

“Accuracy is brought down to 6x6cm, which can reduce pesticide and liquid fertiliser use by up to 95%.”



## Sprayers

# Technology rules

**As increasingly technical sprayers become mainstream in the market, the future of widespread spot spraying looks set. CPM pinpoints some of the latest technologically advanced products to hit the market for a flavour of what's around the corner.**

**By Melanie Jenkins**

**Accurate spray application can improve product use efficiency, optimise costs, aid plant health and help to mitigate environmental concerns.**

Through the development of technological advancements such as pulse width modulation to optimise applications, and artificial intelligence (AI) to identify specific weeds among crops, sprayer manufacturers are constantly pushing the boundaries of what's achievable. Below are some of the latest developments in the market.

### Fendt

Fendt's Rogator sprayers are equipped with the latest technology to aid application accuracy and increase infield efficiencies, demonstrating the continual movement towards high-tech spraying. Recent developments for the Rogator self-propelled models have focussed on improved nozzles and plumbing along with easier options for tank cleaning.

A key feature on the latest generation (MY24) Rogator is a redesigned plumbing system with additional clean water pump to enable continuous internal cleaning of the application tank. The ContiRinse system works on two adjustable thresholds, with the first initiating cleaning when the liquid volume in the main tank drops below a set value. Water is pumped into the non-applicant lines and pipes, displacing chemical residues without diluting the tank mixture. The second threshold is closer to the end of the tank and activates the full cleaning process.

Electro-pneumatic nozzle bodies are now standard and replace the electric versions. These have a lower power requirement and will help to increase longevity and reliability of the machines due to no diaphragms or dead volume areas for liquid or chemical residues.

Coupled to this, Fendt has added new nozzle options. These are compatible with Fendt's OptiNozzle automatic nozzle selection system and are supplied by Lechler to meet requirements for drift control.

The Rogator is also available with variable rate control using application maps which enables operators to only mix the protection products required, avoiding waste. Boom stability has been improved with six OptiSonic height sensors to keep the booms automatically adjusted in uneven crops.

Alongside these developments, Fendt is continuing to progress and develop its targeted spraying system with One Smart Spray. The sensors and cameras on the system detect weeds in the crop and activate the corresponding nozzle to apply liquid to areas that require it, rather than blanket coverage. The system can be used

in row crops such as maize and sugar beet, with both pre-emergence — 'green on brown' — and post-emergence — 'green on green' — applications possible.

Sam Treadgold, Fendt's sprayer specialist, says the wider benefits of these future technologies will be important to growers. "The development of advancing sprayer technology allows users to target plants at an individual level. The upshot is a significant reduction in the use of plant protection products through targeted applications. This offers both financial savings while protecting the environment which will be vitally important to growers. The technology is still in development and testing and Fendt plans to bring it to the market at some point in the future."

### John Deere

Moving into the mid-range sprayer segment, John Deere introduced its 300M series at Agritechnica in November 2023. "This machine is aimed more at the UK market and comes in two models, the 332M and 340M, which have 3200-litre and 4000-litre tanks, respectively," explains John Deere's Mark James.

Although the 300M series occupies the mid-range sprayer market, it isn't without plentiful precision farming tools to advance sprayer operations to the next level. "As standard, it's equipped with individual nozzle control," says Mark. "This technology is capable of cutting operation costs by reducing overlap of sprays. In future it'll also enable users to spot spray using maps produced through crop scouting or with a drone."

The models also include Direct Rate Control within PowrSpray to eliminate under and over-dosing and in variable rate



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applications the adjustment is immediate. "Individual nozzle control should save 3-5% in application rates compared with switching the boom on and off in sections, but we think it's actually likely to be more than this. Over a number of fields, this could result in significant savings and can help improve crop quality by minimising overlap."

The 300M series is fitted with a G5Plus display with a 32.5cm high-definition touch screen. "This comes loaded with activation for AutoTrac and AutoSteer as standard and operators can record what's been applied and where, helping to improve record keeping and aiding future husbandry.

"These same features provide the tools to apply prescription applications such as variable rate and can be run with Trimble's GreenSeeker or Yara's N Sensor for applying variable rate nitrogen."

In addition, JDLink is

included and activated for life, he says. "This allows for full data synchronisation, meaning users can create plans on MyJohnDeere which are synched with the sprayer so that jobs are set up ready for when the operator climbs into the cab."

Although the technological features on the 300M have been included on John Deere's premium sprayer models for a while, including them on this mid-range series opens up access to increased capabilities for a wider range of users, says Mark. "In five years all of these technologies will be ubiquitous on mid-range sprayers."

Later this year, John Deere will be launching its See and Spray system to the UK on its trailed sprayers. The system incorporates high-definition cameras which are mounted every metre of the boom and can spot weeds as small as 2mm in diameter at speeds of 12km/h.

See and Spray consists of ▶



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# Sprayers

▶ two operating modes — ‘green on brown’ and ‘green on green’. “Green on brown is for use on fallow ground or in-row work and is what will be launched later this year. Green on green is still in development for the UK and Europe,” says Mark. “We’ve

so far sprayed more than 1M hectares with this technology across the world and have seen a reduction of 70% in the amount of product applied, meaning it has the potential to incur significant savings.”

## Knight

Multiple technological features on Knight’s trailed and self-propelled sprayers (3500-12,000 litres/24-40m) are designed to help maximise application accuracy.

By entering data such as required

## Ecorobotix

Ecorobotix is taking precision spot spraying to the next level, and for a small company in among a world of big players, it’s made notable headway with the inception of its ultra-high precision Ara sprayer.

Based in Yverdon-les-Bains, Switzerland, the firm originally started out by creating a small two-armed robot between 2014 and 2018, explains Ecorobotix’s Damien Ricci. “The trend at the time was towards producing robotics in agriculture, which helped us to raise funds for the project. However, the main issue was the speed at which it was able to operate — we couldn’t guarantee a work rate per hour and this is an issue for customers.”

This led to shift in direction back towards a trailed sprayer, but Ecorobotix’s Ara is unlike any other trailed sprayer. The Ara consists of three 2m wide enclosed compartments, totalling 6m in width which can be folded to 2.8m for road transport.

Its internal boom features nozzles spaced 4cm apart (a total of 156) which has allowed the firm to overcome the challenge of consistent work rates, with the Ara able to travel at 7.2km/h and spray 4ha per hour without compromising spray accuracy. And because the boom is encased, the Ara boasts a 90% reduction in drift compared with conventional spraying and has the ability to work accurately in windy conditions.

High resolution cameras are situated every 1m inside the three compartments, with one camera taking normal RGB photos to identify weeds and soil, while a second 3D camera capture images to calculate speed, motion and depth control, with lighting provided by two LED flashes, explains Damien. “Each camera box has an isolated computer which analyses every image, and this allows for exact calibrations of what and where to spray meaning accuracy is brought down to 6x6cm, which can reduce pesticide and liquid fertiliser use by up to 95%.”

An image is captured every 10 seconds and stored on an internal SIM card, with some images sent to Ecorobotix’s server to help improve its algorithm. Each computer can hold 500GB of data and once it becomes full, the oldest photo is deleted automatically.

Boom height is automatically adjusted with an electrical actuator based on analysis of the 3D images and can work to a crop height of up to

40cm. “However, if the Ara is spraying grassland to target weeds it can operate beyond this height,” says Damien.

The Ara is able to perform four types of spray applications: selective herbicides, non-selective, can apply pesticides to just the crop or to just the soil without touching any plants, in cases where a pre-emergence application might be required without the risk of residue on the crop.

Ecorobotix has its own team of specialists training its AI to identify specific plant species — crops and weeds — and to differentiate these from the soil. “This is one of our biggest areas of investment internally because the data catalogue required to train AI is enormous,” explains Damien.

So far, the Ara is able to achieve a success rate of 99% accuracy when spraying ‘green on brown’, 95% in terms of weeds among crops, and 90% among different species of weed. “The quicker the work rate, the lower accuracy would be, and if a spray goes next to a weed rather than onto it, then the point of spraying has been missed. This means that half of our R&D goes into detection and the other half goes into optimising machine positioning so the nozzle is accurately positioned for the spray to hit the target,” says Damien.

Water and spray liquid are supplied by two front mounted tanks, a 300-litre mixer tank and a 600-litre clean water tank. “One of the main issues with spot spraying is that you can’t know exactly how much product you’ll consume, so the Ara has been designed this way to allow for in-field mixing so that operators aren’t left with excess diluted product at the end.”

At present, the firm is largely focused on vegetables, sugar beet and oilseed rape, but the aim is to have technology capable of working in the widest array of crops on the market, he says.

Ecorobotix showcased its machine at last year’s Agritechnica and came to LAMMA for the first time in January, says Damien. “These shows were the first time we haven’t had to explain spot spraying, which just goes to show how knowledge is expanding and the benefits of this technology are being realised.”

The Ara is commercially available and has been sold in 18 countries in total, with up to 20 machines already operational in the UK. The sprayer is so in-demand that Ecorobotix is sold out year-after-year, with most being used on onions and carrots.



Swiss firm, Ecorobotix is taking precision spot spraying to the next level with the inception of its ultra-high precision Ara sprayer.



The Ara consists of three 2m wide enclosed compartments, totalling 6m in width which can be folded to 2.8m for road transport.



The Ara’s internal boom features nozzles spaced 4cm apart (a total of 156) which can spray to 6x6cm.

application rate and field size into the filling area computer or in-cab ISOBUS terminal, Knight's Fluid Control Pro technology calculates volume required for a task and automatically manages filling. Active-Rinse, meanwhile, adds a high-flow pump in the clean water system, automatically filling its tank and providing pressurised clean water at the induction hopper for rinsing containers.

With a live induction hopper, booms fed at multiple points to ensure even spray-line pressure, and continuous movement of fluid throughout the machine, Knight's MAXImizer PRO fluid control system enables the sprayer's low volume plumbing to be primed before spraying begins. It also allows for full circulation, automatic agitation and instant nozzle response/switching. The system also means clean water line purging is similarly instant.

Vario-Select nozzle automation uses combinations of four different capacity nozzles on each body to provide up to 16 application rates of up to 400 l/min, and in conjunction with a prescription map can enable variable-rate application. It allows the operator to select required application rate and droplet size, minimum/maximum



*To manage droplet size more effectively on Kuhn's Metris 2 trailed sprayers, Autospray pulse width modulation (PWM) offers continuous high-pressure circulation to enable precise operation with each nozzle.*

pressures and working speed range, and then selects the best nozzles for the task. Nozzle options include conventional single, triplet and quin nozzles, and pulse width modulation (PWM).

Also governed by Vario-Select is Curve-Control turn compensation, using gyroscope measurement for instant switching between nozzle types to ensure the correct rates at inner and outer nozzles during turns. Meanwhile, Knight's 4D Active Boom Control features independent wing control with positive and negative movement to automatically follow ground

contours and maintain boom/nozzle height consistency.

## Kuhn

Kuhn's Autospray smart technology on its trailed sprayers is designed to help operators increase efficiency in the field and maintain accuracy during changing weather conditions. The company is also still in the testing phase for its spot spraying system, I-Spray.

To manage droplet size more effectively on Kuhn's Metris 2 trailed sprayers, Autospray PWM offers continuous ▶

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*Knight's MAXimizer PRO fluid control system enables the sprayer's low volume plumbing to be primed before spraying begins.*

► high-pressure circulation to enable precise operation with each nozzle. This means operators have the flexibility to increase forward speed for greater output, or react to changing weather conditions, as Autospray circulation should ensure consistent output regardless of the changes.

Autospray PWM controls nozzle openings through a series of micro-pulses to maintain a constant pressure irrespective of the required rate. The system activates pulses up to 20 times a second to apply fine, medium, or coarse droplets as set by the operator to control spray pattern and reduce drift. By keeping the droplet size constant, the Autospray system offers users a wider range of speeds without having a detrimental effect on spraying quality.

Operators using Autospray can apply



*Kuhn has continued to test and develop its spot spraying system – I-Spray with both 'green on brown' and 'green on green' weed detection possible, offering up to 95% savings in chemical products.*

liquid at variable application rates in accordance with prescription maps, with the sprayer varying the dose, but maintaining the required droplet size.

Kuhn has continued to test and develop its spot spraying system – I-Spray. During recent field tests and agronomic trials, the concept has extended its range of applications with new sensors and a higher level of integration.

Both 'green on brown' and 'green on green' weed detection is possible, offering up to 95% savings in chemical products compared with conventional blanket applications. The trials have also included a fail-safe approach, with a lower application rate being applied across the whole field and, when a sensor detects a target weed, it signals to increase the rate on the corresponding nozzle. This allows chemical savings to still be achieved and peace of mind is offered to the grower. Further testing will involve measurements of crop biomass to allow targeted and variable applications of fungicides, growth regulators, and even nitrogen.

The system has new compact and lighter sensors, which are fitted to the boom. Coupled to this is the latest generation of artificial intelligence which constantly monitors the crop, in a self-learning mode, to detect weeds with greater accuracy and avoid systemic application leading to herbicide resistance.

The system will be integrated on Kuhn booms and operate through Isobus or Kuhn's CCI screens, while the MyKuhn digital platform can store field maps for ease of use. Although it's still in testing, Kuhn says it still plans to bring the product to the market, but only once it's confident the farmer will be able to use the technology to its full potential. ■

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