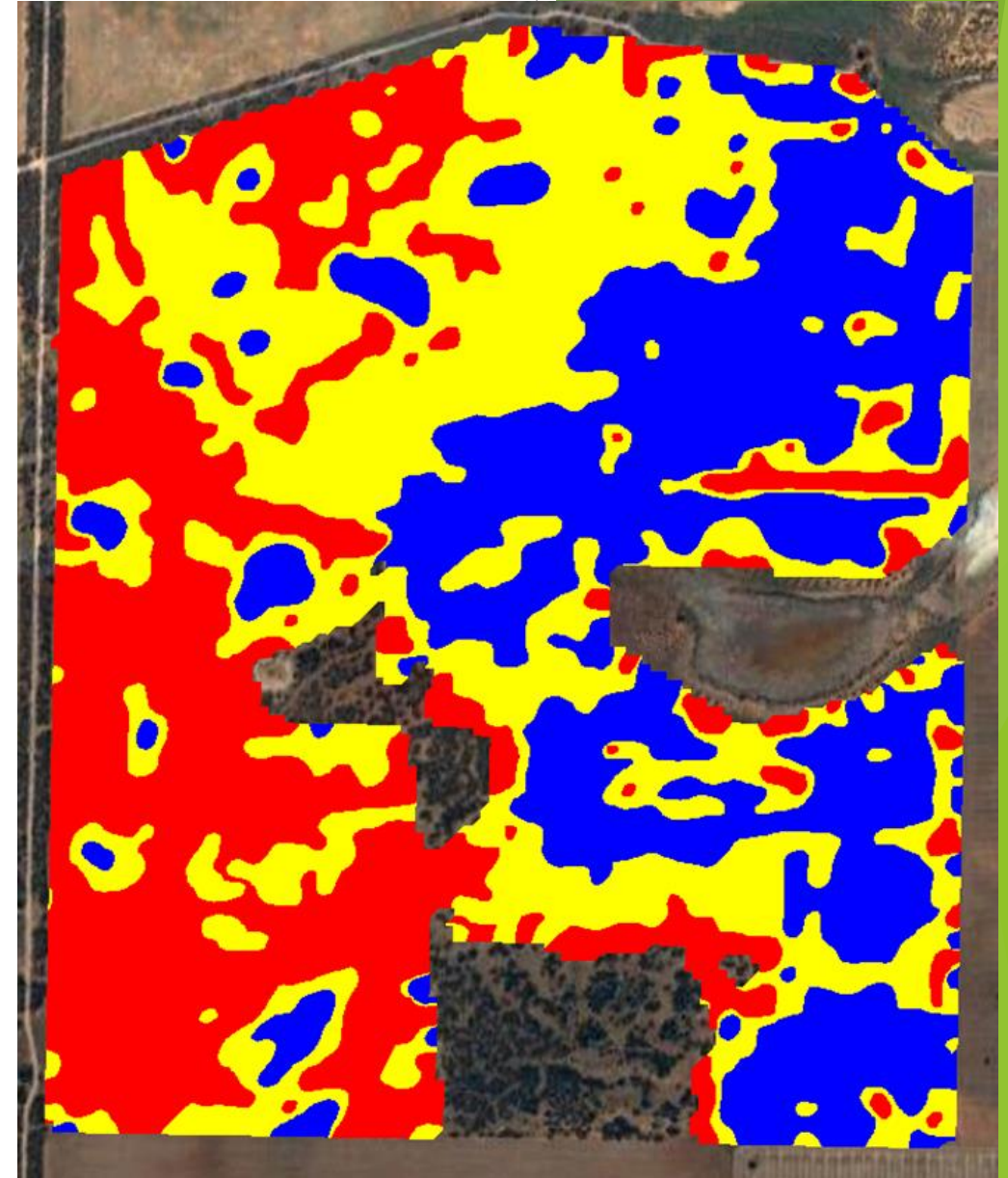
Nitrogen Management

- ▶ Variability within a field
- ▶ Pro Active - Do something to change the outcome.
- ▶ Variable Rate Top dressing

Yield Maps - A little Late

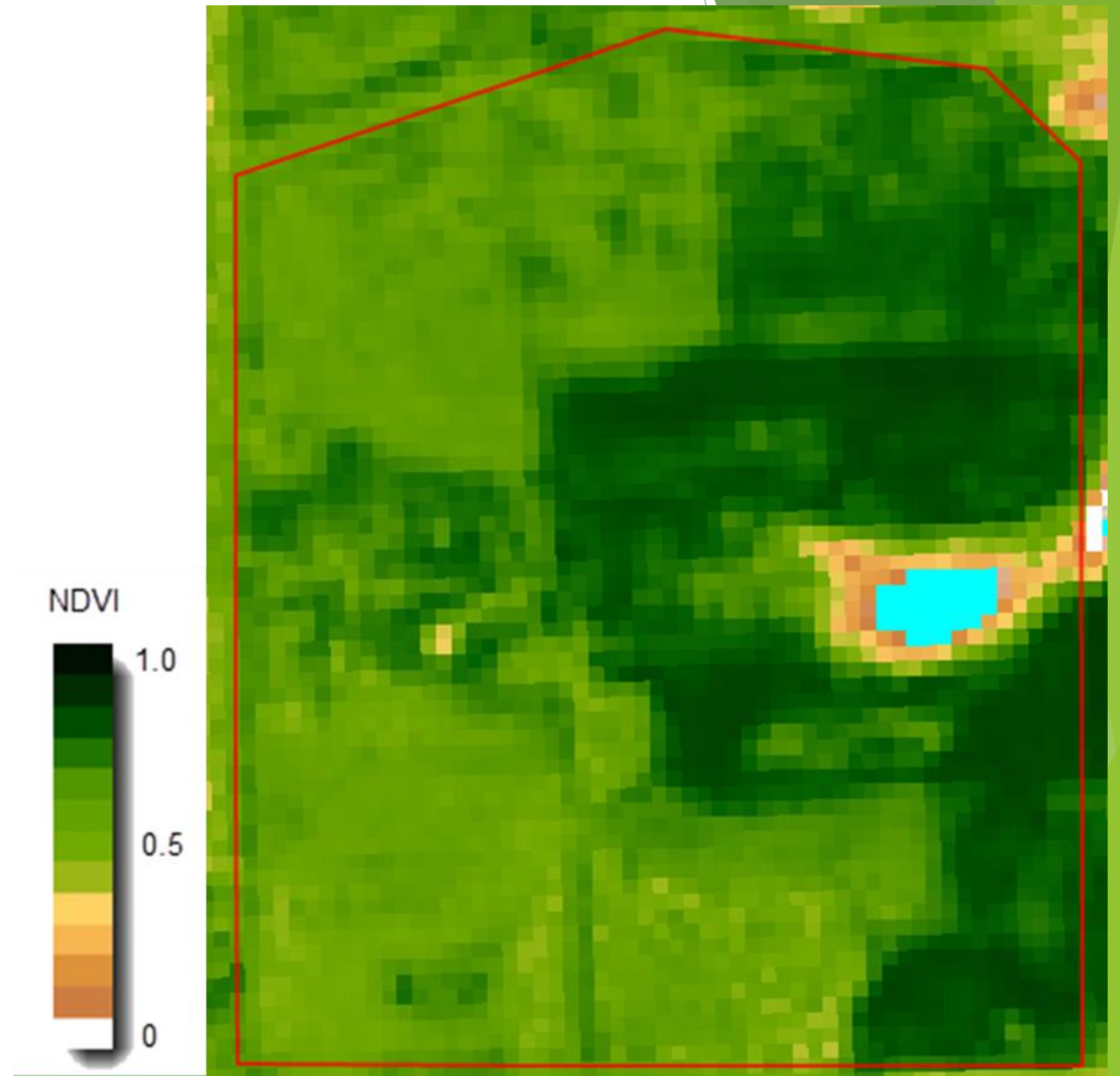
- ▶ They quantify the variability within a field.
- ▶ They don't tell us what the problem was or what to do about it.
- ▶ They help us to know where to look for the next crop
- ▶ Still left asking “ Why did the red area yield less than the blue?”

	Yield Mass (Dry) (kg/ha)		
■	Above	2,700	(88.36 ha)
■	2,200 -	2,700	(104.70 ha)
■	Below	2,200	(93.98 ha)



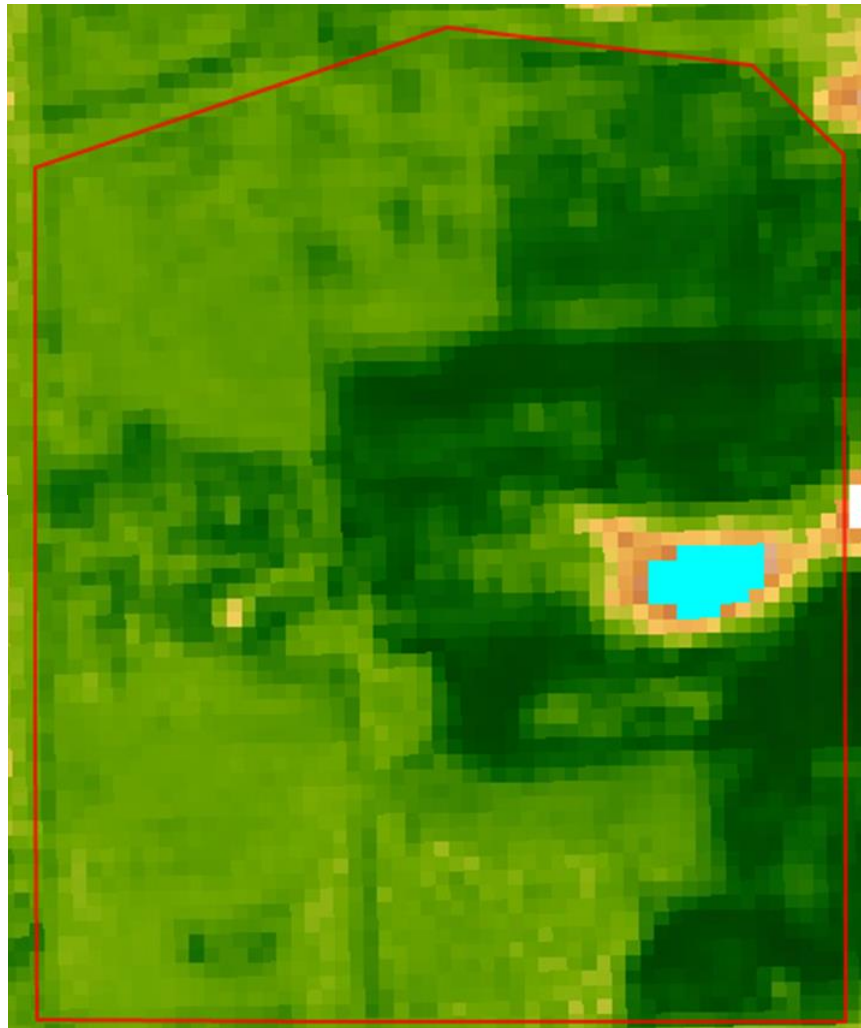
Imagery: NDVI

- ▶ Zoning: Where to look
- ▶ In crop nitrogen decisions
- ▶ Opportunity to act during the growing season to
 - ▶ address Nitrogen deficiencies
 - ▶ Recover/Restore yield potential
- ▶ Dark green is more vigorous
- ▶ Light green is less vigorous.

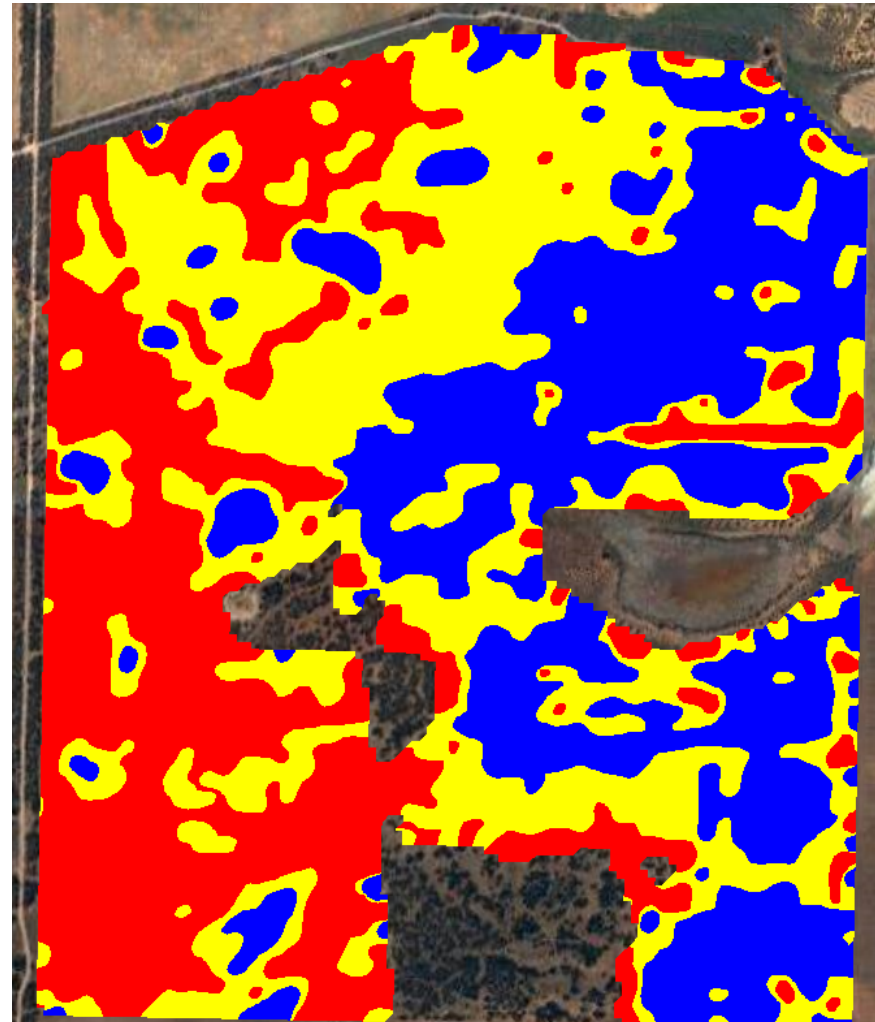


Would you like to change the result?

NDVI Mid July 2016



Yield Pattern Dec 2016

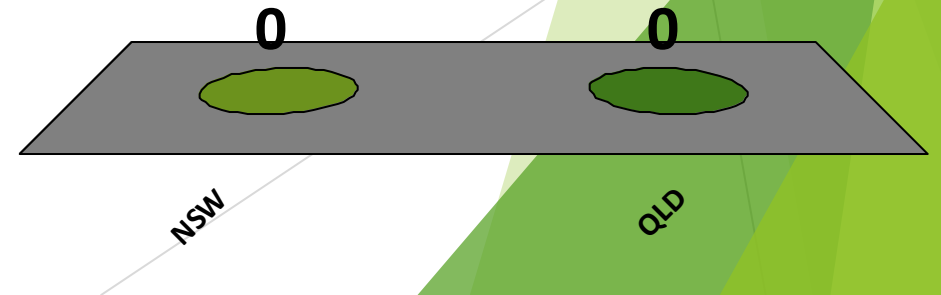


Yield Mass (Dry) (kg/ha)		
Blue	Above 2,700	(88.)
Yellow	2,200 - 2,700	(104.)
Red	Below 2,200	(93.)

Who will win the final game in state of Origin

- A. NSW
- B. QLD

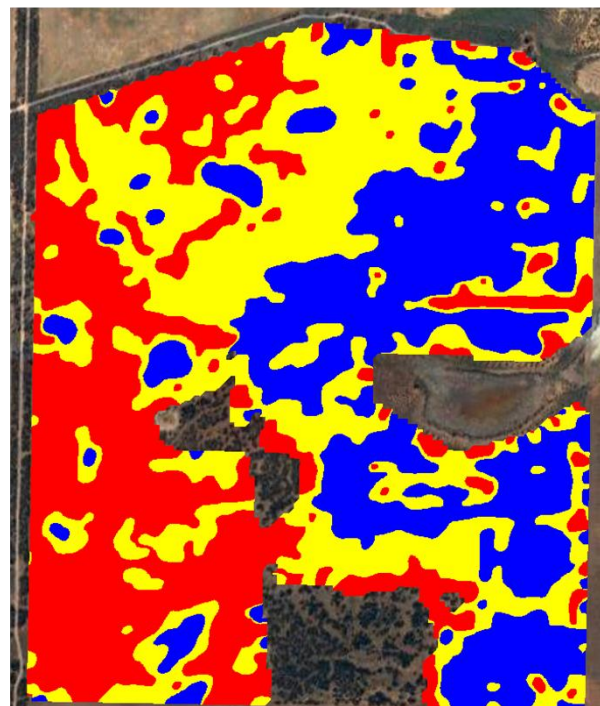
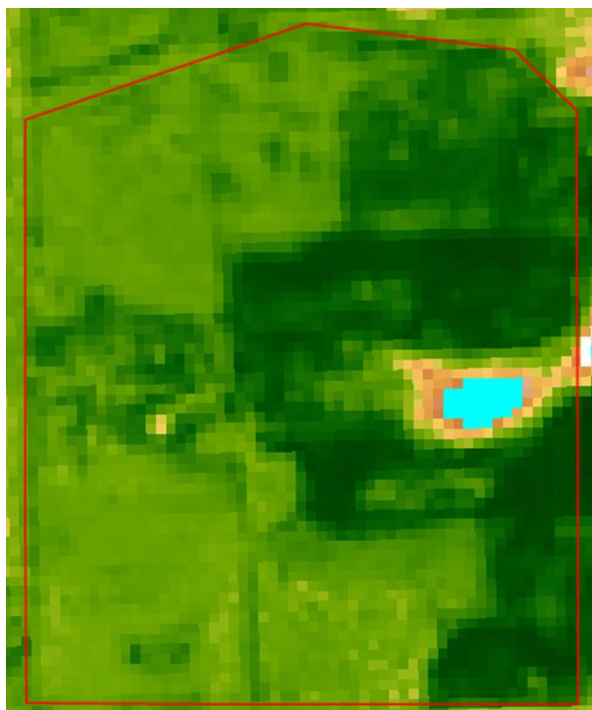
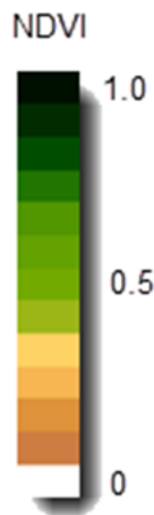
Response
Counter



Who would like to increase yield?

You have 2 choices.

- A. More Urea on LOW NDVI/ Low Yield
- B. More Urea on High NDVI/ High Yield



Response
Counter

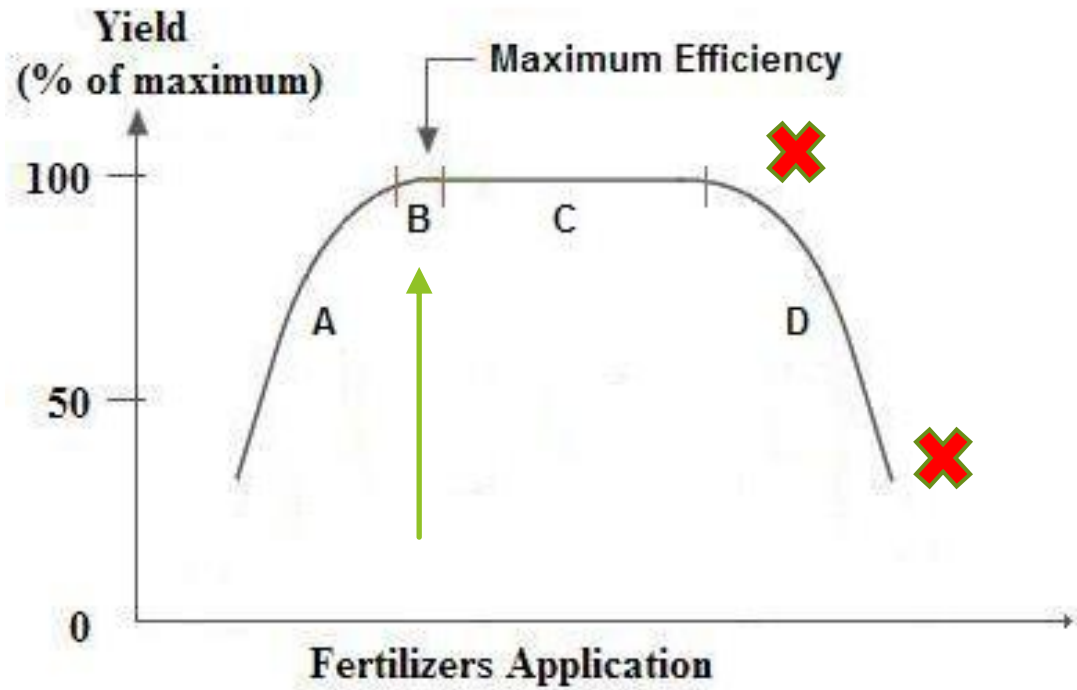


More Urea on LOW NDVI

More Urea on High NDVI

Yield Response to Fertiliser Application

Crop Response To Fertilizers Application



Protein vs Yield

- Yield peaks around 11.2%
- After which yield starts to go flatten out.
- As Protein fell 1% Yield fell approx. 0.7 t/ha
- Low protein is an indicator you are missing out on yield.

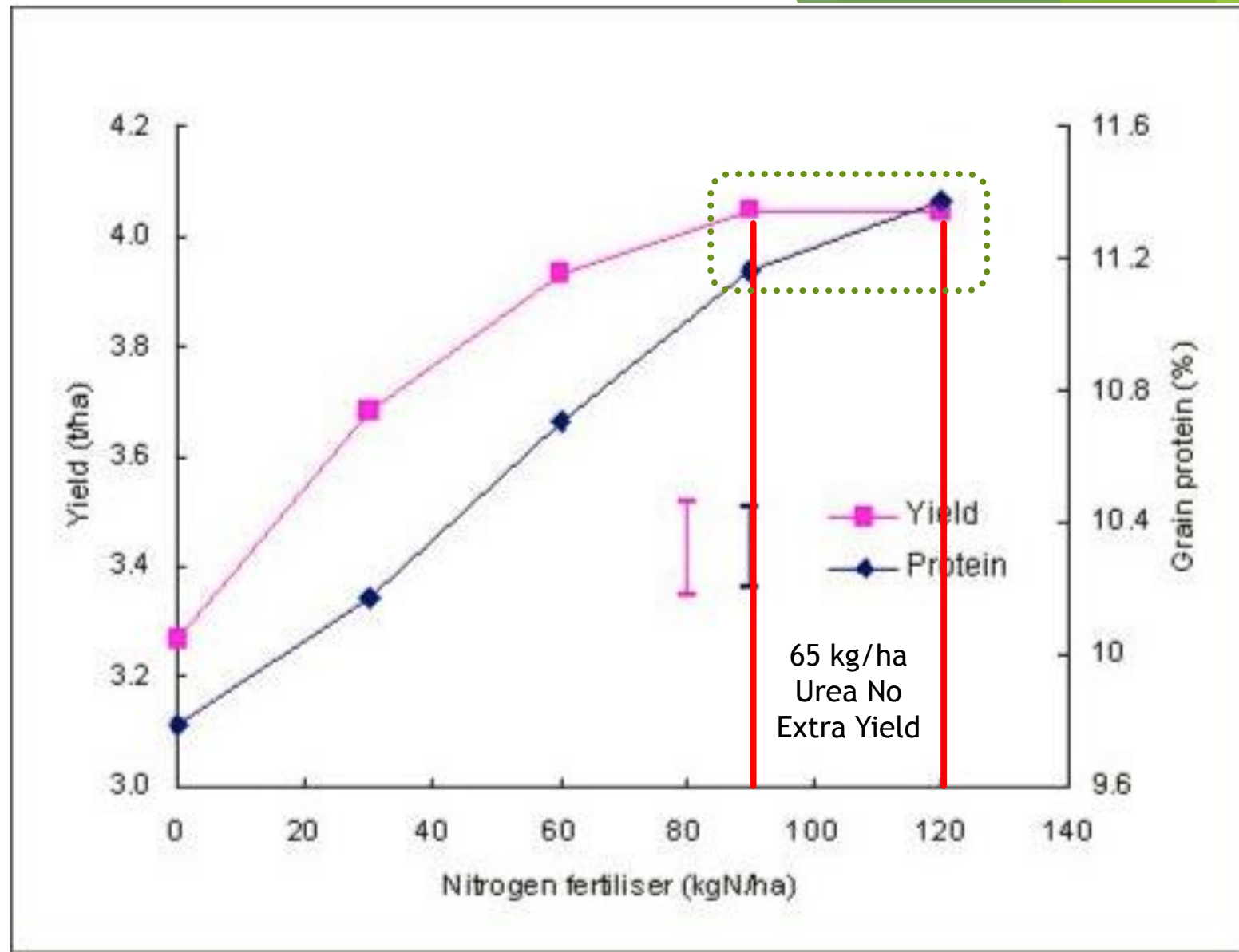
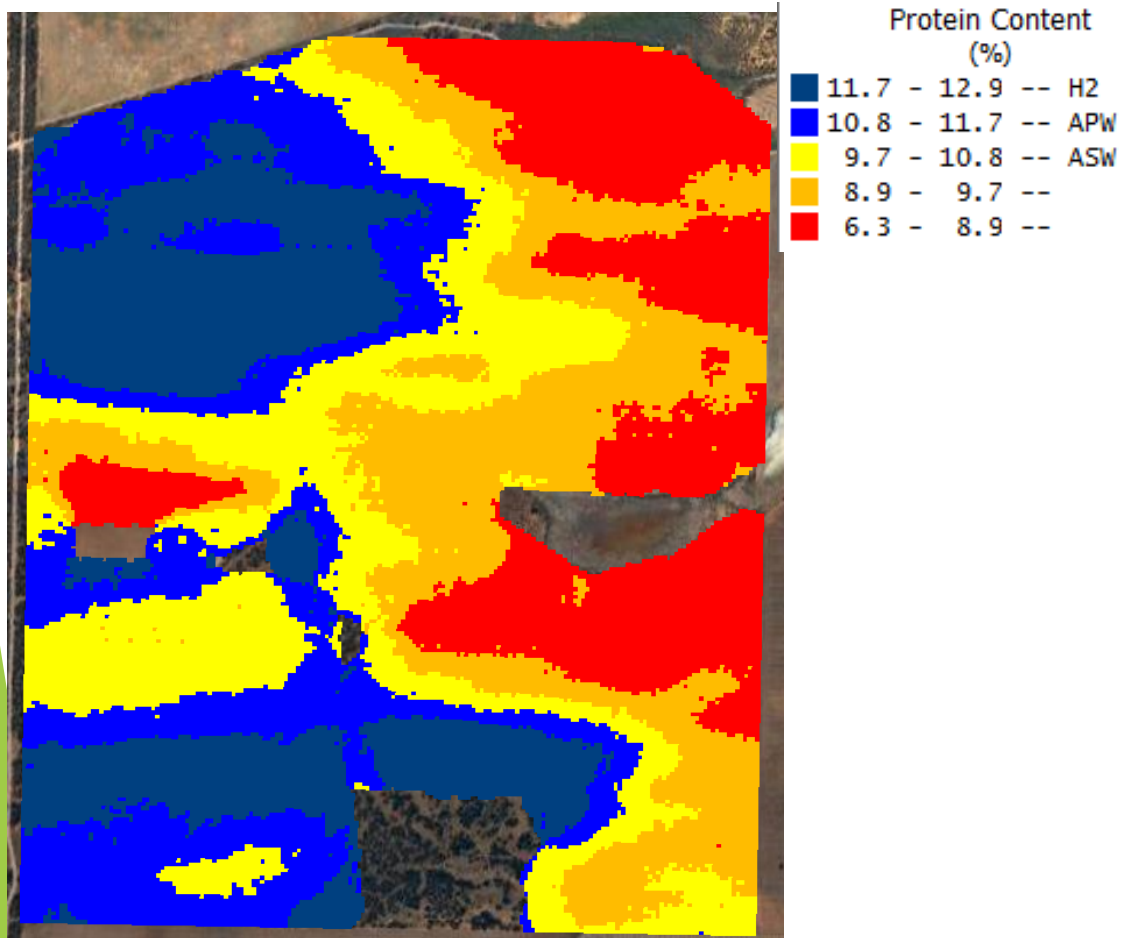


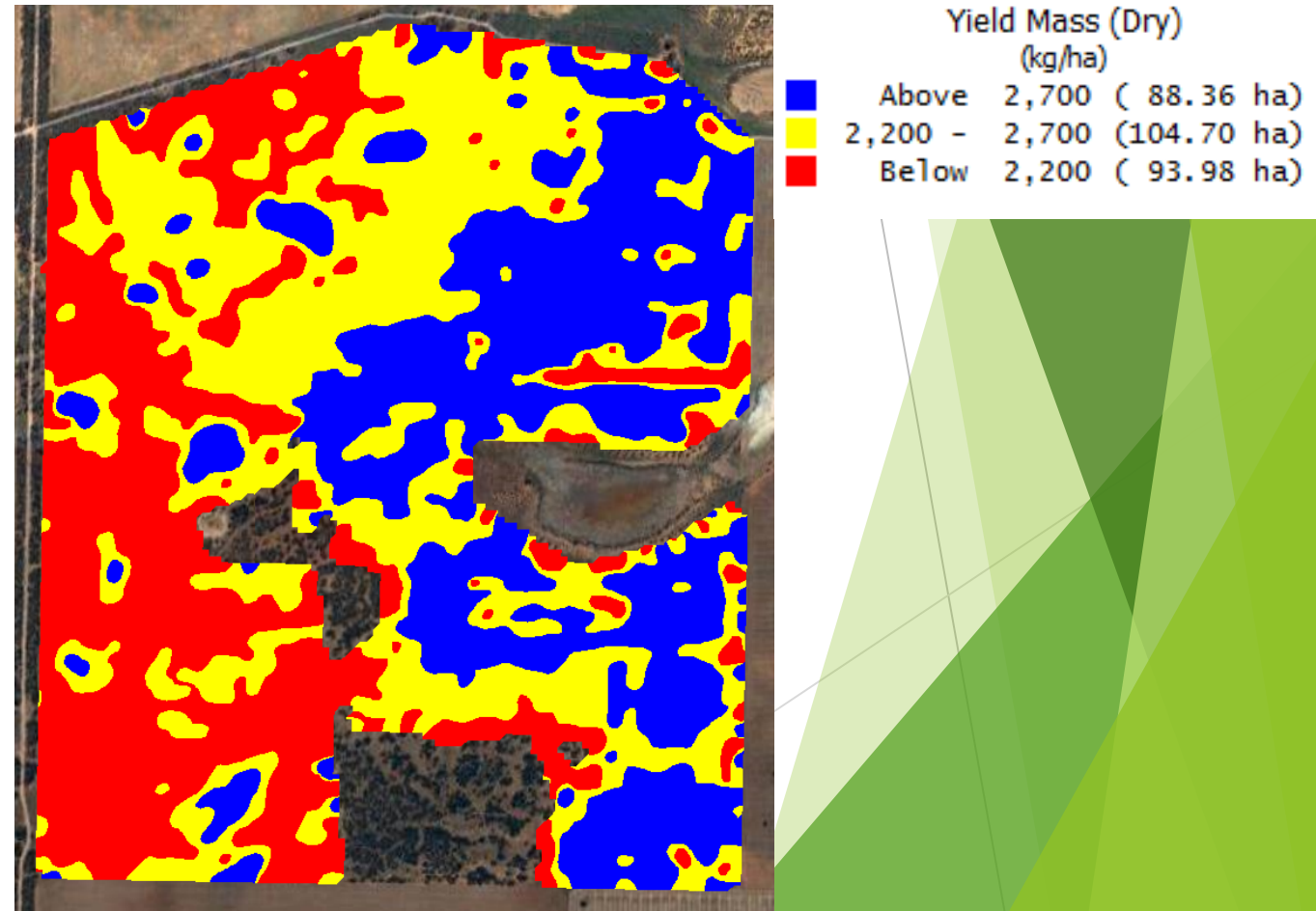
Figure 1. Grain yield (t/ha) and protein concentration (%) from 10 wheat varieties with 0, 30, 60, 90 and 120 kg/ha applied nitrogen in a trial at Parkes in 2011. (Brill et al, 2012, <http://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/04/Comparison-of-grain-yield-and-grain-protein-concentration-of-commercial-wheat-varieties>).

Protein & Yield Inversely correlate

Protein Map



Yield Map



Check what you are doing is working

- ▶ Did you apply enough, too much or about right.
- ▶ Do you need to change the timing of the application e.g. Too late to get a yield response.
- ▶ Other layers of information supporting the decision
- ▶ If it didn't work why didn't it work
- ▶ Something other than nitrogen limiting yield

Don't limit your best areas

► Urea Rate 125 kg/ha vs Yield Response

NDVI	Yield t/ha
Low	0.8 t/ha
Med	1.0 t/ha
High	1.2 t/ha

Ave
155
125
95

More
185
155
125

Do your own assessments



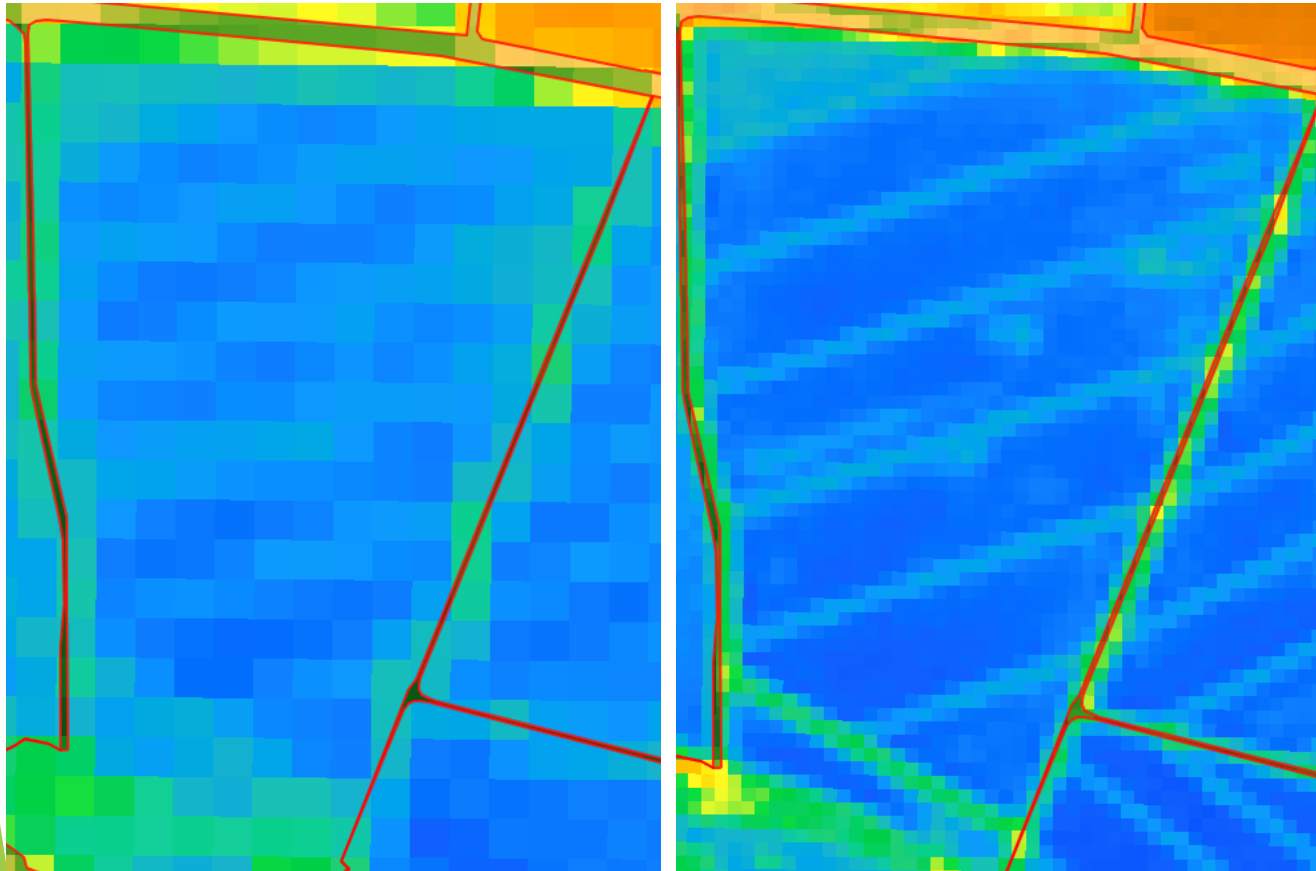
200 kg/ha Urea
PI: 155 kg N/ha

PI N Uptake
72 kg N/ha

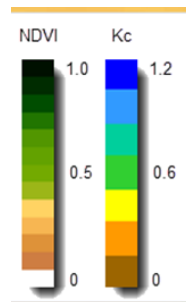
300 kg/ha Urea
PI: 154 kg N/ha

PI Uptake
25 kg N/Ha

Which Resolution to use

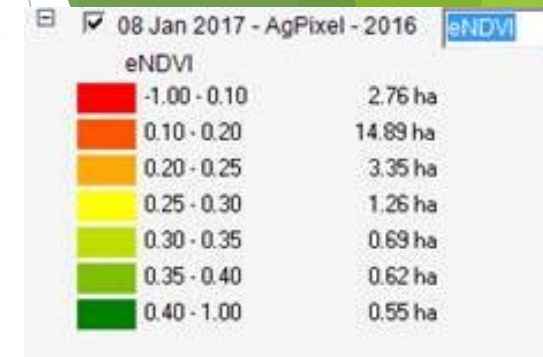
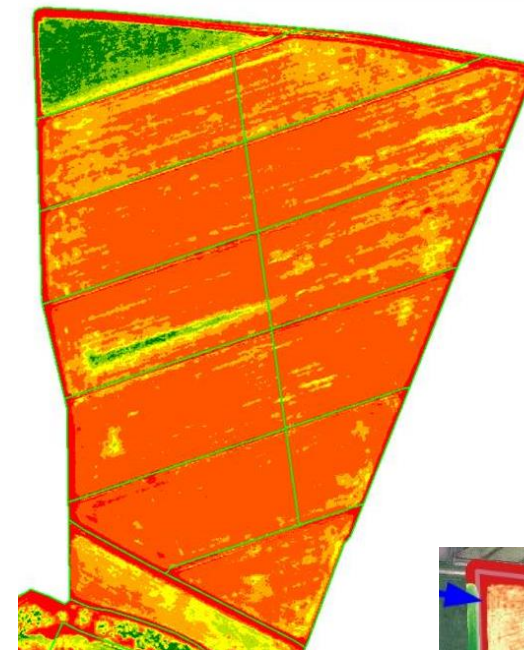


Landsat
30m pixels

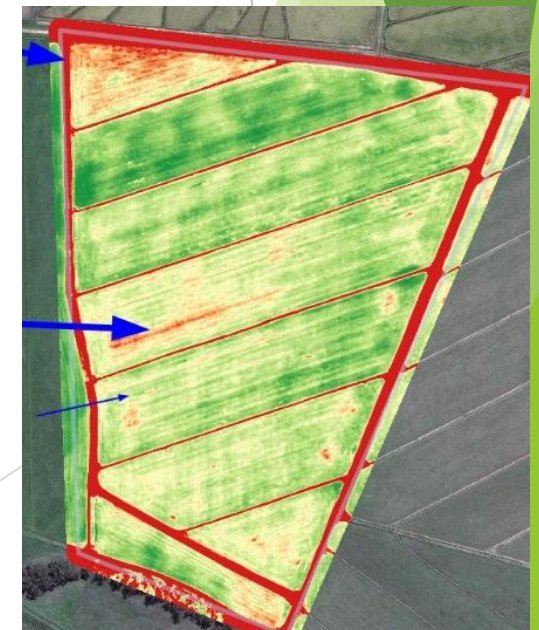


Sentinel – 2
10m pixels
bays defined
clearly

Plane 50 cm pixels

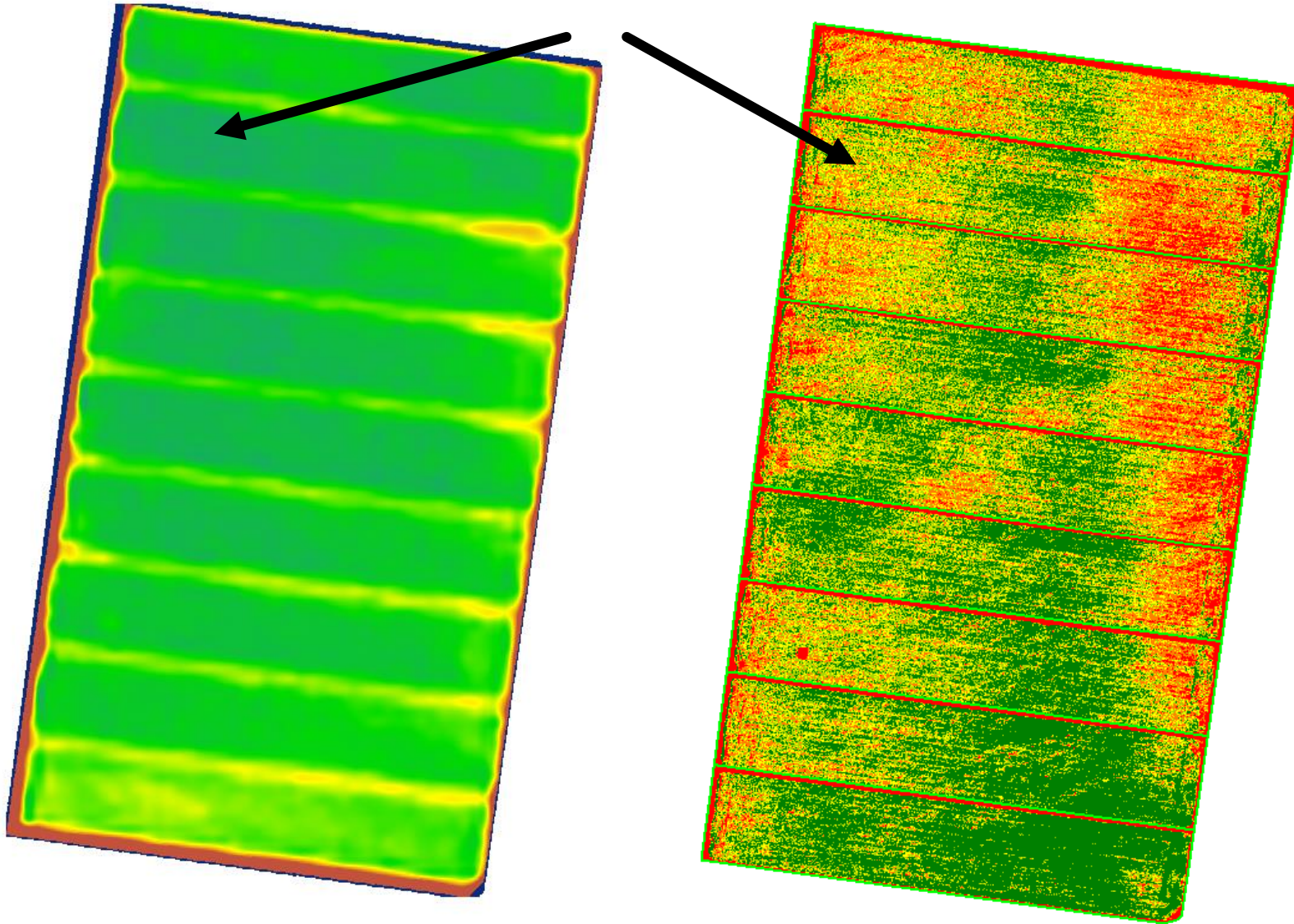


Drone
5cm
Pixels



Satellite vs Aerial 2 days apart

Which do you believe?



NDVI Changes over Time

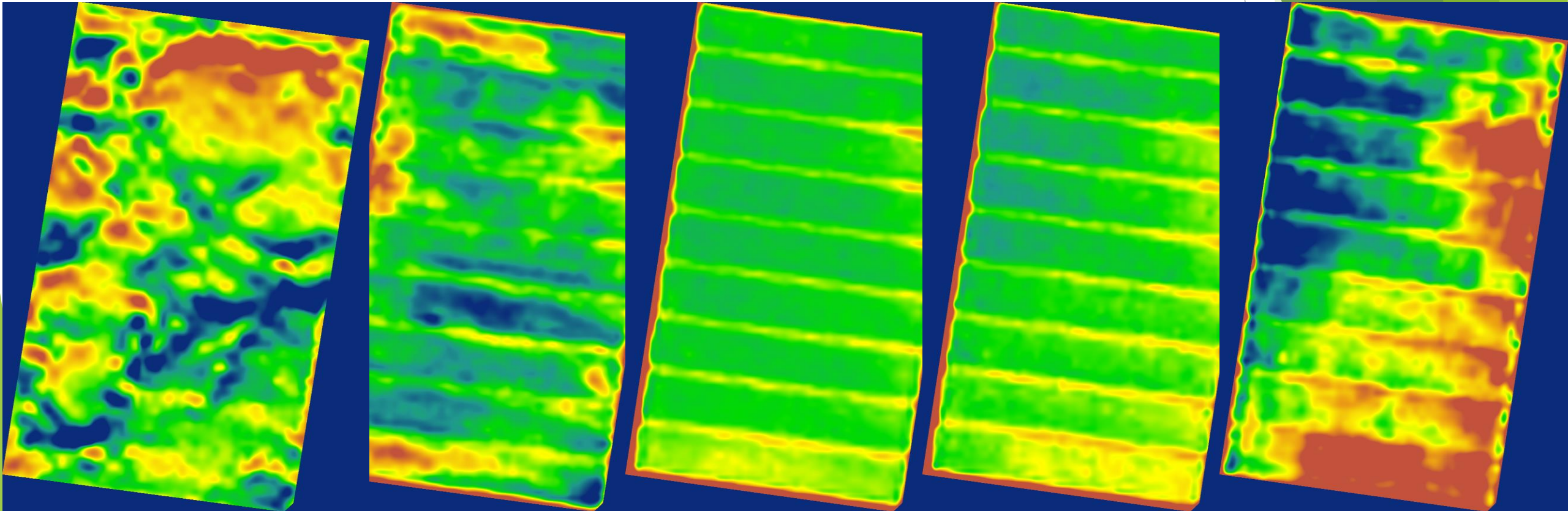
22 Nov 2017

7 Dec 2017

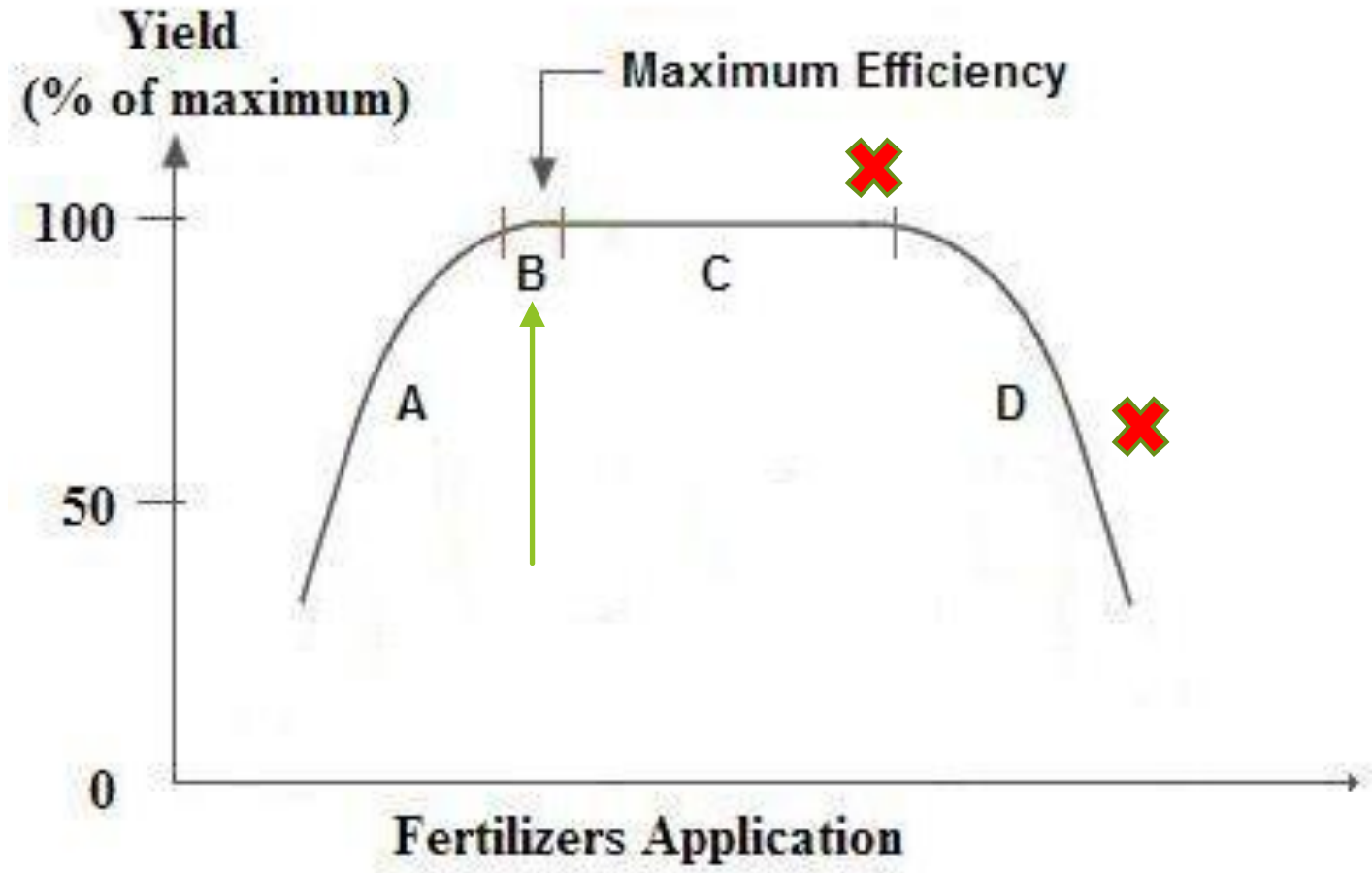
6 Jan 2018

7 Feb 2018

4 Mar 2018



Crop Response To Fertilizers Application



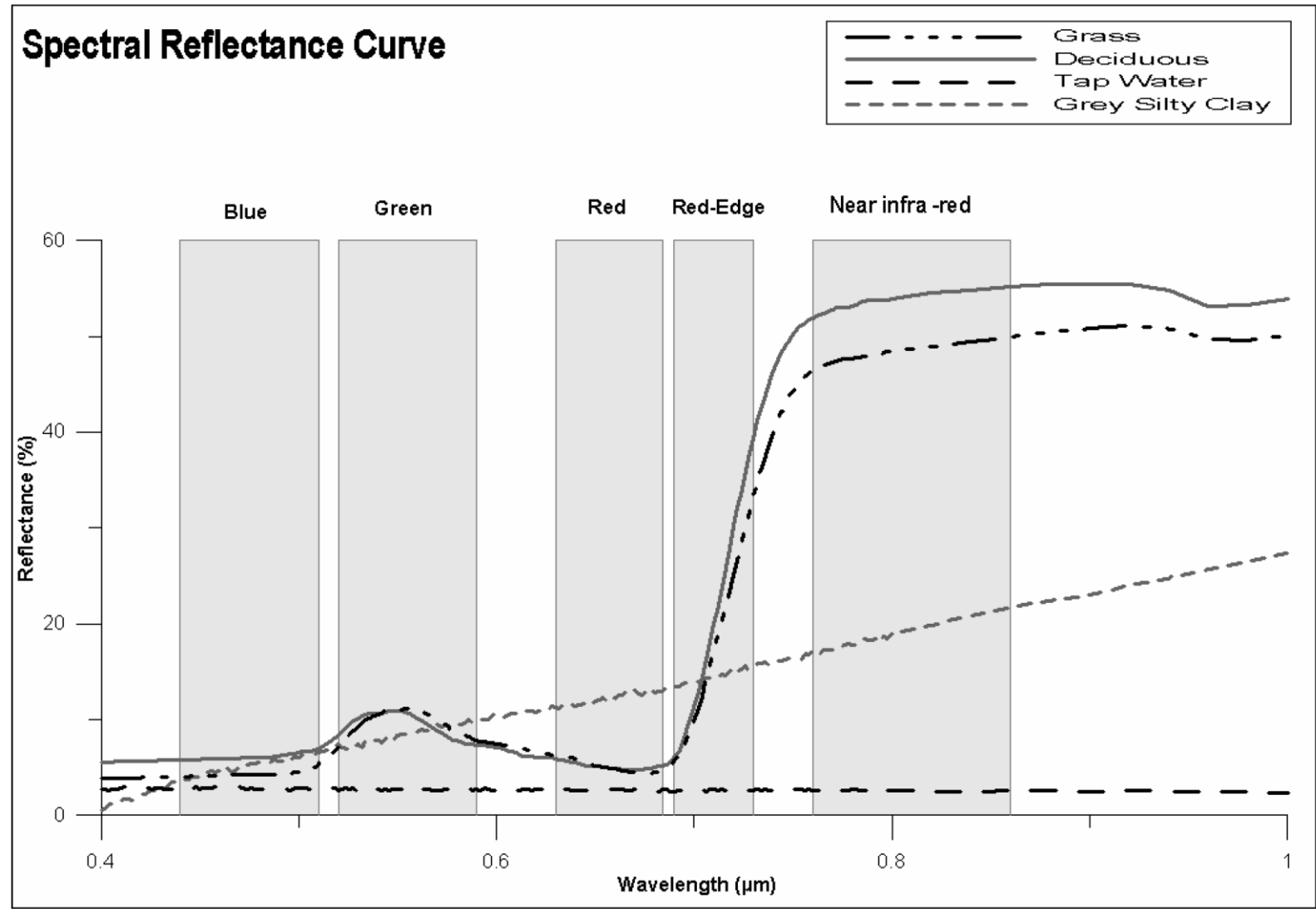
NDVI vs NDRE

NDVI

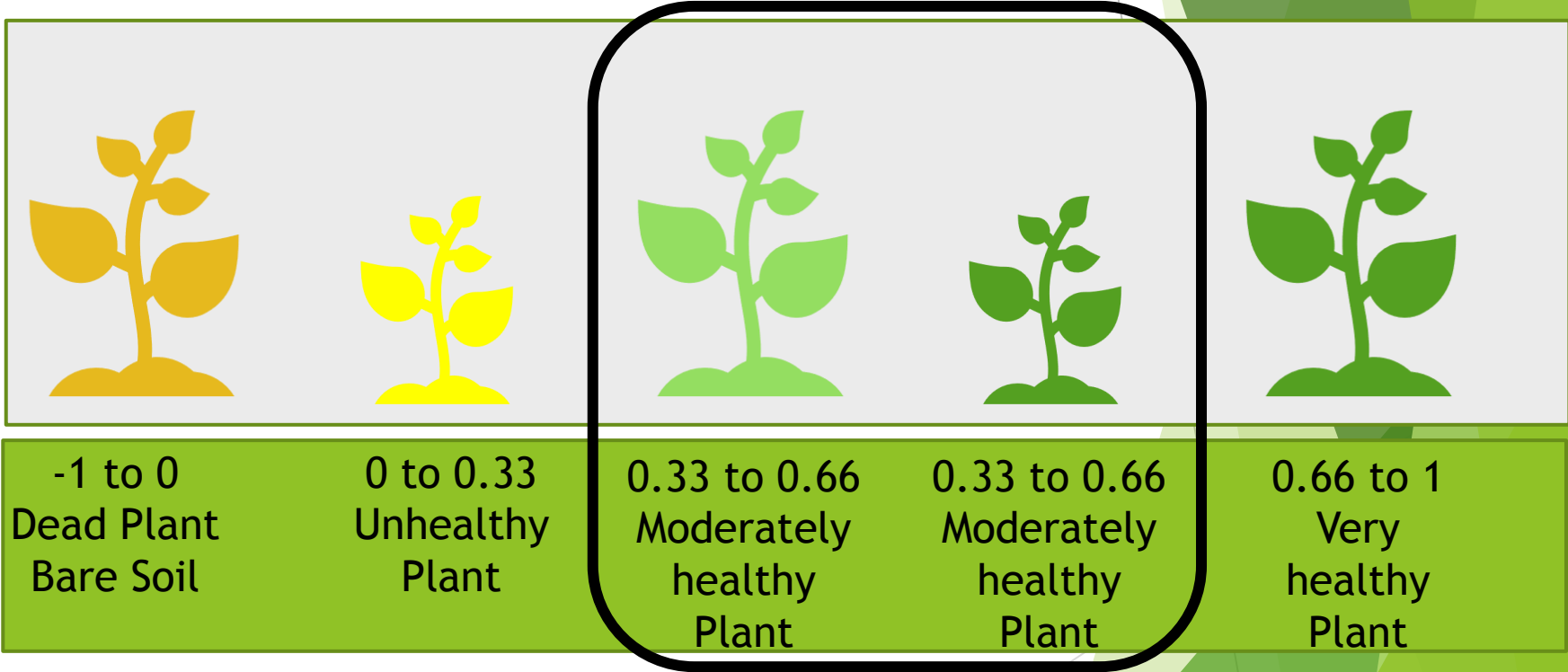
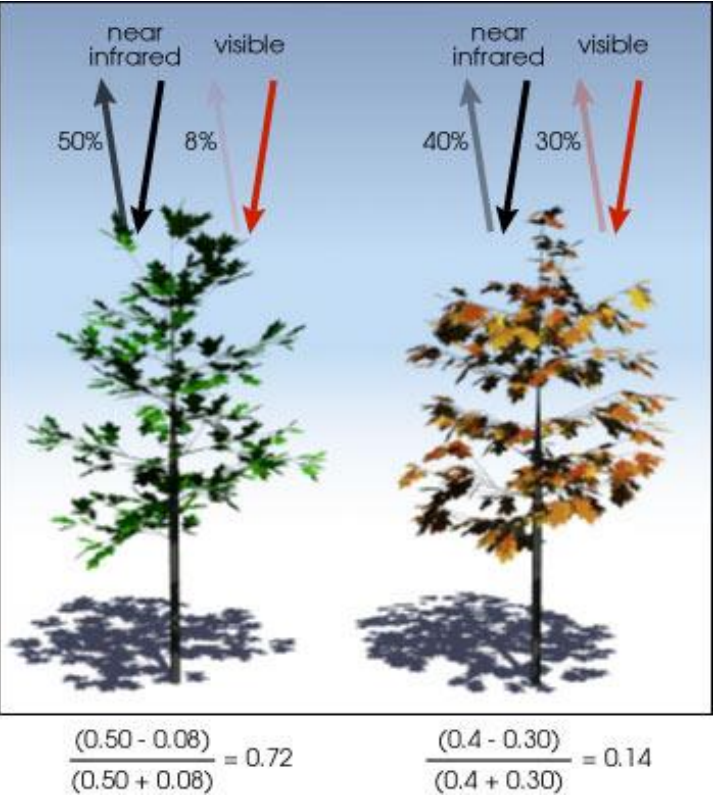
- ▶ Normalised Difference Vegetation Index
- ▶ $NDVI = \frac{NIR - Red}{NIR + Red}$
- ▶ Healthy - Biomass - LAI

NDRE

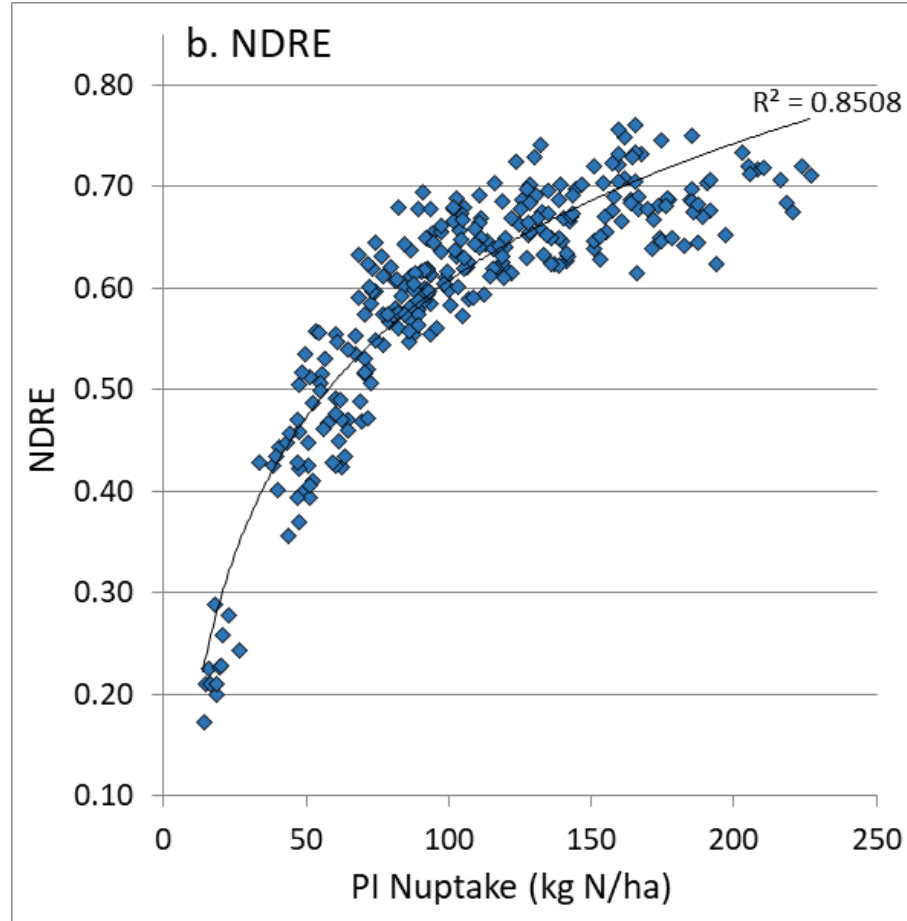
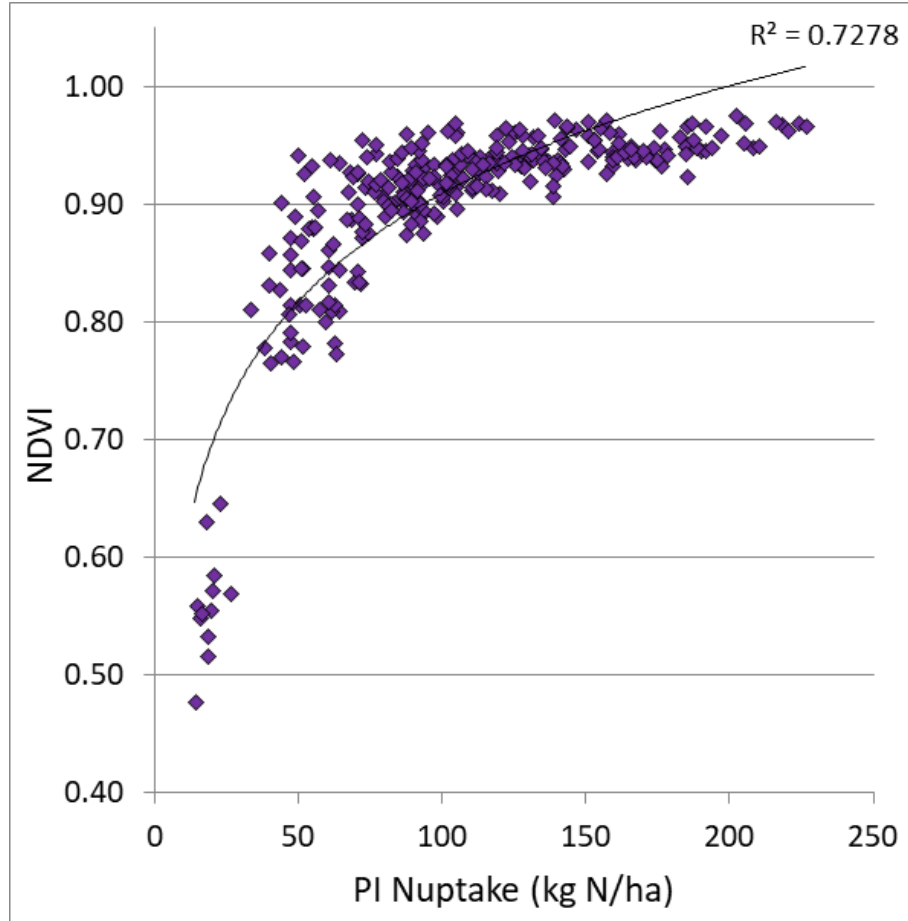
- ▶ Normalised Difference Red Edge
- ▶ $NDRE = \frac{NIR - RE}{NIR + RE}$
- ▶ Red Edge : rapid change
- ▶ NDRE correlates with chlorophyll content in the leaf which correlates with the nitrogen concentration in the leaf .



Understanding NDVI - NDRE



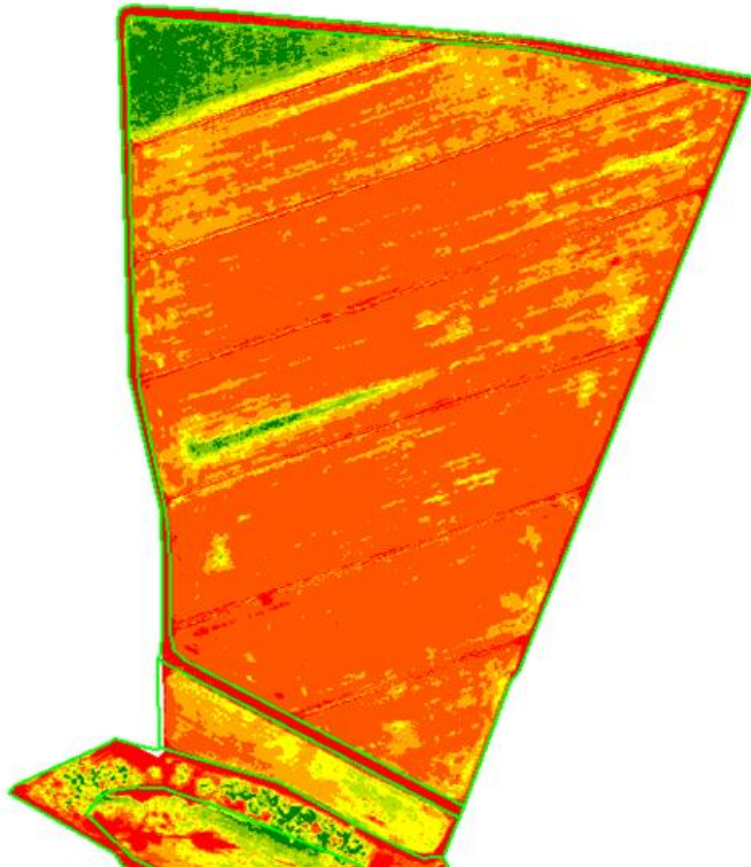
NDRE A better nitrogen uptake Index



Source: “Progress in Remote Sensing of PI Nitrogen Uptake”, IREC Newsletter No 198 - Spring 2017. Brian Dunn, Tina Dunn, NSW DPI, Remy Dehaan, CSU and Andrew Robson.

NDRE A better nitrogen uptake Index

NDVI



NDRE



Conclusion

- ▶ Imagery works well for low vigour areas
- ▶ NDRE is better than NDVI, both struggle in bulky High Nitrogen uptake crops.
- ▶ Don't believe everything you see. It has to make sense.
- ▶ The best image processor is the one between your ears!
- ▶ Multiple types of data - with the similar patterns
- ▶ Historical data from past crops/other crop types.
- ▶ Remember you may have potential to get more yield from your better growing areas.
- ▶ Nitrogen may not be the only limiting factor.