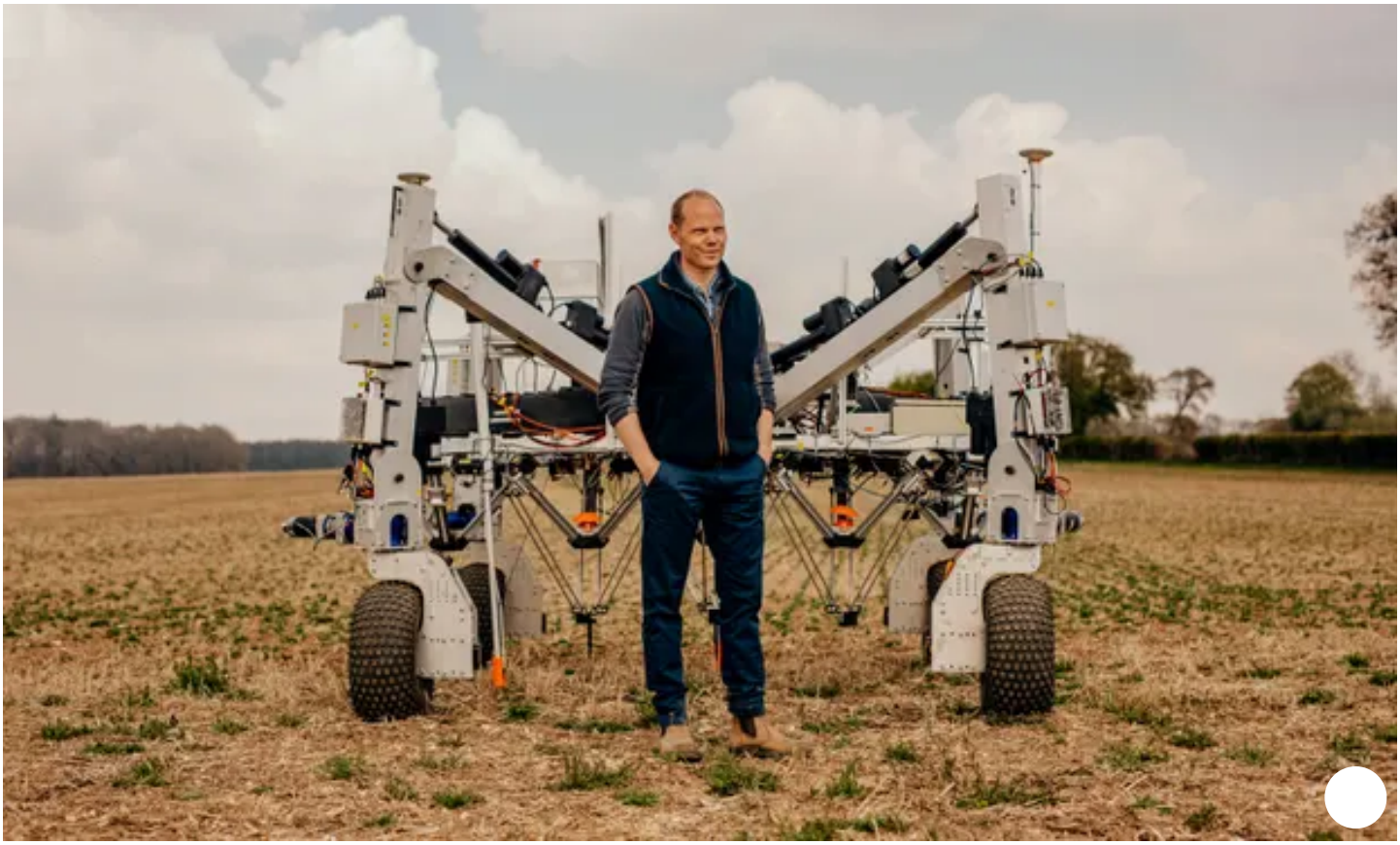

Farming

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Killer farm robot dispatches weeds with electric bolts

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In a sunny field in Hampshire, a killer robot is on the prowl. Once its artificial intelligence engine has locked on to its target, a black electrode descends and delivers an 8,000-volt blast. A crackle, a puff of smoke, and the target is dead - a weed, boiled alive from the inside.

It is part of a fourth agricultural revolution, its makers say, bringing automation and big data into farming to produce more while harming the environment less. Pressure to cut pesticide use and

increasing resistance to the chemicals meant killing weeds was the top priority for the farmers advising the robot company.

The killer robot, called Dick, is the world's first to target individual weeds in arable crops and, on its first public demonstration, it is destroying broad-leaved weeds identified using pattern recognition. A scout robot, called Tom, has already scanned the field in detail and passed the data to an AI engine called Wilma to plot the targets. Dick's onboard AI then ensures a bullseye hit.

Dick demonstrates its weedkilling electrode. Photograph: Peter Flude/The Guardian

Dick is powered by batteries from a Tesla and will begin field trials in October. For safety, the robots have laser sensors to detect obstructions and shut down into a hibernation mode if they encounter something unexpected. They also have big red off buttons on their sides.

Tom, the scout robot, is ready for commercial use, moving at a fast walking pace and delivering 6 terabytes of data a day to farmers,

who can use the data to pinpoint problems with their growing crops. LED lights mean the robots could work at night too.

“There have been times over the last four years when we thought this day would never actually happen,” said Ben Scott-Robinson, the CEO of the Small Robot Company (SRC). “It turns out that building robots that work in fields to any level of reliability or accuracy is tough.”

Scott-Robinson said his robots were part of a fourth industrial revolution, using technology to focus on accuracy, efficiency, and sustainability. “The way farming needs to be done is changing. It isn’t just about producing large quantities of food, it’s also about caring for what happens in the field.”

The robot does not need to kill every weed, he said, as some have benefits. Speedwell is enjoyed by bees and clover fixes nitrogen in the soil, for example. “Neither is a threat to crop growth, so we leave them alone,” he said.

“We are under constant pressure to use less pesticide but if we can’t do that we need something else,” said Tom Jewers, who has a 390-hectare (960-acre) arable farm in Suffolk and is advising SRC, which used his fields to train the robots. “This is as big [a change] as tractors were to horses.”

Hundreds of companies are developing systems to tend to plants individually, such as Blue River and Bilberry, with the aim of cutting pesticides and fertiliser use. Robots are already used to weed in horticulture, deploying a hoe around vegetables and fruit plants. But these cannot be used on continuous rows of wheat and barley.

Ben Scott-Robinson, the Small Robot Company CEO, with the scout robot, Tom, which scans the farm to identify targets for Dick. Photograph: Peter Flude/The Guardian

Dick is still a prototype, carrying weed-zapping technology developed by RootWave, and the expected cost to farmers is likely

to be near the high end of what they pay for pest control. But the price should fall as the system rolls out, Scott-Robinson said.

More development is needed, for example, in tuning the weedkilling bolts so that just enough power is used, thereby extending battery life, and enabling the robot to weed as it moves by maintaining the earth connection needed to complete the electrical circuit. Another project is taking on a moving target - slugs - by squirting deadly worms on them.

Craig Livingstone is farm manager for the Lockerley estate, where Dick's demonstration took place, and is concerned about blackgrass, the biggest threat to the UK's top crop, wheat. "It's costing the industry a fortune and resistance to herbicides is the number one problem," he said. "The robot offers us a real chance to stop using artificial inputs."

Jewers said identifying blackgrass is tough even for farmers. But the robot system can use six different wavelengths of light as a spectral fingerprint to spot the weed. "That is a huge step forward," he said.

The developers envisage many uses for their robots, even listening to the birds sing. The UK's post-Brexit subsidy system will focus on rewarding farmers for public goods such as increased wildlife, and the robots could provide the evidence needed for payment, said Livingstone.

How quickly farmers take up robots is an open question. One observer at the demonstration said: "It remains to be seen if farmers will believe in it and adopt it just yet. Farmers already have huge investments in their tractors and so might prefer technology that works with them."

Andrew Diprose, the CEO of RootWave, said: “We have a solution that allows you to weed your fields without chemicals, carbon emissions, tilling the soil and, at some point, without an operator. It really is the future, and it’ll take us a bit of time to get there. But we will get there.”

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