

Site Specific Weed Management (SSWM)

- South Australian experience

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Site Specific Weed Management SSWM - what is it?

"Targeting the right weed treatment
to the right place"

Nothing new ... but GPS now makes it possible

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Benefits

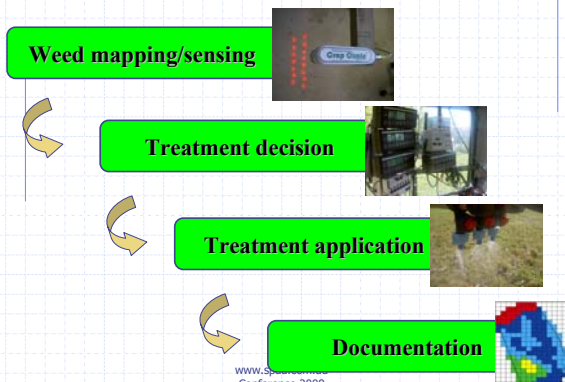
- Less herbicide applied - cheaper
- Expensive herbicides targeted only at tough weeds
- Less yield loss from crop phytotoxicity
- Better weed control
- Environmental – European driver (legislated)

Research

- Worldwide: growing interest and effort
- Australia: little research so far - increasing




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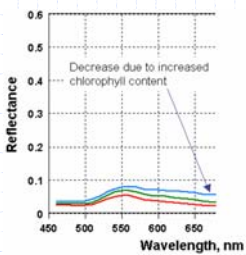
SSWM - components



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Ryegrass – can it be sensed?

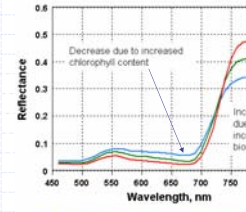
-  ■ N-Sensor
-  ■ Crop Circle
-  ■ Greenseeker




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Ryegrass – can it be sensed?

-  ■ N-Sensor
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$$NDVI = \frac{NIR - Red}{NIR + Red}$$

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NDVI: Normalised difference vegetation index

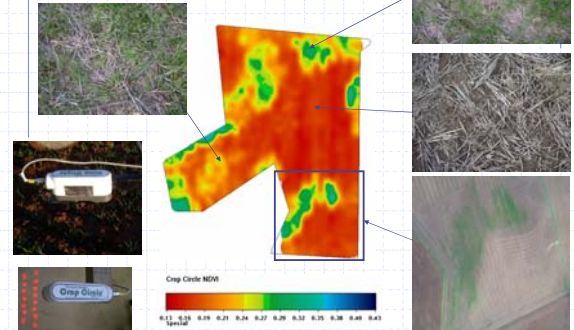
Ryegrass – can it be sensed?

- ◆ Remote control camera plane
- ◆ Satellite/aerial imagery

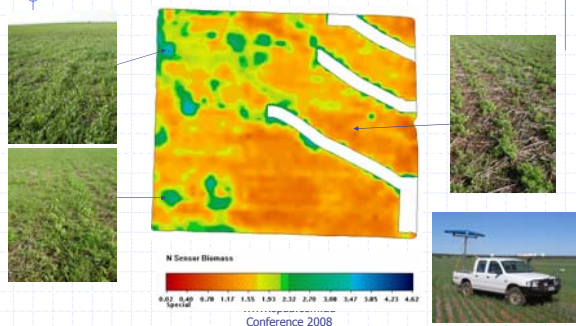


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Ryegrass pre-sowing

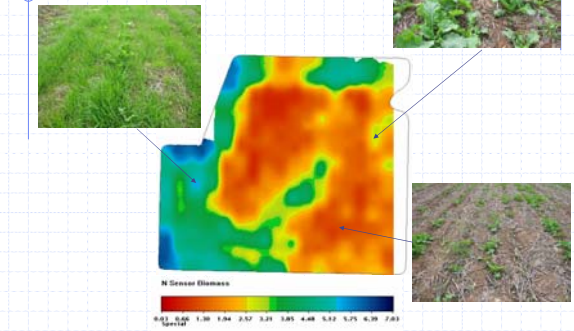


Sensing ryegrass in lentils



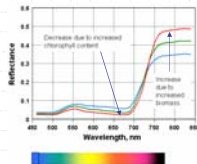
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Ryegrass in Canola



What else is in the pipeline?

- ◆ Can we sense individual species?
 - ◆ Hyper-spectral
 - 256 wavebands (very expensive)
 - waveband "drift" problem
 - ◆ Machine vision/image analysis
 - shape/reflectance recognition
 - complex and specialised research



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Patch management of ryegrass

- ◆ Why bother?
 - To limit weed populations to acceptable density thresholds
 - Herbicide resistance
 - Overlapping plants
- ◆ Options
 - Pre-emergent herbicides
 - Selective grass herbicides
 - Crop desiccation
 - Seeding rates
- ◆ Benefits
 - Herbicide savings through variable rate technology
 - On/off, or
 - Low dose/high dose
 - Improved weed management

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Variable rate ryegrass control – treatment list

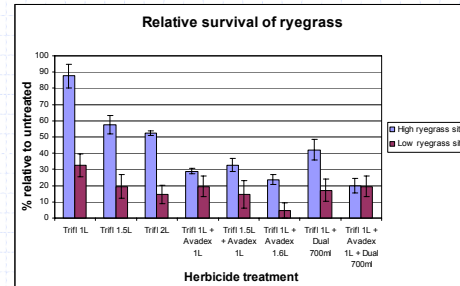
◆ Nine treatments

- Nil
- 1 L/ha trifluralin (480 g/L)
- 1.5 L/ha trifluralin
- 2 L/ha trifluralin
- 1 L/ha trifluralin + 1 L/ha triallate (Avadex Xtra)
- 1.5 L/ha trifluralin + 1 L/ha triallate
- 1 L/ha trifluralin + 1.6 L/ha triallate
- 1 L/ha trifluralin + 0.7 L/ha metolachlor (Dual, 720 g/L)
- 1 L/ha trifluralin + 1 L/ha triallate + 0.7 L/ha metolachlor

◆ Trial repeated under different levels of grass weed pressure

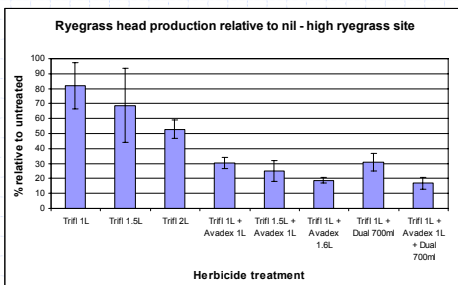
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Variable rate ryegrass control



- High ryegrass site: nil = 574 plants/m², LSD = 13.2%
- Low ryegrass site: nil = 11 plants/m², Not significant

Variable rate ryegrass control



- High ryegrass site: nil = 207 heads/m², LSD = 29.6%
- Low ryegrass site: nil = 1.6 heads/m², Not significant

Trifluralin resistance levels

Region	Moderate resistance (% of samples)	High resistance (% of samples)
SA – Lower North	44	8
SA – Mid North	19	6
SA – Yorke Peninsula	84	22
Vic – Wimmera	2	0
Vic - Mallee	10	1

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Ryegrass Control in Wheat

Seeding rate (kg/ha)	Herbicide	Ryegrass heads/sq m
75kg/ha	Trifluralin 1L/ha	112
75kg/ha	Trifluralin 1L/ha + AvadexXtra 1.5L/ha	52
150kg/ha	Trifluralin 1L/ha	40
150kg/ha	Trifluralin 1L/ha + AvadexXtra 1.5L/ha	19

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Variable rate ryegrass control - Select

	RG plant counts (plants/m ²)		RG head counts (heads/m ²)	
	High RG	Low RG	High RG	Low RG
Nil	936 a	71 a	1558 a	557 a
Select 150 ml/ha	50 b	7 b	249 b	59 b
Select 250 ml/ha	12 c	2 c	83 c	33 b
Select 350 ml/ha	6 d	1 c	43 c	17 c
Select 500 ml/ha	3 d	1 c	15 d	3 d

◆ Treatments repeated in a high and low density ryegrass population.

◆ Different letters indicate treatments that are significantly different at the 5% level of significance.

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Direct Injection Technology



- ◆ Chemical injected directly into spray line.
- ◆ Ability to variable rate control.
- ◆ Can add extra chemicals only where they are needed.
- ◆ No tank mix.

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Cerberus 3 tank sprayer, Stuttgart



Prof. Roland Gerhards

What could I do with my current boom?

- ◆ Vary rates of tank mix
 - Need to compensate with changes in speed or use a second line
 - Does not allow the addition of extra chemicals
- ◆ Do an extra pass

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Ryegrass patches – are they stable?

- ◆ Weed seed dispersal
 - Natural dispersal
 - Spread by harvesters
 - Spread by tillage
- ◆ Seasonal expansion and contraction of patches

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Other uses for crop sensors

- ◆ Variable rate fertiliser applications
- ◆ Variable rate fungicide applications
- ◆ Variable rate growth regulant applications

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Summary

- ◆ Ryegrass is patchy, herbicides are expensive, but technology has improved.
- ◆ Results indicate benefits for patch management of ryegrass.

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WeedSeeker for fallow spraying



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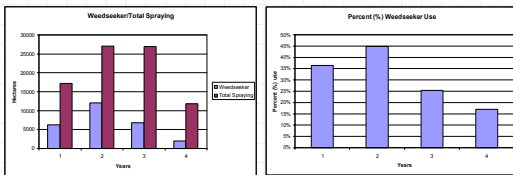
WeedSeeker for fallow spraying

How a WeedSeeker® sensor works

1. "Light emitting diodes" (LEDs) produce a combination of invisible infrared and visible red light which is projected onto the target approximately 2 feet below the sensor.
2. The light reflected from the target is captured by a detector at the front of the sensor.
3. Sophisticated electronic circuits inside the sensor analyze the reflected light and determine when it matches the light reflected by green plants.
4. When green plant's reflectance is identified, the sensor waits until the plant is under the spray nozzle and then triggers a fast-fire solenoid valve which sprays the plant.



WeedSeeker use in NSW conditions



Local experience indicates a reduction in area sprayed of 80-90%, but it depends on how weedy the paddock is.

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WeedSeeker Costs

Width (m)	Price/metre (AUD\$)	Price (AUD\$)
9	4,900	44,100
12	4,792	57,500
18	4,622	83,200
24	4,442	106,600
27	4,537	122,500
32	4,422	141,500
36	4,381	157,700

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WeedSeeker comments

- ◆ Will hit coke can size weeds at 16-18 km/h 100% of time.
- ◆ Can hit 20c piece size weeds at 16 km/h, but potential for less reliable job.
- ◆ Better at night, no shadow effect from natural light.
- ◆ Needs recalibrating every now and then on a weed free patch to correct for background soil and stubble.

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