

# Precision performance

“ The goal is to provide a system that protects nature while helping growers reduce the usage of herbicides. ”

## Machinery Sprayers

The need for greater precision is driving innovation in sprayer design. CPM takes a look at some of the most recent launches.

By Charlotte Cunningham

**Sustainable crop protection, in terms of both products and application, is somewhat of a buzz phrase at the moment, with a drive right across the industry to farm more with the environment in mind.**

And with the Agriculture Act slowly taking effect, it looks increasingly likely that reducing the environmental impact of operations is going to be key.

At the business end of crop protection application is the kit, and thankfully today's sprayers are more efficient and precise than ever before.

So what's new?

### Mazzotti/John Deere

Fully owned subsidiary of John Deere, Mazzotti, is updating and extending its range of MAF self-propelled sprayers or 2021.

For 2021 the existing MAF 2580 (2500-litre capacity), 3180 (3000-litre) and 3580 (3500-litre) models will feature multiple upgrades, including a new solution system, an increased range of spray booms, John Deere spray controls and a new Deere-sourced operator station.

The MAF range will also see the addition of a new compact high-capacity machine, the MAF 4080.

This features a chassis with a longer wheelbase to enable the larger 4000-litre solution tank to be carried, while maintaining the ideal 50/50 weight distribution achieved by the smaller MAF models, says the firm.

All four models are powered by a 175hp four-cylinder Tier 5 John Deere engine, which is claimed to offer users quiet operation, high productivity, and fuel efficiency.

The MAF 2580 and 3180 machines feature a standard 40km/h hydrostatic transmission, with the option to specify a high-performance system incorporating engine and transmission management with either 40 or 50km/h transport speeds.

This 'high-performance' transmission is fitted as standard to the larger MAF 3580 and 4080 models.

Alternatively, mechanical drive can be specified with the Mc variants, which offer a joystick-controlled, infinitely variable hydro-mechanical transmission. "Utilising mechanical axles to transmit more power to the ground, the Mc versions provide higher traction, superior hill-climbing ability and more efficient road transport," says John Deere crop care specialist Mark James.

The steering system, featuring selectable two-wheel, four-wheel or crab steering modes, has been upgraded and now features automatic alignment when switching between the modes.

Steering power is also improved, offering the ability to fit wider, large diameter tyres. Four-wheel steering is now automatically

disabled at speeds above 14km/h, and a mechanical locking device is fitted, which improves safety by preventing rear-axle steering movement when in transport mode.

A new range of MK spray booms from 24 to 36m wide, including a triple-fold 36/24m version, are also now available for the 2021 Mazzotti MAF sprayers.

### Amazone

2021 sees a plethora of changes to the Amazone sprayer range. The UF 01 is taking a back seat and for this year is offered only as a 900-litre or 1200-litre tank, in boom widths up to 24m. The control options are either AmaSpray+ or ISOBUS and there is a limited options list.

According to Amazone, these new entry-level sprayers feature all of the old performance, but just at a reduced price.

The expanded UF 02 range is now in ▶



*The combination of nozzle choice and adjuvant is a cheap and simple solution that growers cannot afford to ignore, says Jonathan Cahalin.*

A green Fendt tractor is pulling a long, multi-sectioned spray boom across a lush green field. The tractor is positioned in the middle ground, and the spray boom extends from the foreground towards the tractor. The background shows a clear blue sky and a line of trees in the distance.

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Mazzotti is updating and extending its range of MAF self-propelled sprayers for 2021.

► 1000, 1300, 1600 and 2000-litre tank sizes with the option of expanding this to a further 1500 litres on the front that utilises the patented, all-new FlowControl+ giving full automatic control of the tank mix, weight distribution and cleaning. The UF 02 now features also the choice of AmaSpray+ or ISOBUS. Individual nozzle control is provided by AmaSwitch.

The UX trailed sprayer range has also grown and the new UX 5200 Special comes with an uprated 380 l/min pump to give high water rates and forward speeds as well as sufficient agitation for the increased capacity, whereas the UX 01 Super features boom height control and damping second to none with the height automated set depending on the nozzle spacing selected from the cab.

Finally, the 4500-litre, self-propelled Pantera 4503

comes also with ContourControl boom height control and SwingStop for maximising nozzle effectiveness, says Amazone's Simon Brown. "Both the Pantera and UX come with the option of AmaSelect for automated nozzle selection to control droplet size, variable nozzle spacing for band spraying as well as individual nozzle control. These features AmaSelect Spot, CurveControl and Row are now within the software for increased chemical saving across a wide range of applications in both cereals and specialist row crops."

### Horsch

Horsch has announced its PrecisionSpray pulse nozzle system is now available on all new Leeb PT self-propelled and Leeb LT and GS trailed sprayers.

According to the firm, PrecisionSpray is one of the first to integrate the technology completely into Horsch's sprayer



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software without requiring third-party controllers, making it easier to use.

PrecisionSpray uses the latest generation pulse width modulation nozzle controls to ensure spray volumes are consistent across the field despite variations in sprayer speed or changes in boom speed when turning.

As a sprayer turns the speed of the boom across the ground is dramatically faster on the outside than the inside, and effect increased as the boom widths get greater. PrecisionSpray's curve compensation alters the spray volume proportionally across the

boom length to ensure the same volume of spray/m<sup>2</sup> from the inside to the outside of the turn.

In addition to curve compensation, PrecisionSpray offers stepless adaption of the volume flow at constant pressure and drop size and is able to adapt the application rate without changing the spray characteristics.

## Kuhn

Kuhn has introduced an automatic steering-axle system as an option on its Metris 2 and Oceanis 2 trailed sprayers to enable more precise driving and reduce crop damage when spraying.

Fitting a machine with steering-axle technology is usually a time-consuming task, with brackets to make and the linkage to attach to the rear of the tractor. However, the Track Assist system simplifies the process by replacing the mechanical connection with a gyroscopic sensor, which is simply fixed to the rear of the tractor with a magnet.

The gyroscopic sensors detect the steering angle of the tractor and the sprayer follows the tractor's trajectory.

Track Assist has a wide operating angle of 23o — 28o on the Oceanis 2 — and also activates across a wide forward speed



*Kuhn has introduced an automatic steering-axle system as an option on its Metris 2 and Oceanis 2 trailed sprayers.*

range, from 2km/h up to 22km/h, to ensure effective working at the headlands and safety when in transport mode.

The Track Assist system also has the capabilities to realign the sprayer with the tractor when reversing, to increase the ease of manoeuvrability.

## Nozzle options

As well as choosing the right sprayer for the job, appropriate nozzle selection is also essential for precise, effective spray, says Agrovista's technical manager Mark Hemmant.

And from a weed-control perspective, ►

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► choosing appropriate nozzles and setting them up correctly are vital to achieve the correct spray pattern and quality, particularly when grass weeds are small and difficult to hit.

"We need to ensure as much of the active ingredient as possible reaches the target," says Mark. "Grassweeds are extremely competitive and some, notably blackgrass, have become increasingly difficult to control."

Here, nozzle angle is key, and Agrovista trials have consistently shown that alternate angling of nozzles forward 30° and straight down has produced significant improvement in control over the conventional vertical

set-up, when using flat fan nozzles applying 100 l/ha to create a medium spray quality.

"These are the parameters we would recommend," says Mark. "We would also advise using blue 80-03s in the forward-facing position and blue 110-03s vertically to achieve the best droplet size and spray pattern."

"Angling nozzles in this way improves efficacy by breaking up the spray sheet to reduce drift overall, but increasing droplet movement at the target level which applies more active ingredient to the leaf. This is a particular advantage when you're faced with a small grassweed with upright leaves."

Where drift is a concern, Lok-it can be

added at 0.25% by volume, says Mark. "The product can also enable increased forward speeds of up to 14km/h in the right conditions as long as booms are stable."

Lilac 025 nozzles can be used to produce a finer spray quality if necessary, and would be the nozzle of choice with twin lines, using forward-facing nozzles on the front line and vertically mounted ones on the back.

The combination of nozzle choice and adjuvant is a cheap and simple solution and a valuable addition to the armoury, says Jonathan Cahalin, Agrovista's head of arable in Scotland.

"There are no magic bullets when it comes to grassweed control, so anything

## Could new research influence strategy?

Weed control goes beyond just having a decent sprayer, and new research from Rothamsted has highlighted the importance of incorporating cultural controls alongside efficient products and machinery.

The study showed that crops are now more vulnerable to weeds than before the advent of herbicides, with researchers saying that weeds pose an unprecedented threat to food security.

Using data from the world's longest running experiment, the Rothamsted Broadbalk wheat trial in Herts, the researchers found that, on plots where herbicides have never been used, yield losses to weeds have been consistently increasing since the 1960s.

Less than a third of the harvest was lost to weeds in the first ten years of the dataset, but between 2005-2014, this had risen to more than half.

The team from Rothamsted Research who carried out the study, say this is due to weeds doing better than crops in a warming climate, coupled with a shift towards shorter crop varieties that get shaded out by the taller weeds.

And just like crops, many weed species have also benefited over this period from increased use of nitrogen fertilisers.

In addition, more than half a century of consistent chemical spraying has also led to the rise of herbicide resistant weeds, threatening our ability to protect the gains in crop productivity achieved since the 1960s.

"Reducing yield losses from weeds is increasingly challenging because of the evolution of herbicide resistance and we can no longer rely on herbicides alone to counter the increasing threat from weeds," says lead author, Dr Jonathan Storkey.

"If we compare yield lost to weeds in the first ten years of the dataset, weeds 'robbed' on average 32% of the yield compared with 54% in the last ten years of data.

"Our results demonstrate that weeds now represent a greater inherent threat to crop production than before the advent of herbicides and integrated, sustainable solutions to weed management are urgently needed to protect the high yield potential of modern crop varieties."

Alongside the ever-increasing losses to weeds, the analysis of data showed that weeds also reduced wheat yields proportionally more on plots with higher rates of nitrogen fertiliser.

On comparable plots where weeds were controlled with chemicals, higher wheat yields were achieved when more nitrogen fertiliser was added — meaning that herbicides are most beneficial on the highest yielding wheat fields.

Modern crop varieties with high fertiliser inputs are, therefore, more vulnerable to higher yield losses if herbicide resistance becomes a greater problem, he warns.

The Broadbalk winter wheat trials were established in 1843 to contrast different amounts and combinations of inorganic fertilisers compared with farmyard manure on wheat yields.

Since the mid-1960s, some plots have had herbicides applied and some haven't.

The team looked at data from 1969 onwards — around the start of the so-called 'Green Revolution' when higher yielding wheat cultivars, and increased nitrogen fertiliser use became the norm worldwide.

However, as their data clearly demonstrates, these increased global yields were only made possible with a concurrent increase in the use of pesticides.

A total of 41 weed species were recorded in the plots, with farmers' main nemesis blackgrass being ever present — and especially abundant on plots with high fertiliser rates.

In addition to the rise of herbicide resistance, the adoption of shorter crop varieties — favoured for putting more nutrients into the grain and not the stem — has also led to increased yield losses



*New research from Rothamsted has shown that crops are now more vulnerable to weeds than before the advent of herbicides.*

as the diminutive plants are often out-competed by much taller weeds.

As a result, Jonathan says going forward it's likely that plant breeders will consider traits that reduce yield losses from weeds as well as those that optimise yield potential.

The final factor responsible for the increase in weed pressure is climate change. Between 1969 and 2014, average air temperatures measured at the meteorological site local to the Broadbalk experiment have risen consistently.

Calculated over the main growing season for UK weeds, average temperatures have steadily increased and are now approximately 2°C higher than they were in 1969. As the growth of the weeds responds more to warming temperatures than the crop, this has given the weeds a competitive advantage.

"Management and climate change have combined over the past 45 years to increase the threat from weeds," adds Jonathan. "If we could no longer rely on herbicides, it could be argued that, in terms of weed pressure, the situation is now worse than before their widespread introduction in the 1960s."

"Our results highlight the need to diversify weed control strategies by complementing herbicides with non-chemical options including increasing crop competition and disrupting weed life cycles using fallows or more diverse cropping rotations."

we can do to improve control has to be worthwhile.

"It's not expensive to ensure the nozzle set-up is correct, especially when you consider the paybacks that can be

achieved. Every extra percent of control is critical, particularly with blackgrass, and this is a really practical way of improving performance.

"On a more general note, given the wide

variety of tasks a sprayer has to perform, it's a good idea for operators to have more than one set of nozzles and replace them regularly to maximise efficacy and boost returns." ■

## French technology aids precision

Those of you on Twitter will have probably seen the video footage recently of Bilberry's Intelligent Spot Spraying System laden on sprayers, making its way across fields and flaunting its capabilities to pick out even the smallest of grassweeds.

And if you haven't seen it yet, it's definitely something to take another look at.

Bilberry is a French tech start-up founded in 2015 by Guillaume Jourdain, Hugo Serrat and Jules Beguerie.

According to the firm, its goal is to provide a system that protects nature while helping growers reduce the usage of herbicides, and the Intelligent Spot Spraying System does just that.

Today, the Bilberry technology is found on kit from manufacturers including Agrifac, Berthoud and Dammann.

"With the help of an array of cameras mounted directly on the sprayers and with well-trained weed recognition algorithms, our system is capable of identifying any specific weed in real

time before applying the appropriate herbicides with great precision," says the firm. "The deep learning software and the constant gathering of new field data from farms around the world, enables us to continuously improve the precision of our system and add new types of weed to the ever-growing library of our Intelligent Spot Spraying System."

Bilberry claims that the system reduces the usage of herbicide by more than 80% — and as a result, helps to protect the environment and significantly lower input costs.

"A camera network is embedded directly on the booms of the sprayer. The cameras are compatible with all sprayers on the market, regardless of size or brand. During weeding, an embedded computer, linked to the cameras, analyses the images of the field in real time and is capable of recognising an array of weed species present within crops."

The on-board computer controls the spraying in



*Bilberry's goal is to provide a system that protects nature while helping growers reduce the usage of herbicides (Photo: Bilberry.io)*

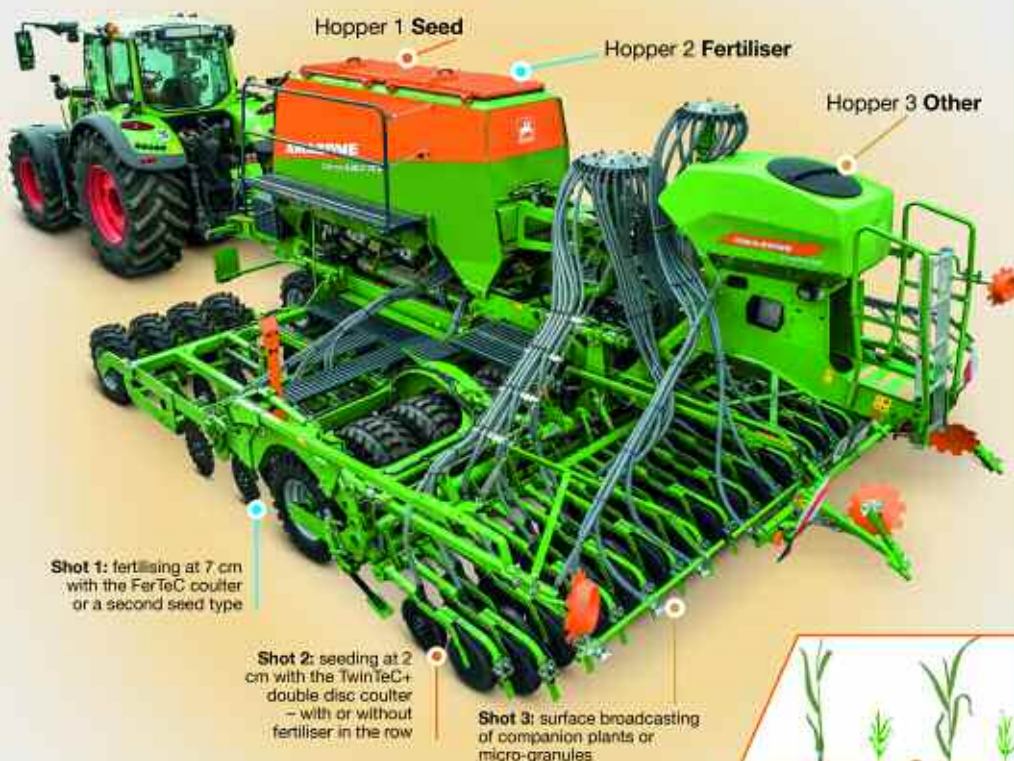
real time, in order to identify and only spray on the weeds. It can cut a section of nozzles or work one nozzle at a time.

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 management software.

The system works largely on green-on-brown applications — with a limited amount of green-on-green capabilities — though expanding this is currently in development.

# Feed your seed

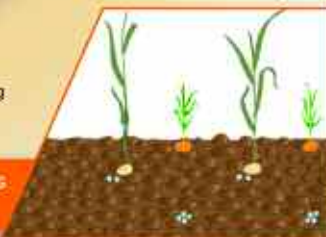
## Introducing the Amazone Triple-shoot system



**Shot 1:** fert[ilising] at 7 cm with the FerTeC couler or a second seed type

**Shot 2:** seeding at 2 cm with the Twin TeC+ double disc couler — with or without fertiliser in the row

**Shot 3:** surface broadcasting of companion plants or micro-granules



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Triple-shoot gives you the ability to sow two seed types along with fertiliser at three different placement depths.