bilberry

BILBERRY

Intelligent spot spraying system

In France, 2016, 3 engineering classmates gathered to look at a new way to apply artificial intelligence to modern sustainability challenges.

After speaking with farmers they quickly identified two key issues in the industry: the overuse of chemicals, alongside their associated costs and environmental impact as well as the resistance of certain weeds.

Now, a team of 28 who are passionate about innovation and agriculture develop smart solutions for growers, based on cameras and artificial intelligence.

✓ **Up to 93% herbicide savings**

✓ **Green-on-green & green-on-brown weed detection**

✓ **Live crop data as you spray**

✓ **Weed mapping for future planning**

BILBERRY INTELLIGENT SPOT SPRAYING SYSTEM

High-definition RGB cameras connected to embedded computers are mounted directly on the boom, completely covering the spray treatment area. The cameras capture imagery across the field and the computers use algorithms to analyse the vegetation and recognise weeds among the crops.

The in-cab user interface display allows the operator to configure, monitor and control the detection process, and send real-time directions to the nozzle controller.
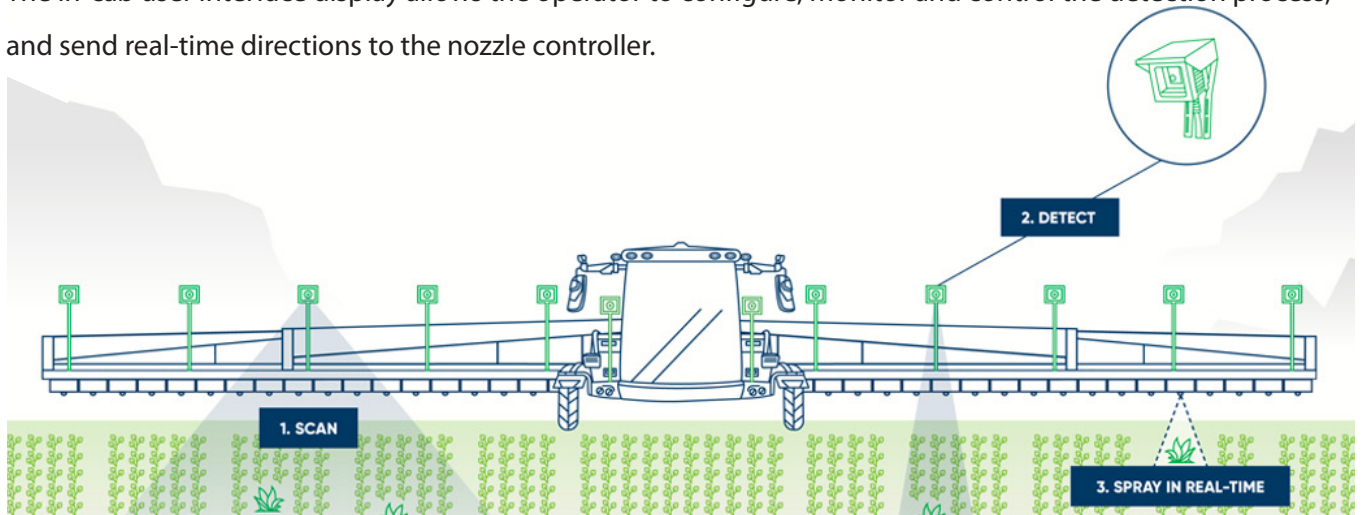
WHAT THE CAMERAS SEE (GREEN-ON-GREEN)

The white rectangles below are the camera's field of view at a point in time. The red highlighted area is the detection of weeds in a crop.

Above: Broadleaf being detected in a wheat crop.

Above: Blue lupins being detected in a lupin crop.

WEED DETECTION ALGORITHM

Bilberry technology uses artificial intelligence; the more the system is used, the better the weed detection algorithms.

With continuous imagery recordings, Bilberry can build a database of fields, crops and weeds to keep refining weed detection and increase accuracy and efficiency.

HOW IT WORKS

EMBEDDED CAMERA NETWORK
A camera network is embedded directly onto the boom.
Cameras are compatible with all boom sizes.

WEED RECOGNITION
An embedded computer, linked to the cameras, uses proprietary software to communicate with the sprayer.
It analyses images of the field in real time while moving, recognising weed species present within crops.

REAL-TIME SPOT SPRAYING
The on-board computer controls the spraying in real-time to identify and only spray chemical on recognised weeds.
It can cut a section of nozzles, or work one nozzle at a time.

WEED MAPPING
Information collected in the plots is automatically and immediately transcribed in the form of maps.
These maps can be integrated into the sprayer for further processing or in agricultural processes management software.

WHERE IT WORKS

|	CROP	WEED DETECTED	RESULTS	TECHNOLOGY APPLICATIONS
AVAILABLE NOW	Wheat, barley and oats	All broadleaf weeds (radish, volunteer canola, capeweed, double gee)	80 - 95% of weeds were detected and sprayed when weeds were visible	• Map broadleaves • Produce weed map over multiple years of data, increase the accuracy of the system
2022 BETA RELEASE	Narrow-leaf lupins (white lupins)	Blue lupins	80 - 95% of weeds were detected and sprayed when weeds were visible	• No solution previously existed, cutting edge technology • Can be used for mapping, or for further herbicide options
2022 BETA RELEASE	Canola (all herbicide technologies)	Grasses	80 - 95% of weeds were detected and sprayed when weeds were visible	

CASE STUDY

	FIRST APPLICATION	SECOND APPLICATION
AREA	6000 ha	6000 ha
CROP STAGE, WEED SPECIES AND SIZE, WEED INFESTATIONS	Wheat 3-5 leaf Weeds Radish 2-5 leaf. Density: light to medium	Wheat 6 leaf to Mid Jointing. Weeds Radish 5 leaf to flowering. Density: light to medium
PRODUCTS & RATES	Quadrant 1.0 l/ha	Velocity 1.0 l/ha
SPRAYER SETUP	**Spectrum: Extremely Coarse** Low Drift Twin Fan 03 nozzles 3 bar 130 l/ha at 20 km/hr	**Spectrum: Coarse** Low Drift Twin Fan 02 nozzles 8 bar 150 l/ha at 20 km/hr
SPOT SPRAYING EFFICIENCY TEST RESULTS	**14 DAT : 93.5% Affected** 28 DAT : 81.3% Dead and Affected	**14 DAT : 88% Dead, affected & treated** 28 DAT : 78% Dead, affected & treated
HERBICIDE SAVINGS	90%	93%

Developed by Peter Norris and Andrew & Rod Messina

COMPONENTRY

CAMERA

High quality RGB (red, green, blue) cameras capture 16 images p/second.
Mounted in an IP67 impact-resistant aluminium housing.
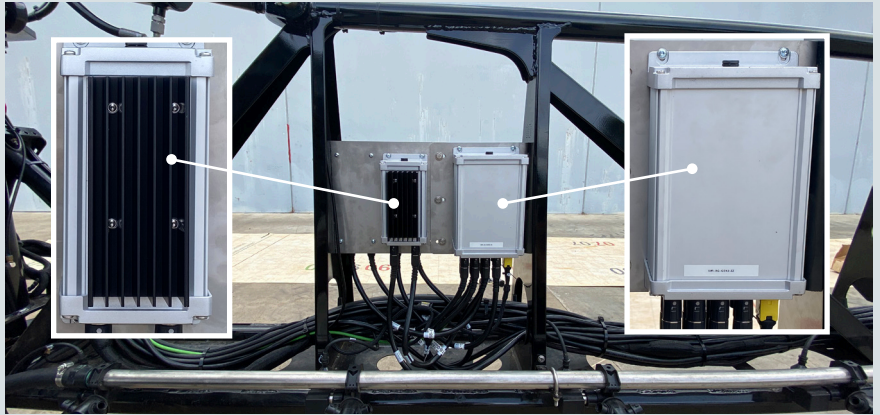
COMPUTER MODULE

High-powered, intelligent computer modules that process large amounts of data in real-time. Patented identification software determines the correct location, required nozzle position and application duration to hit individual weeds. Mounted in an IP67 impact-resistant aluminium housing.

SWITCH MODULE

Provides power to computers and cameras and is the junction between the componentry mounted on the boom and the in-cab console. Mounted in an IP67 impact-resistant aluminium housing.

MODEM

Allows remote access for product support, software upgrades and algorithm updates.


IN-CAB DISPLAY

Collects detection messages from computers and sends nozzle/section commands over the integrated network to the boom's rate controller. Interacts with the GPS, providing weed mapping information and proof of placement. Allows users to change active crop type, sensitivity and other settings.

MILLER NITRO INTEGRATION

AIR REGULATOR & SOLENOID

Utilises the Miller Nitro air supply to activate the camera-fold. The regulator is a water trap for a dual way, air-operated solenoid.
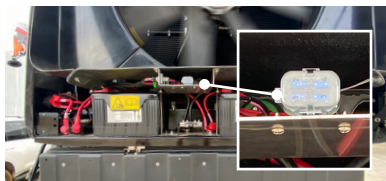
FUSE & WIRE INTEGRATION

All power supply has custom-made cables to integrate into Miller Nitro wiring. Includes full fuse protection, and is easy to check and service.


CAMERA-FOLD

Australian-designed, unique system allows for compact transport and storage of cameras. Air-operated cylinders provide automatic lifting and folding.

FREQUENTLY ASKED QUESTIONS

Will the Billberry system spray every weed in my paddock?

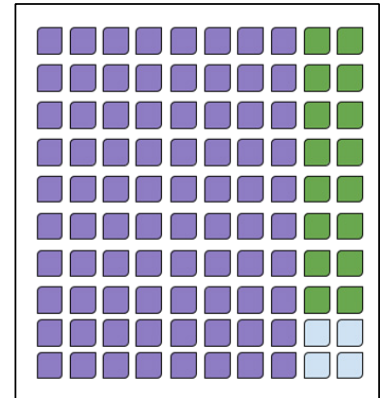The camera must first see the weed to be able to identify it.

A two-part spray strategy is strongly recommended for the best spray coverage. This strategy allows the system to detect any weeds it may have missed due to weeds being too small or overshadowing crop/stubble.
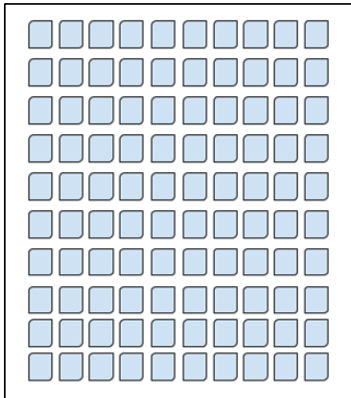
NO APPLICATION:
100 WEEDS UNSPRAYED
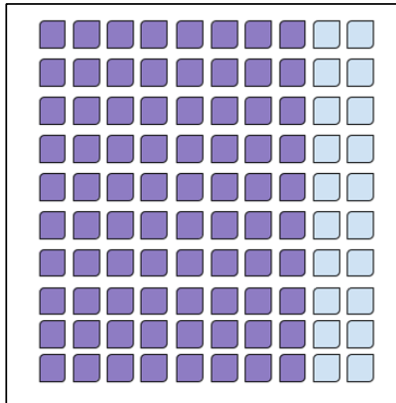
FIRST APPLICATION:
80 WEEDS SPRAYED
20 WEEDS UNSPRAYED

SECOND APPLICATION:
96 WEEDS SPRAYED
4 WEEDS UNSPRAYED

What is the recommended sprayer speed to use with the Bilberry system?

20km p/hour is recommended for optimal data processing speed and fuel efficacy for chemical application.

Does stubble affect the performance of the Bilberry system?

Yes, it does. The higher the stubble load, the more chance of it over-shadowing weeds, making it difficult for the cameras to see, identify and spray.

Can I use the Bilberry system at night?

Night spraying is not suitable for green-on-green applications. Daylight hours are recommended for best results. For green-on-brown applications, night spraying is possible with the addition of a nightlight kit.

Is there an ongoing charge?

Yes, Bilberry uses a subscription model to use its system. Several pricing options are available depending on your cropping program and usage.

Even with paying an annual subscription, will I save on chemical usage?

Yes. Intelligent spot spraying with Bilberry has shown to reduce chemical usage by up to 93%, offsetting your subscription costs. Note, the potential amount saved will vary depending on what chemical is used.

What does the annual subscription give me?

Continual software updates and algorithm improvements. Own-outright purchases (as opposed to subscription) only includes 2 years of updates.