A sustainable future

Drones

Being left behind is a frustrating situation to be in, and while many countries have adopted crop spraying with drones, the UK and the EU are yet to take this leap. *CPM* speaks to two firms that are advocating for the adoption of this technology.

By Melanie Jenkins

Back in November, *CPM* travelled to Hungary to see first-hand what relative newcomers to the UK, ABZ Innovation, is up to and how it hopes to help bring drone spraying to the UK.

ABZ Innovation believes drones will be part of the sustainable future of agriculture. "Agriculture is battling a number of challenges and multiple factors working against one another, meaning there's conflict between quality food production and climate change," says the firm's CEO, Karoly Ludvigh.

"How we're applying pesticides currently isn't sustainable and it won't work forever, we have to reduce what we're using," he states. "At ABZ Innovation, we believe drones will be able to solve some of these issues — that's not to say they'll replace heavy machinery, but there is a place for them alongside."

He admits that pesticides are required to grow enough food to feed the growing global population but says there's a question about how many litres of these products have to be used. "We believe that the use of drones is an interesting solution to help significantly reduce the amount of chemicals required."

One way he feels drones are a solution is through the use of controlled droplet application (CDA) systems. The majority of spraying equipment uses hydraulic application, providing droplet sizes of variable sizes. "The problem with this, is that the smaller droplet sizes of 60microns or less will evaporate rather than reach the plant," explains Karoly. "The second issue is that larger droplets can be too big and roll down leaves to the ground, resulting in waste and pollution. So in using hydraulic systems, about 50% of the chemistry is lost."

Even dispersal

"But in CDA — which is 50-year-old technology — it uses low pressure to drip water into a fast-rotating disc," he says. "Thanks to centrifugal force, small droplets are formed and dispersed evenly. This allows us to use less chemical and the system is virtually maintenance free — it has no nozzles so there's no way for the system to get clogged so long as particles in the tank are smaller than the diameter of the piping."

Anyone familiar with CDA might question how this can work in crop spraying because its basic principle means that it applies the droplets horizontally. "This is why it's not a commonly utilised technology, but on drones the advantage comes through their flight," explains Karoly. "The trajectory of the droplets is altered downwards by the propellors of the drone which provide strong downforce. A lot of drones are starting to adopt this technology, but many aren't optimising the airflow to create a uniform spray which is achieved through precise positioning of the propellors, rotors and arms."

Optimised airflow along with CDA has allowed ABZ Innovation drones to use around 50% less chemical and cut water use by 90% on average, compared with traditional sprayers, says Karoly. "An example of this improvement in efficiency was at a vineyard in Tokaj, Hungary, where not only were pesticides cut by 54% and water by 90%, but the system produced 82% less CO_2 and overall, the vineyards operating costs were reduced by 50%.

> *"Using a drone makes the data much more usable and means nothing is lost in translation."*

"Not only are drones able to significantly reduce chemical and water use, the system

ABZ Innovation drones operate a powertrain with four lithium polymer batteries and a charger, running one battery while two charge slowly to prolong their life, while a third cools.

can also be used directly after rain because ground travel isn't prohibited," he adds. "Legislation means that spraying can't be done in wind speeds of more than 5m per second, but our drones are theoretically able to spray safely in wind speeds of 7-8m per second if the speed and altitude of the drone is reduced. However, in terms of being able to fly safely, the drones can handle winds of up to 20m per second."

And through the use of multispectral and RGB cameras, the drones can collect health data on crops. "Using this information, we can upload a spot spraying plan to the drone and help to further increase the chance to cut usage. The drone will then automatically plan its route to the designated areas to spray," explains Karoly.

Spray pattern can be adjusted by altering speed, altitude and droplet size to avoid waste, with spray widths ranging from as low as 1.5m up to 6m on the firm's small drone, and up to 9m on its large drone. "If the user instructs the drone which type of crop is to be sprayed, it'll suggest which parameters to use and 95% of the time will undertake a spraying plan automatically, leaving operators to monitor it, refill the tank and replace its battery."

The small drone weighs 20kg and is capable of spraying around 50ha per day, while the large drone weighs 35kg, can spray 150-200ha per day, or around 10-15ha per hour, carrying up to 20kg.

Each drone operates a powertrain with four lithium polymer batteries and a charger, running one battery while two charge slowly to prolong their life and the remaining one cools after use. These can run from 200 up to 1000 cycles, depending on how they're used, says Karoly. "Up to 90% of the operating costs of drones is because of battery degradation, which is why we run four per drone, so that those not being used can charge slowly and so there's always a battery ready to use. If users require batteries quickly, a charge can take between 1-20 minutes, but charging slower will preserve battery life."

The drone's routes are automatically planned to ensure it returns to the base station before the battery runs out, but there are several measures in place to guarantee a safe landing should its charge become depleted. "If the battery hits 30%, it will automatically return to the base station, but at critical levels of 10% charge the drone will then steadily descend to a safe location."

ABZ Innovation currently sells its drones to users and provides support and training to pilots, but also offers a contracting service. It's also developing a 30-litre drone and aims to have a 50-litre version as well as offering a Lidar-based avoidance system.

But ABZ Innovation is facing one challenge known to all drone developers, overcoming the legislation surrounding spray application in the UK and EU. "We believe the market has tremendous potential, but the biggest obstacle is still legislation. We're working on obtaining licences to operate in the UK and there are lots of customers out there wanting to purchase drones for spraying but they're just waiting for it to be legal. We have a really efficient tool to help revolutionise agriculture, but the legislation isn't ready for it."

On home soil, the familiar faces of the Drone Ag team are continuing to develop and promote drone technology. "We're still pushing to change legislation as a company," says the firm's Edwin Nichols.

Drift trials

A consortium of industry representatives in the UK, which includes drone experts from around the world, and notably the USA, is undertaking drift trials in various countries and is in communication with the CRD, CAA and HSE to demonstrate that these studies are reputable, he explains.

"This year we're planning to conduct a few different trials in the UK, including with slug pelleting and also with glyphosate spraying, which means we're actually starting to use regulated chemicals to utilise drones to their full capacity."

These trials will be small to start with, but Edwin hopes that a trial may be used for regulated application within the UK. "We're pushing for this but things are still changing on a weekly basis. If we can demonstrate through publicity and filming that these systems aren't the danger many think they are, then this'll be a big win.

"Realistically, drone spraying is going to happen, and we have to start utilising

Propellors on the drone provide strong downforce, and when optimised, can create uniform spray patterns.

Karoly Ludvigh believes that the use of drones is an interesting solution to help significantly reduce the amount of chemicals required.

This year Drone Ag's planning to conduct a few different trials in the UK including glyphosate spraying, which means drones may soon be utilised to their full capacity.
Photo: Drone Ag Limited 2024.

technology and making agriculture more efficient."

Agri-tech is a notoriously tricky area to source investment into, but Drone Ag has undertaken a two-year project working with chemical manufacturers to test its drone on trial plots. With backing from Innovate UK, the business has edited part of its app so that it can work autonomously from a base station.

"The idea is that ag-chem and seed companies can position our base station at the side of their trial fields and we can then monitor these throughout the season," explains Edwin. "For example, there could be a field with 1000 different plots in, all with different treatments or seeds or crop types, and instead of sending people out into the field to do physical sampling and observations, we'll be able to do all of this automatically with our drone system."

Some of the base stations are due to be positioned on farm from April this year which will start the process of bringing the idea to market, says Edwin. "This is something different that hasn't really been done before in terms of drone technology."

The project came about through Drone Ag's work with agronomy firms who were already aware of, or were already using ▸

Drone Ag has undertaken a two-year project working with chemical manufacturers to test its drone on trial plots as a replacement for human observations. Photo: Drone Ag Limited 2024.

▸ Skippy Scout, which led to investment from ag-chem companies. "It's been quite a wild process as we hadn't realised how well the idea would sell, but every time we speak to companies at trade shows they're wanting to buy it now, they don't want to wait for it to become commercially available."

Consistency is key

Edwin believes this is likely because many firms are struggling to source seasonal staff to undertake trial plot analysis. "But the biggest issue a lot of these companies have with this type of R&D is that a person doing this work on a Monday morning is likely going to score something very differently to someone on a Friday afternoon. And equally, one person could score something very differently to another person.

"So you just can't get repeatable data, whereas with a drone, it'll score everything exactly the same and then you can really start to analyse data on a larger scale, even across multiple countries. Using a drone makes the data much more usable and means nothing is lost in translation."

Currently, there are two trial sites being assessed as potential hosts for base stations, but there are still many legislative hoops to jump through to make this happen. "We have to get the trials approved with the Civil Aviation Authority (CAA) because the aim is for this operation to be entirely autonomous, but at the moment, someone has to be within line of site of the drone. But we hope that in the future, no one will have to be in the field or on site while the drone operates, it'll just autonomously undertake its tasks."

Drone Ag is having to change some of its analysis to be more scientific as well as having to build specific artificial intelligence (AI) models for this system to operate. "Skippy already runs on AI models that were created a while ago now, so we're essentially going to revamp these for both our original Skippy and for the trial plots.

"Compared with when we started, we now have hundreds of thousands of images, from different countries, with varying sunlight, soil colours and textures, meaning we can build a much more robust AI system which takes in a larger date set."

The first step is to build the basics, which means just spotting the green plant, he explains. "We'll then move on to identifying minute detail, such as when plants are emerging, and this will progress onto segmentation of crop and weeds, plant counts, followed by disease identification and pest damage."

Drone Ag now has an in-house AI engineer focused on developing the system, and an android developer working on the flight side of things, and someone else working on the app. "On the machine learning and AI side of things — even down to precision landing and reading QR codes — there's a lot being developed."

"We're still right at the start of this project but once we're out on site we can start nailing down the specifics. It's a big project but the potential outcome from it is huge," adds Edwin.

While the firm continues to push the boundaries of drone capabilities, Drone Ag's flagship product, Skippy Scout, continues to expand and is now in 19 different countries, says Edwin. "It's starting to pick up traction in the US and Canada and we're also speaking to quite a few people in Australia and New Zealand which means we're reaching various different markets, and the bigger the field, the better the system works in terms of saving time and gathering data. ■ "