COULD ROBOTS BE THE FUTURE OF FARMING?

This driverless tractor concept developed by CNH Industrial provides a glimpse of the future of automated farming

From drones to automated tractors, advances in technology are changing the way we farm for the better

WORDS **BRENDON HOOPER**

What could a typical arable farm look like in 10 or 20 years' time? Imagine drones buzzing overhead surveying fields, automated machines working the soil and cultivating 'smart'-bred crops, while farmers use 'big data' to improve yields and increase productivity.

The exciting thing is that this vision could soon become commonplace. Right now, arable farming technology is advancing at a tremendous pace, helping farmers to reduce labour costs and improve productivity – which could prove vital if the supply of seasonal labour drops once the UK leaves the EU.

George Badger, Farming Consultant at Strutt & Parker, says we only have to look at the growing number of arable farmers already using precision technology to see the tech revolution taking place. He suggests around two-thirds of the arable farms in East Anglia use satellite-guided precision technology, which enables farmers to drive machinery in straight lines without overlapping during cultivating, drilling or spraying. Precision application means fertiliser, seed and sprays can be deposited exactly where they are needed most, rather than being spread uniformly across the whole field – helping to optimise yields, and reduce costs and environmental impacts.

'But what we're now seeing at the trial stage is driverless, automated machines, with no cabs,' says Badger. 'These are mainly prototypes but, in time, they could become standard equipment. The benefit is that when you take the man out of the machine, the equipment no longer needs to be so big and heavy, so it could work, satellite-guided, 24 hours a day. Moreover, as the machine becomes smaller, the soil suffers less compaction and degradation.'

Automated processes have the potential to radically change the farming industry, and trials focusing on the next big leap – where the farmer won't even need to go into the field – are already under way. For example, engineers at Harper Adams University's National Centre for Precision Farming are using robots to grow and harvest a hectare of cereal crops – all without setting foot into the field. The Hands Free Hectare project team recently assembled their first automated farming robot to drill a spring crop in March.

Project member Kit Franklin, an agricultural engineering lecturer at Harper Adams University, echoes Badger's opinion of field agricultural automation being an opportunity to reverse the trend of ever-increasing machine size, which he says is having a damaging impact on our soils. 'It's the future of farming,' he says. 'Automated swarms of small, light tractors and implements that perform high-resolution, precision farming could reduce compaction and increase the efficiency of input use, while maintaining current work rate and staffing levels.'

Franklin believes such technological advancements are not about putting people out of jobs, but instead evolving roles to make farming more efficient. So rather than a tractor driver needing to be in a tractor, their job will focus on being a fleet manager and agricultural analyst, looking after teams of farming robots that meticulously monitor crop development.

However, according to Franklin, once the technology becomes more readily available, the barriers to its adoption are twofold: legislative, because there is currently no legislation framework applicable to automated field systems; and a public perception of robots 'stealing' jobs. 'I foresee a large resistance from those who may have a negative, media-tainted view of robotics,' he says.

Nevertheless, if the UK is to boost productivity post-Brexit, it's going to need the benefits of automation to make farming more efficient and profitable. 'Of all arable farms, 67% still rely on the EU subsidy for profit on their agricultural activity. So, if this is reduced or cut completely, we will need automated processes to help reduce costs,' Badger states.

Bird's-eye view

The use of unmanned aerial vehicles (UAVs) – also known as drones – for monitoring crops, surveying weed populations and investigating drainage conditions, could also become an ordinary sight at farms of the future. 'Increasingly, the farms we see perform better are those that regularly monitor the fields themselves, to enable reactive decision-making and the best timing of applications,' says Badger. 'If you can cover vast areas with a drone, it would certainly increase efficiency. At present, drones aren't widely used, but they could become a standard piece of equipment in the future.'

A smart investment in drones is already paying dividends at the Trumpington Farm Company, one of Strutt & Parker's clients in Cambridgeshire. Trumpington began using drones last year after previously relying on satellite imagery to apply their variable-rate fertiliser, working out the leaf area index (biomass) of their crop from the infrared spectrum. However, says farm manager David Knott, they are now taking the next technological step. 'We've been using a drone to fly a predetermined path across our fields. With its 4K camera, we capture high- ➔

> A DRONE CAN COVER A FIELD IN THREE MINUTES, WHEREAS A PERSON TAKES AN HOUR

Agricultural automation has many guises, such as Wall-Ye, a robot designed to prune vines in France

resolution imagery, upload it and work out what the biomass of the crop is, and turn this into shapefiles [a common format for storing geographic information system (GIS) vector data] to know exactly where to apply variable rate fertiliser.'

This year, Knott and his team will test a new ability for the drone to differentiate between plant leaves, so that, for example, areas of blackgrass can be treated by an automatic sprayer, which will be 'told' by the drone exactly where to spray.

'It's a lot easier to fly a drone quickly over a field, rather than having an agronomist walk up and down each patch, or having a sprayer operator trying to guess which bits need spraying off,' says Knott. 'A drone can cover 20 hectares in three minutes, whereas a person would take an hour. It's improved accuracy, saved time and cut costs.'

Knott says the only downsides are the difficulties in managing large amounts of data, being unable to fly the drone in bad weather, and its batteries only allowing 20-minute flight times. 'UAV tech is revolutionising farming, but there is still a lot to consider.'

Bigger data

The ability to manage, analyse and share vast amounts of data will also become an essential part of a farmer's skillset, helping to save costs via the digital economy. Apps that are designed for saving time and maximising output price and minimising input price, such as Graindex and Yagro – both of which are being trialled by Strutt & Parker – will become just as indispensable as an expensive drone or automated sprayer.

'I wouldn't be surprised if supply chain logistics become largely automated,' says Jason Beedell, Partner in Research at Strutt & Parker. 'At present, large amounts of fertiliser are bought in advance and stored in barns, because they get a better price. Instead, "pre-ordering" to ship the physical product to a field exactly when it's needed could become more common.'

Sharing data and knowledge, especially through mobile technology, will also be crucial. For example, @AgriChatUK on Twitter shares information throughout the farming community, such as real-time warnings about pests and diseases. 'It's a forum where everyone can get together to improve farming knowledge, with no geographical barriers,' says founder Simon Haley. 'It can also be an antidote to the isolation rural workers sometimes feel – connecting people, sharing knowledge and improving the industry.'

But to achieve much of this, says Badger, a lot more needs to be done to connect rural businesses to faster broadband speeds. 'Poor connectivity is a barrier. In the coming years, we will rely on sharing "big data" from the farmer to the agronomist, so better real-time decisions about the future management of the crop can be made. Sharing knowledge and experience will be key.' ■

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DEVELOPMENTS IN SMART BREEDING

Dr Phil Howell leads the cereal pre-breeding programme at the National Institute of Agricultural Botany (NIAB). Speaking in a personal capacity, he thinks that, over the next two decades, climate change is going to dramatically affect how we approach agriculture.

'More extreme weather events mean we will need to develop crop varieties that are tolerant of both waterlogging and heat,' he says. 'We may also require a new resistance to pests and diseases that, at present, we don't think of as a problem.'

Central to this will be 'smart breeding' and the development of F1 hybrids – the selective breeding of a plant by cross-pollinating two different parent plants. 'These will benefit growers in terms of gross margin, due to increased yield and especially increased yield stability,' says Howell.

Although F1 hybrids might counteract some of the pressures from climate change, developments could be slow, warns Howell: 'Much of the public distrusts science, and politicians are too afraid to make unpopular choices.'

Photography: CNH Industrial; Getty