

**Site Specific Weed Management (SSWM)**  
**- weed mapping and patch spraying**

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**GRDC**  
 Grains Research & Development Corporation

**SARDI Plant and Soil Health**

**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



**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

**Potential benefits**

“... targeting the average weed density results in the wrong decision at almost every point in the field”

**German research**

- Six seasons over many sites:
- 20-70% herbicide reduction
- Weed control maintained
- No weed build up next year



Prof. Roland Gerhards (RHS)  
 Uni. Hohenheim, Stuttgart, Germany

## SSWM – local potential?

Herbicide resistant weeds (eg ARG, wild oats)

Example for HR ARG:

Blanket trifluralin application with VRT direct injection of Avadex to dense patches



## SSWM - components

Weed mapping/sensing



Treatment decision



Treatment application



Documentation



## SSWM system options

Mapping vs Real-time (on-line)

- one or two passes

Weed/crop biomass vs weed ID

- simple NDVI vs real-time 25 spp ID

Treatment decisions

- on/off vs single direct injection vs 3 tank system
- on-line decision support software

Treatment scale

- boom section (3m) vs nozzle vs micro-droplet

## Cerberus 3 tank sprayer, Stuttgart



Prof. Roland Gerhards

## Direct Nozzle Injection Assembly

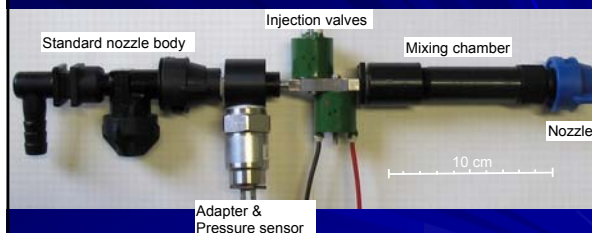


Image courtesy of Dr Jiri Vondricka, Uni. of Bonn, 2008

## Main approaches used world-wide

Multi-spectral: Red, Green, Blue, NIR bands

- cheapest and most common approach
- e.g. Crop Circle

Hyper-spectral: 256 wavebands (very expensive)

- waveband "drift" problem

Machine vision/image analysis:

- shape/reflectance recognition
- complex and specialised research

## NDVI Sensor types

Normalised Difference Vegetation Index  
 $NDVI = \frac{NIR - Red}{NIR + Red}$

Crop Circle

Green Seeker

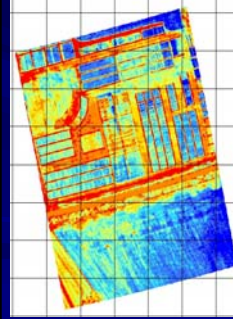
Yara N sensor

MS Camera imagery

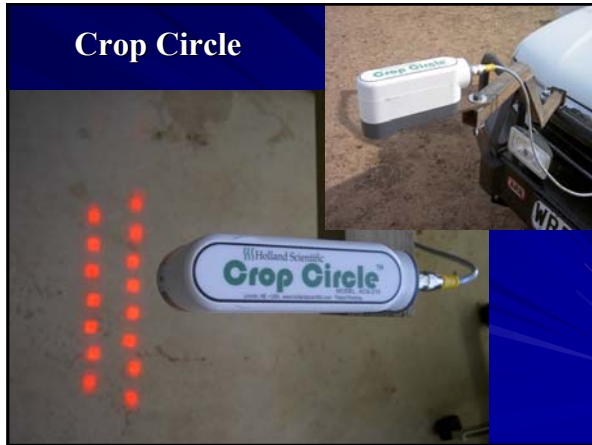
Aerial/satellite imagery

Remote control camera plane

## Hart trial site (west) Sept 2007



## Crop Circle



## GreenSeeker



## Yara N Sensor



## Multi-spectral camera - France



## Plant Fluorescence

- Germany
- Not NDVI



## Multi-spectral camera system - SARDI



## Australian R&D challenges

### Mapping/sensing systems

### Injection/application systems

- Allan Mayfield/ Sam Trengove *et al.* research
- Cerberus 3 tank sprayer in Germany
- DIS nozzle in Germany

### Wide rows, stubble

## Practical considerations

- Pre-sowing window too short – eg canola
- Pre-sowing biomass – summer weeds and vol. cereals
- Wild oats – delayed emergence
- Header rows
- Stubble
- Soil surface moisture

## Practical considerations



## Most likely mapping methods:

### Australia short-medium term

- Mapping done before spraying
- Early post-emergence likely best window
- Mapping as part of routine pass – e.g. EPE spray
- Scanning system that can handle header rows

(Yara N-Sensor?)

## Thanks to ....

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