Precision Ag Trials

Weed Seeker demonstration

Birchip

Although PA tools have been available to Australian grain growers for many years, and the benefits have been well documented, it is estimated that less than 1-% of grain growers utilise PA 'beyond guidance' in any form.

The objective of this GRDC / SPAA funded project is to increase the level of adoption of PA 'beyond guidance' by broadacre farmers. The project specifically aims to increase the level of adoption of variable rate (VR) by growers in the project to 30% by 2013. This goal will be achieved by demonstrating how to use PA tools to growers at a regional level and by increasing the skills of growers and industry in PA to a level where they can then use PA tools in their farming systems to achieve economic, environmental and social benefits.

Trials and demonstrations are conducted on growers' properties and are visited throughout the season using farm walks and workshops to discuss the advantages and disadvantages of PA techniques with the involvement of other regional growers.

This information sheet presents the outcomes of the SPAA trial **2** from season 2011.

Aims:

To demonstrate the effectiveness of weed sensing technology (WeedSeeker) for controlling problematic low population weeds (e.g. Prickly Lettuce).

Background:

The adoption of precision agriculture technology has increased rapidly over the past 3-4 years, particularly in auto-steer guidance and variable rate fertiliser application systems. The improvements in efficiency and reduction of costs have been imperative to minimising risks in a variable climate. Many of these gains have not addressed other major costs that farmers incur. In a No-Till farming system, the annual expenditure on herbicides is $55/ha in the Mallee and $65/ha in the Wimmera, including summer spraying (ORM, 2010).

Preliminary use of remote sensing equipment such as Weedseeker® has successfully reduced herbicide usage for specific weeds (e.g. Fleabane and Milk thistles) in a summer fallow situation. The Weedseeker® technology uses light emitting diodes (LED) to measure the reflectance from the ground. The sensor is able to identify a green plant, through the different reflectance it emits, which will then activate the spray nozzle to apply the herbicide automatically. Given sporadic weed germination, weeds varying in size and distribution; this technology could potentially reduce the quantity and cost of applied herbicides significantly giving an economic and environmental benefit.

About the trial:

The Wimmera and Mallee experienced the wettest summer in 100 years. Many paddocks were subject to flooding and access to paddocks was reduced. A paddock in the Rupanyup area (30km north of Horsham) become infested with Milk thistles, dead nettles and stemless thistles. Parts of the paddock held water for longer periods and therefore higher density and sized plants were present in those areas. The weeds present varied but main weeds were Milk Thistle (odd variegated thistle) and Dead nettle. Before spraying 3 zones of different densities were identified. Where the water had been laying over summer, the high density was said to have 60-80% ground cover, low density (5-10% ground cover) and moderate density (10-20%). The moderate density had a similar plant density of the larger thistles, but notably more dead nettle seedlings.

To quantify the actual savings or benefits where WeedSeeker can be used, we attempted to measure the amount of water sprayed on the same strips (using GPS) for a blanket. Blanket spray compared to the amount used using WeedSeeker. Large-scale equipment was used for this demonstration. The boom used (Sonic boom, with a JCB tractor) is equipped with 2 lines, one for WeedSeeker and the other for a blanket application. Because the plumbing and tank sizes were different it was difficult to measure the amount water used from each system accurately, subsequently we measure directly out of the WeedSeeker tank and line. Subsequently, when operating the WeedSeeker line as a blanket application, the boom was set on flush, this unfortunately meant that the water rate was 150L/ha on the exact same pressure (2.5 bar). For extension purposes, the amount of water used will be adjusted back to farmer rates of 75L/ha.

Speed was kept constant at 16km/hr. We filled the tank with 400L of water, then identified the area identified (e.g. High density), we first sprayed the same area using the WeedSeeker recording the area covered (in hectares) until the boom was emptied. We then sprayed the exact same area using same line and tank but on flush (tanks re-filled with 400L). The area covered until the boom rain out was again measured. The WeedSeeker area was then divided by the blanket area, we considered that anything over 100% e.g. 140% gave us 40% extra area or 40% savings. We then repeated this process for each identified density (low, moderate and high). Unfortunately, the trial was not replicated as it was taking at least an hour to do each replicate. No chemical was used in this experiment, just water. Ten digital photos were taken every 10 metres in transects (20m apart) at a height 1m. The purpose of these photos will be to get an accurate assessment of ground cover (%) in each zone.

Once the water rates and potential savings within various parts of the paddock were identified, the entire paddock was sprayed with herbicides. Alternate passes (e.g. every 2 pass) were sprayed with a blanket line and a Weed Seeker line.

Boom settings:	
Nozzle type:	TeeJet 0465E WeedSeeker, Blanket line (Teejet AI-02)
Pressure:	2.5 bar (varied with the number of nozzles going off in the high density.)
Nozzle spacing:	38cm
Boom height:	70cm (this was sometimes lower than the height of weeds.
Speed:	16km/hr
Weather condition:	Wind 5-7km/hr, Temp 19 degrees C, humdity 30%, Sunny (40-50% cloud cover)
Boom width:	100ft or 30m

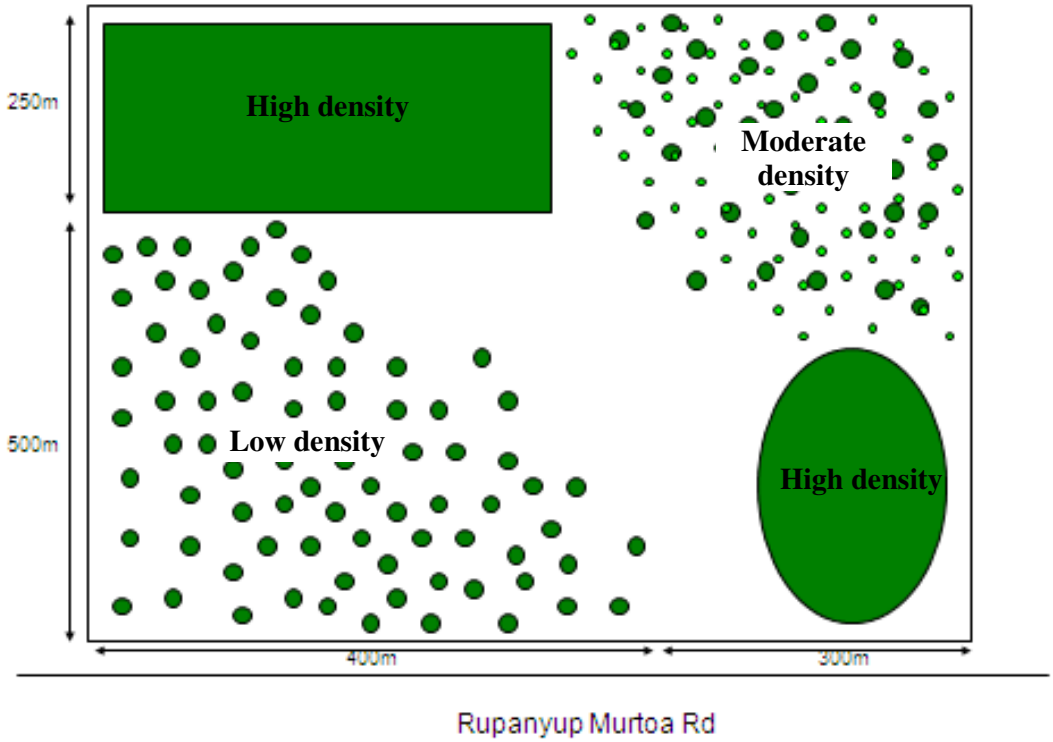

Figure 1. An illustration of the variability across the paddock. The high density areas are where water laid for 1 month after the January floods.

Results:

Low density: 1-5% ground cover, small to medium size thistles, no emerging dead nettles

Moderate density: 5-10% ground cover, medium to large size thistles, patches of dead nettles.

High density: 80-90% ground cover, large size thistles with a consistent understory of dead nettles.

Table 2. Water rates found at each plant density.

	Water rate (L/ha)		
	Low density	**Moderate density**	**High density**
Blanket spray	75	75	75
Weed Seeker	36	52	120
Additional area covered	**+52%**	**+30%**	**-60%**

The amount of water varied greatly between the different areas. Under the high weed density, using the Weed Seeker actually used more water than the blanket. However, at both the low and moderate densities, by using Weed Seeker, water use reduced by 52% and 30% respectfully.

When comparing the overall paddock gains from using Weed Seeker technology, there was substantial savings made (Table 3). The water rate used for the blanket application was targeted at 90L/ha. Using the Weed Seeker, the average water rate was 19L/ha (incorporating each different zone). This equated to a 78% saving in water and subsequent chemical.

Table 3. Water rates found when the entire paddock was sprayed.

Application	Area sprayed (ha)	Water used (L)	Water rate (L/ha)
Blanket Spray	37.5	3300	88
Weed Seeker	37.5	700	19

Interpretation:

This study has shown that substantial savings can be made with the use of this technology. It essentially, allows the farmer to have a zero tolerance on summer weeds, without having to apply economical thresholds. The study also identified that the savings will not always result. If there is consistently, 60-70% ground cover, the economical returns may not be as great. This is due to the way the technology is designed. Often in relatively high densities, two sensors would come on to spray one weed, hence twice the amount of water. This is most likely the cause of more water being used in the areas with the High density.

Overall, the Weed Seeker technology has the potential to reduce chemical costs and increase the efficiency of spray applications.

Who was involved?

Morgan Farms – site hosts
Tom Lyons (Southern Precision) – Spray contractor
Simon Craig (BCG), Tim McClelland (BCG) – Principal researchers
Simon Craig (BCG) – Trial Coordinator

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