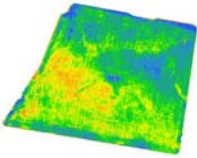




Using Sensors to Improve Crop Management

What is Precision Agriculture ?

Yield Mapping
and
Variable Rate Application

Vehicle Guidance
and
Auto-Steering

Agronomic Benefits of High Accuracy Auto-Steer




Four Year Rotation

1. **Wheat**
2. **Canola**
3. **Barley or Wheat**
4. **Pulse** Chickpeas, Faba Beans or Lupins

1. **Wheat**

and On and On it Goes.....




Year 2 - **Canola**

- Sown *Between* wheat stubble row ; stubble remains standing.


- Stops soil throw into adjacent rows, soil builds up against crown promoting breakdown
- Stubble not lying on rows, no physical barrier to emerging canola plants.
- Keeps row moist longer, aids germination. Protects young plants.
- Less shading of Chemical



Year 3 - **Barley (or Wheat)**

- Sown *On* canola row, which is *Between* cereal rows of two years ago.

- Roots follow pores left by tap roots of Canola
- Roots absorb nutrients from decaying Canola roots
- Crop planted in area of highest biofumigation
- Less disease transferred from old cereal crown residues



Year 4 - Pulse Crop Chickpeas, Faba Beans, Lupins etc.

- Sown *Between* last years cereal row.
- Stops soil throw into adjacent rows, soil builds up against crown promoting breakdown
- Stubble not lying on rows, no physical barrier to emerging plants.
- Less shading of chemical, more simazine on soil, not stubble.

Year 1 - Wheat

- Sown *On* pulse row, *Between* cereal rows of two years ago.
- Roots follow pores left by tap roots of pulse crop
- Roots absorb nutrients from decaying pulse roots, high in residual Nitrogen
- Less disease transferred from cereal crown residues
- Less shading of Chemical

Managing Paddock Variability

Nitrogen Removal

CROP	Nitrogen Removal	Urea Equivalent	Cost Urea @ \$800 /t
Total			

Nitrogen Removal


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Wheat 3.5 t/ha			
Total			

Nitrogen Removal

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Wheat 3.5 t/ha	81 kg/ha		
Total	81 kg/ha		

Nitrogen Removal

CROP	Nitrogen Removal	Urea Equivalent	Cost Urea @ \$800 /t
Wheat 3.5 t/ha	81 kg/ha	175 kg/ha	
Total	81 kg/ha	175 kg/ha	




Cost Urea @ \$800 /t
\$ 140 /ha
\$ 140 /ha





Cost Urea @ \$800 /t
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Nitrogen Removal

CROP	Nitrogen Removal	Urea Equivalent	Cost Urea @ \$800 /t
Wheat 3.5 t/ha	81 kg/ha	175 kg/ha	\$ 140 /ha
Canola 1.8 t/ha	74 kg/ha	160 kg/ha	
Total	155 kg/ha	335 kg/ha	\$ 140 /ha




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Wheat 3.5 t/ha	81 kg/ha	175 kg/ha	\$ 140 /ha
Canola 1.8 t/ha	74 kg/ha	160 kg/ha	\$ 128 /ha
Total	155 kg/ha	335 kg/ha	\$ 268 /ha




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Barley 4 t/ha	76 kg/ha	165 kg/ha	\$ 132 /ha
Total	231 kg/ha	500 kg/ha	\$ 400 /ha

 Integrated Management for Agriculture


Nitrogen Removal

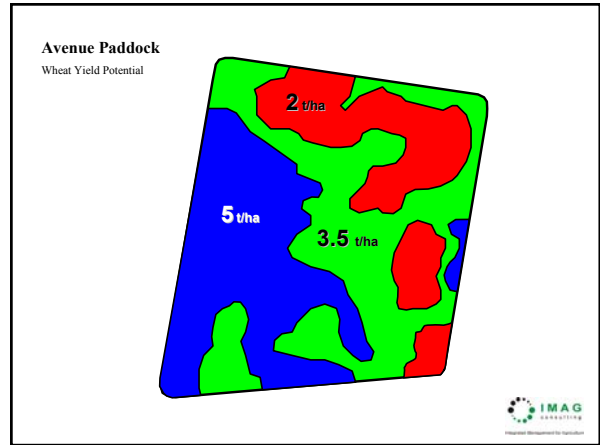
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Medium Yield Potential Zone

 Integrated Management for Agriculture

Nitrogen Removal

CROP	Nitrogen Removal	Urea Equivalent	Cost Urea @ \$800 /t
Wheat 2.0 t/ha	42 kg/ha	90 kg/ha	\$ 70 /ha
Canola 0.9 t/ha	37 kg/ha	80 kg/ha	\$ 64 /ha
Barley 2.2 t/ha	41 kg/ha	88 kg/ha	\$ 66 /ha
Total	117 kg/ha	250 kg/ha	\$ 200 /ha


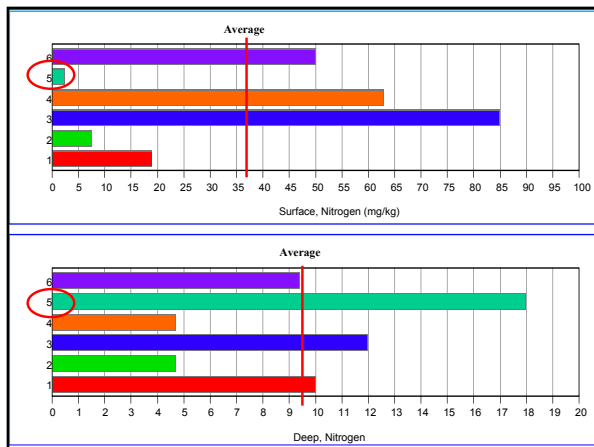
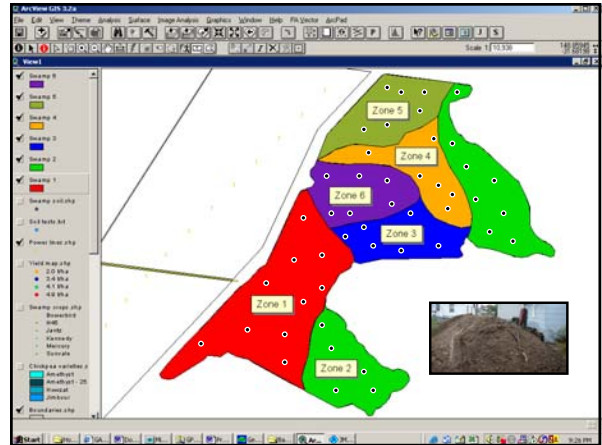
Low Yield Potential Zone

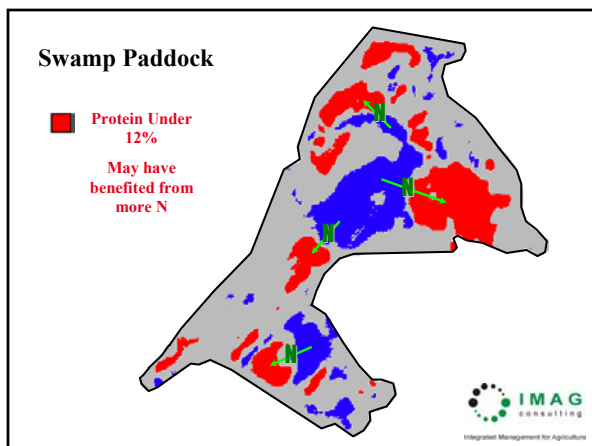
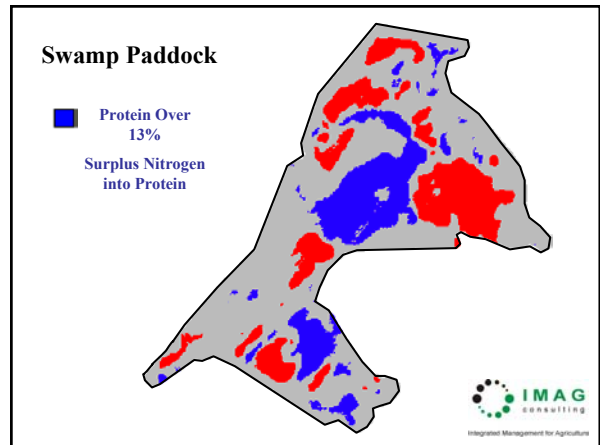
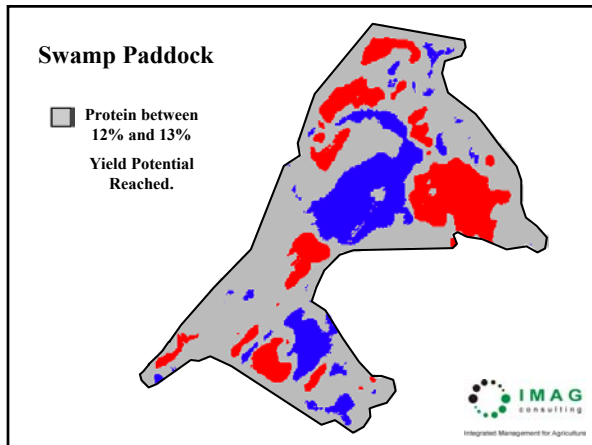
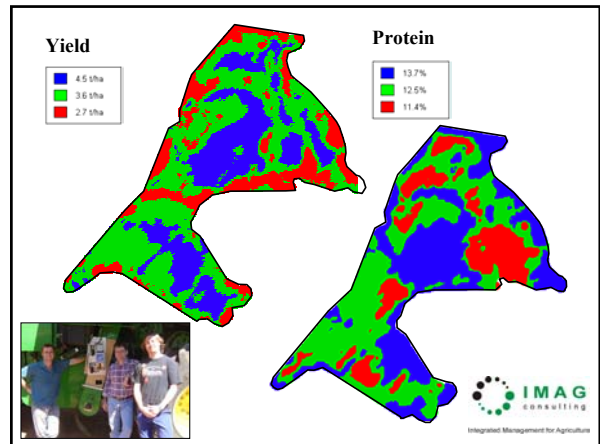
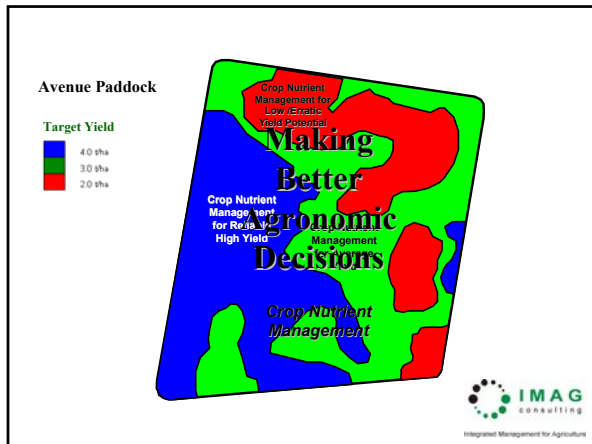
 Integrated Management for Agriculture

Nitrogen Removal

CROP	Nitrogen Removal	Urea Equivalent	Cost Urea @ \$800 /t
Wheat 5.0 t/ha	122 kg/ha	265 kg/ha	\$ 212 /ha
Canola 2.5 t/ha	106 kg/ha	230 kg/ha	\$ 184 /ha
Barley 6.0 t/ha	117 kg/ha	255 kg/ha	\$ 204 /ha
Total	340 kg/ha	750 kg/ha	\$ 600 /ha

High Yield Potential Zone

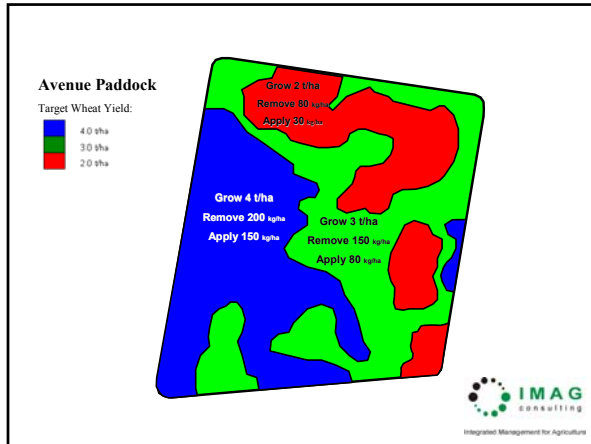


HOW CAN WE BETTER MANAGE NITROGEN?

Ideally:

Apply Nitrogen to Match the Yield Potential of Different Soil Types

IMAG consulting
Integrated Management for Agriculture



HOW CAN WE BETTER MANAGE NITROGEN?

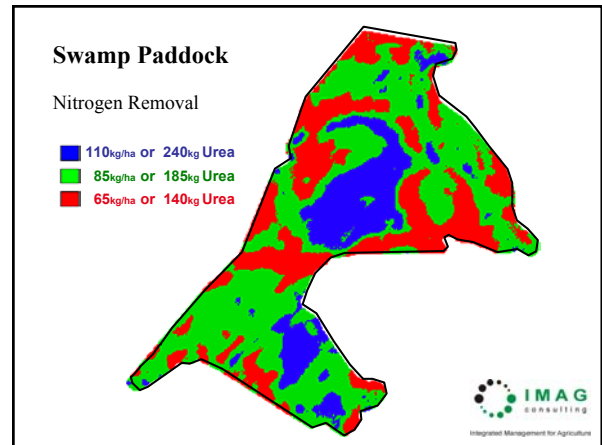
BUT....

How do we know
How *much* Residual Nitrogen
is *already* in the soil ??

HOW CAN WE BETTER MANAGE NITROGEN?

BUT....

How do we know
How *much* Residual Nitrogen
is *already* in the soil ??



CROP SENSING

Determine Crop Performance
and
Response to Extra Nitrogen
In Season

NDVI

What is NDVI ?

- Normalized Difference Vegetation Index

$$NDVI = \frac{(NIR - RED)}{(NIR + RED)}$$



Leaves and Light

It's Very Infra-Red



High NDVI Reading
0.6 – 0.9

Lots of Chlorophyll per m³
Lots of Sunlight being Converted to Sugars,
Plant Happy and Healthy!



Leaves and Light

Not Quite as Infra-Red



Medium NDVI Reading
0.4 – 0.6

Less Chlorophyll per m³
Less Sunlight being Converted to Sugars,
Plant getting Hungry!



Leaves and Light

Not Infra-Red at All



Low NDVI Reading
0.2 – 0.4



Collecting NDVI Data

Satellite



Aircraft

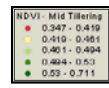
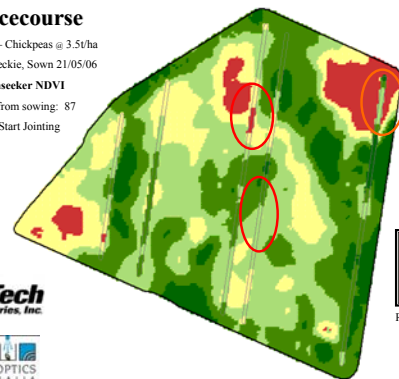


Ground Based Sensors



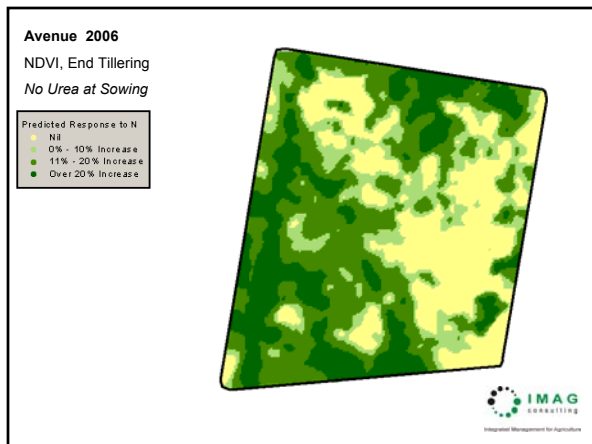
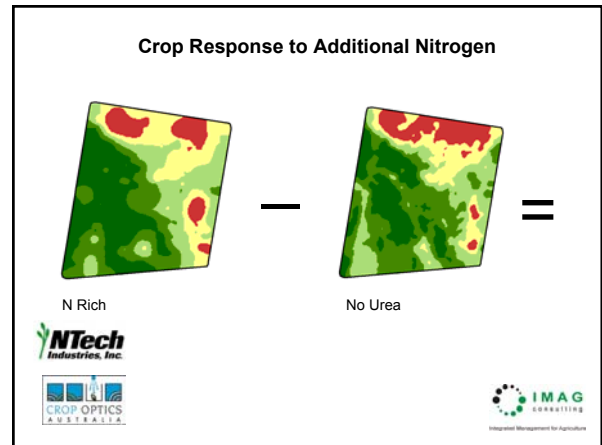
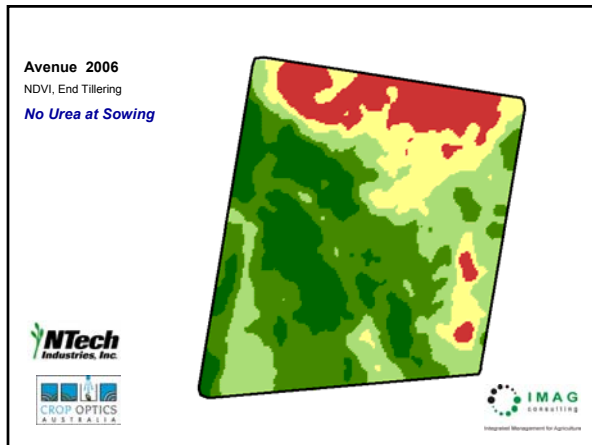
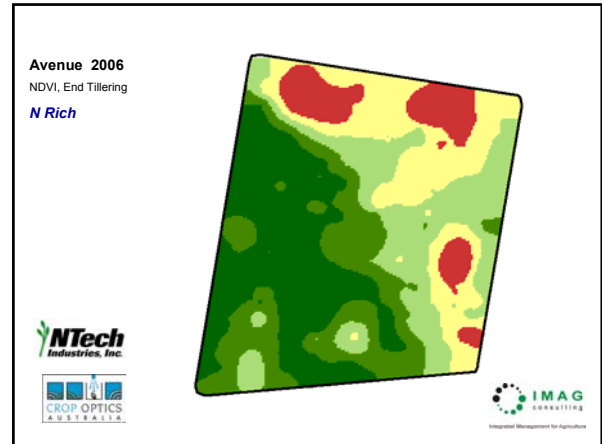
Racecourse

2005 – Chickpeas @ 3.5t/ha
Strezleckie, Sown 21/05/06
GreenSeeker NDVI
Days from sowing: 87
Z30 - Start Jointing



Run Date: 16/08/2006





Traditional Management
enhanced with some
New Tools.

IMAG CONSULTING
Integrated Management for Agriculture

Putting it All Together & Doing it a Bit Better


Target Yield

3 t/ha

Seed: 50 kg/ha

DAP: 50 kg/ha

Urea: 60 kg/ha



Target Yield	SEED	DAP	UREA
4.0 t/ha	55 kg/ha	60 kg/ha	100 kg/ha
3.0 t/ha	50 kg/ha	50 kg/ha	60 kg/ha
2.0 t/ha	45 kg/ha	40 kg/ha	40 kg/ha


Target Yield

3 t/ha

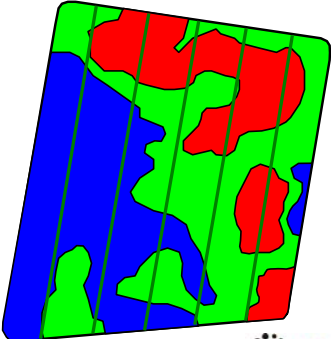

Seed: 50 kg/ha

DAP: 50 kg/ha

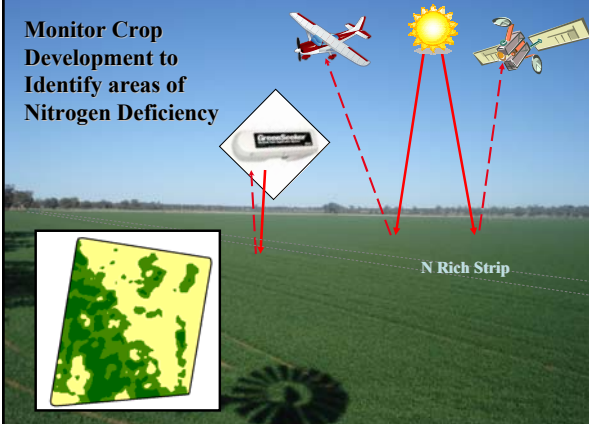
Urea: 60 kg/ha



Nutrient Rich Strips
Pre-Drilling Urea at 150 kg/ha

Monitor Crop Development to Identify areas of Nitrogen Deficiency



Get Yourself a Sensor

and see for yourself



GreenSeeker®
Data Collection and Mapping Systems



If you like walking!



Holland
SCIENTIFIC

Get Yourself a Sensor

and see for yourself



GreenSeeker®
Data Collection and Mapping Systems




Probably more Practical!



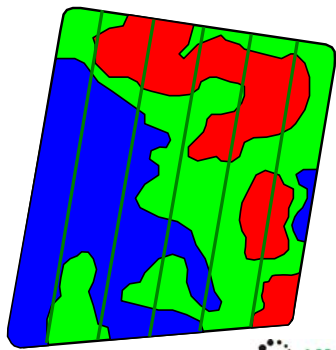

Holland
SCIENTIFIC

TRY A FEW DIFFERENT THINGS

Nitrogen Rich




See What Happens!

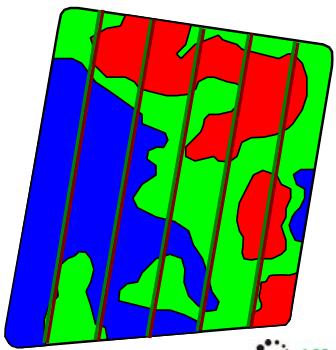




TRY A FEW DIFFERENT THINGS

No Nitrogen




See What Happens!

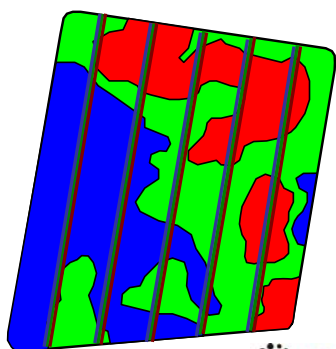




TRY A FEW DIFFERENT THINGS

Fixed Rate of Urea



Is it worth all the trouble?


Integrated Management for Agriculture

www.imag.net.au





Matt, Agronomist Glenn, Agronomist James, PA Specialist



Crop Scanning Forum















