DIGIFARM PROJECT: Weed mapping

Background

Increased levels of herbicide resistance and community concern about use of pesticide have forced the industry to look for alternate strategies for weed management.

Spot spraying technology has become increasingly popular over the last several decades for maintaining fallows. This technology senses green plant material as a spray boom passes over and triggers a spray nozzle (s) to selectively spray fallow weeds leaving bare ground unsprayed. This can allow large savings in herbicide as only a small proportion of the paddock is sprayed which may in turn enable the use of higher rates of more expensive chemicals (where label requirements permit) to be used on hard to kill weeds. There is also a community and environmental advantage via lower chemical use.

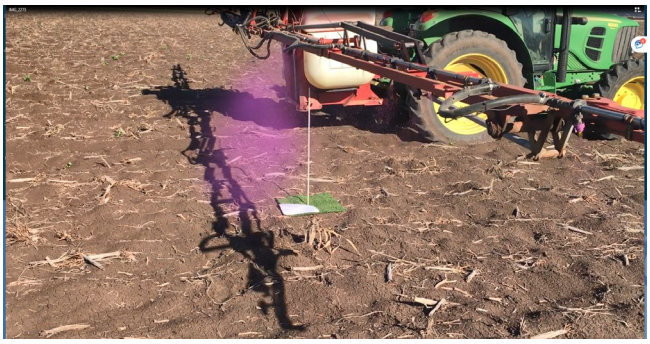

Figure 1. Spray nozzle activates in the vicinity of piece of astro turf that was previously mapped using a drone.

How does it work?

This technique involves several steps commencing with a photographic survey completed of the fallow paddock completed by a drone. The photographs are then stitched together to produce a mosaic which is then analysed by software to identify the position of weeds.

A map of targets is produced that can be read by the spray controller to trigger the appropriate nozzles or section of boom as the sprayer passes over the targets.

In order for the map to be accurate the GPS data from the drone must be corrected (unless the drone has a corrected GPS). This can be achieved by placing markers in the corners of the paddock prior to the aerial survey. The markers are incorporated into the survey and then a corrected position obtained for the markers using appropriate equipment. The photographic survey as a whole can then be corrected.

This technique can effectively turn an ordinary boom spray with individual nozzle or section control into a “spot sprayer” without incurring the significant capital expense of purchasing a sprayer incorporating “green on brown” technology.

In this project an attempt was made to expand the use of this technology on the Liverpool Plains and apply the technique to a wider range of farm technology systems. We collaborated with the University of Southern Queensland who are developing software to produce weed maps from aerial photographic surveys.

A photographic survey was completed of a bare paddock uses pieces of green “astro turf” as targets. The pictures were sent to the University of Southern Queensland were software developed by the university was used to produce a map. This map was used to spray the paddock in Figure 1.

Mapping of weeds can enable existing boom sprays to be turned into low cost “spotsprayers”

Pros/cons

The main advantage of this technology is the capital saving that can be made by using existing boomsprays to function as “spotsprayers”.

It can also provide information on the total area of the paddock requiring spraying. This may result in a decision to spray the entire paddock if numbers are large enough or a decision to adjust the herbicide(s)

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and rate used according to budget. It also allows a determination of whether the proposed spot spray application is within label rules. In short it allows time for decision making between detection of weeds and spraying.

The downside is the need to fly the drone, stitch the images, correct the GPS data, produce a map and load the map into the sprayer in between weed germination and spraying.

Farmer/advisor experience using the technology

Whilst this technology works and there are several providers producing maps for growers, we found difficulty getting the technique to work reliably across a range of controllers.

Agricultural GIS and guidance systems contain significant intellectual property (IP) and manufacturers can be understandably be unwilling to provide details on the format of their systems.

What's next?

The increasing number dedicated spot spray boom sprays are reducing the potential for this technology and beyond that "green on green" spray technology which uses image recognition to target weeds in crops and pasture may also find use in fallow situations. There may be application in situations of extremely low weed populations where the cost of running a boomspray is not justified. In this situation a weed map could guide an operator to individual weeds which could then be chipped by hand.

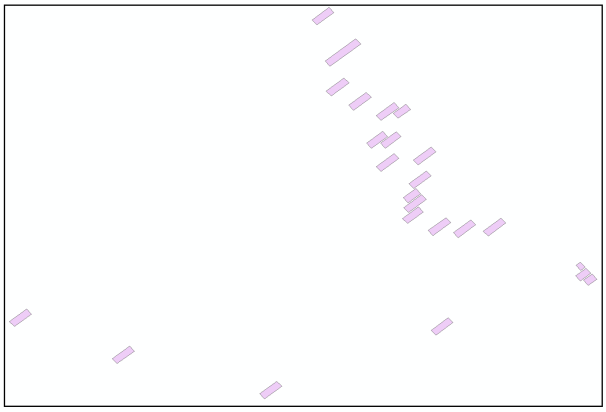

Figure 2. Information from drone flights is turned into targets within a shape file, this one is from the map used by boomspray in Figure 1.

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