HOW IS TECH REVOLUTIONISING THE AGRICULTURAL SECTOR?

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High-tech is gaining ground in the age-old world of agriculture and agricultural innovations have gradually revolutionised work in the fields and on the farm in recent years.

Agricultural drones, robot weeders, connected farms, urban agriculture, new financing methods – all have developed within a new dynamic ecosystem, the Agritech. Tomorrow’s farmers could control their tractor from a distance or monitor their grazing sheep using a drone.

This Special Report, prepared by EURACTIV France, offers a brief overview of the various innovations that could assist the agricultural sector’s transition towards greener practices.
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‘Agri-tech’ spreading like wildfire across French farms

By Aline Robert | EURACTIV.fr / Translated by Daniel Eck

Technology can already be found everywhere on French farms, but the so-called “agri-tech” trend wants to push innovation even further. Two hundred fifty of France’s start-ups are already specialising in agriculture and working towards developing software, drones, robots, artificial intelligence and satellites.

Since the time of draft horses, which were still being used in the 1960s, high-tech has been making its way into European agriculture at a rapid pace. Yet, if horses are making a big comeback for certain farming activities, such as organic viticulture, it is still at a very small scale.

“Today we have almost autonomous tractors, which hardly need drivers anymore,” said Stéphane Marcel, head of digital technology at InVivo. Guidance technologies, the use of satellites to geo-locate operations, but also smartphones, software and even drones are now an integral part of the daily lives of farmers.

In France, agronomic research, which has always been widely supported by public authorities, has now shifted towards what is known as “agri-tech”.

Does it mean producing more with less? Better and closer to the customer? At a distance but without labour? Or even sustainably? But while the keyword is innovation, the motivations leading to ‘agri-tech’ are multiple.

The association ‘Ferme Digitale’, paradoxically located in the Paris suburbs, includes 45 projects which are attempting to establish digital technology on farms. Its objectives include the development of organic fertilisers, setting up marketplaces
to avoid Amazon, as well as creating decision-support software or even the participative financing platform, known as Miimosa.

In total, nearly 250 start-ups in France are focusing on the agricultural sector. On the cooperative side, the InVivo group, which brings together 3,000 companies, is also developing a more expansive range of tech products and services.

For example, the group’s Smag software covers 10 million hectares of France’s agricultural territory. The software gives farmers access to cross-referenced information on their smartphone, including about the weather, optimum spraying dates, seeds, fertilisation plans (addition of nitrogen) and regulatory compliance.

And the consumer who buys his/her baguette every day is unaware of the tech involved, though it is so omnipresent in his diet.

“In France, it is often complicated regulatory constraints that drive the use of software, whereas elsewhere, technologies are developed to optimise productivity,” said Stéphane Marcel.

Between respecting grassed strips or watercourses, farmers must keep records that can be computerised. Software is also very present in animal husbandry, mainly because of the complexity of veterinary management.

ALGORITHMS AND SATELLITES TO MONITOR WHAT IS HAPPENING IN THE FIELDS

High-tech is not only present at the developmental stage of the agricultural sector since the control of the entire Common Agricultural Policy (CAP) is also evolving thanks to the reinforcement of the algorithms. The €59 billion allocated to farmers is often subject to fraud, something the paying agencies are trying to reduce.

Aid is allocated according to specific criteria, which are also costs for the farmer, who has a potential interest in preserving certain information from the paying agency, as analysed by the OECD in its report on “Digital Opportunities in Agricultural Policies”. Satellite imagery may now offer an answer to this problem.

In partnership with the European Space Agency, two satellites, Sentinels 1 and 2, provide permanent and precise images of agricultural plots, with ultra-precise information which includes the type of crop and the exact size of the plots of land.

The technology is also able to analyse whether the land is fallow or not. The data is distributed in open source, which makes developers happy for the data-driven part of agriculture.

In terms of monitoring agricultural activity subject to the CAP, Italy, Spain and Belgium, in particular, are already using them to determine whether or not to grant area aid, which accounts for nearly 80% of the funding.

But this is an insufficient number of countries according to the European Court of Auditors, which deplores the fact that the Commission has not yet validated the methodologies of other EU member states wishing to use satellite data.
As farmers are urged to reduce their use of plant protection products (PPPs), they are forced to take on manual weeding, a tedious task for which manpower is hard to find. But could so-called ‘robot weeders’ provide a solution to this problem?

Before weedkillers were introduced to the agricultural sector, weeding used to be a mammoth task, which was done by hand. However, as the reduction in the use of pesticides has become a political priority and organic farming is developing across the board, the issue of weed control is back on the table.

Besides being tedious, weeding is also very labour-intensive.

“About a third of a market gardener’s working time is spent on weeding. And it’s very difficult to find labour,” explained Maët Le Lan, who leads the South Brittany’s market gardening experimental station and has been working for several years on improving the working conditions of farmers.

This means that weeding tasks are mainly carried out by market gardeners, many of whom suffer from musculoskeletal disorders.

IMPROVING WORKING CONDITIONS

Based on this observation, the company Naïo Technologie has launched the development of a robot weeder.

“The basic idea was based on discussions we had with farmers who

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Could robot weeders be the solution to France’s pesticide problem?

By Cécile Barbière | EURACTIV.fr / Translated by Daniel Eck
had great difficulty finding labour because of the drudgery of weeding” explained Gaëtan Séverac, robotics engineer and co-founder of Naïo Technologie.

Oz, the small electric robot which has been developed by Naïo Technologie over the past few years, can weave its way through the rows of vegetables thanks to its inbuilt GPS guidance system.

With the help of a camera and a laser, Oz locates its path between salads and tomato plants to avoid possible obstacles.

“The camera and the laser are used to differentiate between a weed and a salad and eliminate the right one” explained Gaëtan Séverac.

A hundred or so market gardeners have already equipped themselves, mainly in France, but also in other countries such as Belgium and the Netherlands.

“For more than 30 years, research projects have been carried out in the field of robotics and weeding or harvesting. But they were limited by cost and technology,” said the engineer.

Technological advances have now opened up a whole range of possibilities.

PROMISING SOLUTION

Yet, if the solution looks promising on paper, several obstacles stand in the way of Oz, as the technology is not yet fully developed.

“The robot makes mistakes when weeding. Sometimes if a weed is too high, it will go around it and damage the vegetable plants,” said Maët Le Lan, who has been experimenting with the robot for five years at the experimental station.

The idea is to test the robot’s different updates to be able to advise farmers in their investments, especially given the robot’s €25,000 cost. “We must be able to tell market gardeners whether it is worth investing or not” explained the manager.

Today, the robot’s performance varies according to the farm, the farmers’ appetite for technology, etc. But besides the cost and improvements to be made to Oz, the robot’s programming is also made more complicated by the wide variety of crops, including cabbages, turnips, salads, carrots, parsnips, of which are spaced out differently. Such information needs to be programmed on Oz’s route.

“Today, half of our customers are organic farmers. But in the wine growing business, we only have winegrowers who would like to switch to zero weed control,” Gaëtan Séverac explained.

These days, we are more expensive than chemical weed killers, so farmers who choose to use chemical weed killers are in a real effort to reduce the use of chemicals”.

ROBOTICS TO THE RESCUE OF WEED CONTROL

Besides Naïo Technologie creating the robot Oz and vine-weeding-robot Ted, other firms have also started to work on developing robotics to deal with weed management.

Touti Terre, an SME based in Haute-Savoie, has developed the Toutilo robot, which allows market gardeners to weed by hand, but in a far more ergonomic position.

As a result, the robot does not just reduce the working time devoted to weeding by about 20% but also makes the work less tiring.

Finally, other machines offer the use of ultra-precise weed killers.

This is the case of the Ecorobotix robot, which is more targeted at large cereal crops and allows a micro-dose of weed killer to be sprayed on the exact location of the weed.
Automation in the farming sector is playing an increasing role in improving the quality of both animal and farmers’ lives. Pascal Huger, a goat breeder in Thenay in the Loir-et-Cher region, talks to EURACTIV France about his choice to automate on his farm.

Huger has opted for maximal automation, a move that he says gives him more time to take better care of the animals.

Caring for a herd of 400 goats of the Saanen breed, Huger sells his milk to cheesemakers who produce cheese under the Protected Designation of Origin (PDO) not far from his home. He wants to save time so he can look after his goats.

“Robots may seem inhuman, but they actually give me more time for my goats,” Huger said, highlighting that his priority is, and will always remain, the herd and its well-being.

AN ENTREPRENEURAL APPROACH

In order to guarantee optimum milk production, which meets the PDO’s strict specifications, the quality of the goats’ feed is the farmer’s primary concern.

“A good diet means good milk and hence a good cheese,” according to the farmer.

His goats produce the milk used for Selles-sur-Cher, Valençay, Sainte-Maure, Pouligny-Saint-Pierre, as well as the renowned Crottin de Chavignol.

In 2002, he bought the farm from his boss as a former farmworker and now employs one worker of his own. Although only two of them manage this huge herd, the Saanen breed is not

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only good at producing milk but also has a calm temperament.

And now, thanks to automation, the most tedious tasks are left to the machines.

While the bales of hay, green fodder and grass are distributed by the farmer along with the barn gates, feed supplements are managed by a computer and distributed by a robot, which makes it possible to “personalise” the process.

While the goats are divided into separate pens according to whether they are pregnant, nursing or not, the rams are also kept separate.

The robot dispenses exactly the right amount of feed supplements for each pen, according to the needs of the goats. This means that the breeder no longer has to prepare the mixtures by hand and carry heavy buckets, as the robot takes care of the mixtures and distribution.

CONTROLS AT ALL STAGES

Milking is also fully automated. Each goat is equipped with an electronic identification tag, which identifies the goat as soon as it enters its space on the rotary milking machine. Once the liners are installed on her udders, the milk is sent directly to the storage tank, and the milk checks are carried out automatically.

This avoids regular manual sampling that disturbs the animals and also allows a better yield.

Sensors in each “pulsometer” manage the milk flow and allow for the automatic removal of the liners when the flow slows down. Milk sensors record the production of each animal and an automatic feed dispenser adapts the ration to each goat according to its production.

All the information is accessible on a touch screen that signals the slightest anomaly during milking, allowing the farmer to intervene quickly at the first sign of trouble.

The data collected by the software allows thorough management of the herd, given that each goat is listed with its lactation number, the batch in which it is located, as well as its gestation and production history.

The data also includes information regarding the milk’s quality and the goat’s health, as well as a list of declarations and administrative procedures to fulfil when an animal gives birth or leaves for the slaughterhouse.

This information enables the farmer to decide the best time to rest a goat for its dry period (about two months) before putting it back into gestation, bearing in mind that the average lactation period is ten to 12 months.

A FARM THAT SWITCHES TO ENERGY-SAVING MODE

Another particularity of Huger’s operations is that he delivers his milk every day to a farmhouse cheese producer in the neighbouring village.

To avoid cooling his milk too much, he adds some serum in the evening so that it can start the fermentation process.

The temperature is thus lowered to 12°, instead of the 4° required for health reasons if the milk goes to the dairy.

Furthermore, its milk tank is equipped with a heat recuperator; the energy spent to cool the milk is recovered to heat the hot water, as well as for the insulation of the buildings which, together with ventilation, keeps the goats cooler inside in summer.
France is experimenting with drones as a means of spraying pesticides so that by 2021 it can launch the practice as it could lead to more precise treatments, as well as a reduction in the use of phytosanitary products.

In recent years, the use of agricultural drones has increased, especially as these can reach steep plots of land and spray phytosanitary treatments as close as possible to where the products are needed.

But could these unmanned aerial vehicles (UAVs) revolutionise the sector?

"With agricultural drones, we optimise spraying and can thus pay more attention to the number of products used," explained Mikaël Montagner of international drone manufacturer, Drone Volt.

With the latest sales figures for 2018 showing an alarming 21% increase in the use of pesticides, the French agricultural sector remains highly dependent on inputs despite France’s so-called ‘Ecophyto’ pesticide reduction plan striving to halve the use of these chemicals since 2008.

In other words, France is facing an unprecedented challenge in trying to reduce the use of phytosanitary products.

While spraying drones can be part of the panoply of new technologies to reduce the use of plant protection products, their development is still in its early stage.
And for good reason.

Until the French decided to launch an experiment on spraying drones in October 2019, the practice was banned as ‘aerial spraying’ was considered highly harmful to the environment. By October 2021, however, the experiment should make it possible to determine the benefits of using aerial spraying drones.

But for the time being, only farms that have agricultural plots “with a slope greater than or equal to 30%” can take part in the experiment. Besides, UAVs are only allowed to spray organically certified products or can be applied to plots of land that carry the so-called ‘high environmental value’ certification.

These agricultural drones, therefore, allow farmers to access areas that are difficult to reach with traditional farming tools, as well as to fine-tune the number of products used by targeting the parts of the land requiring treatment.

“The use of agricultural drones is of definite interest to plots of land with high added value, including in the viticulture sector or when there are particular slopes, such as those in Alsace,” explained Mikaël Montagner.

Besides the cost of the drone, which can amount to around €30,000, the spraying operation needs to be carried out by an experienced pilot. Weather conditions can also affect the use of the spraying drone. Using agricultural drones to spray pesticides, therefore, requires the mobilisation of plenty of resources.

Although the use of agricultural drones for spraying pesticides remains in its infancy, these UAVs can be used for other purposes.

So-called ‘plot mapping’, for example, took off in 2016 after drones were made available for civilian use in 2012. UAVs are, therefore, being used to identify nitrogen-deficient areas where crops have difficulties growing, so that drones can calculate the necessary nitrogen doses as precisely as possible.

Used in large-scale cereal crops, ‘plot mapping’ can improve the profitability of a farm by applying the right product to the right place at the right time, a task which proves to be quite the challenge for cereal growers who sometimes have to keep an eye on hundreds of hectares of crops.

COULD DRONES BE USED IN LIVESTOCK FARMING?

Another prospect for the agricultural drone is the surveillance of herds on livestock farms, which sometimes spread over many hectares of farmland.

“Drones equipped with a thermal or photographic camera can facilitate the monitoring and counting of animals,” Montagner added.
Sustainable rooftop-fish-farming conquers Brussels city heights

By Marion Candau | EURACTIV.fr / Translated by Daniel Eck

Europe’s largest urban farm, located on the rooftops of the EU capital, raises fish and grows vegetables while meeting strict circular economy criteria. The founder of BIGH (Building Integrated Greenhouses), Steven Beckers, says his urban farm plans to emulate his successful practice across the border.

It has been possible to eat sea bass from Brussels ever since Belgian architect Steven Beckers, a pioneer in urban agriculture, founded BIGH (Building Integrated Greenhouses) in 2015.

Covering an area of 4,000 square metres, Europe’s largest urban farm is located in the heart of Brussels, on the rooftops of the Foodmet, a food hall known as “the belly of Brussels”, which attracts more than 100,000 people every weekend.

“Having always had a vision of the city as a solution and not a problem, I’ve been investigating ways to make it productive,” said Beckers.

“As an architect, I also saw the potential of surrounding a building with a productive greenhouse whose plants regulate the climate and protect the occupants from extremes, while at the same time purifying the air of the CO2 it is burdened with,” Beckers added.

On the roofs of the Foodmet, the farm adopts a circular economy model by ensuring that nothing is lost and everything is re-purposed. The farm’s energy comes primarily from the

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energy lost by the building it overlooks and from solar panels.

“We recover the fatal energy from the Foodmet’s cold rooms using a heat pump. The pumps are powered by electricity from the site’s grid, which itself is largely powered by photovoltaics. So, we mainly use wasted energy, as well as green energy,” the founder added.

**AQUAPONICS**

But BIGH’s prowess lies in the fact that they are raising fish in the middle of the city and using their excrements to nurture the plants. The striped bass, native to South America, is raised in large ponds, in which biofilters treat its excreta to transform them into nitrites and then into nitrates, which are, in turn, used as nutrients for the tomatoes, eggplants and peppers in the greenhouse.

“The choice of striped bass is based on the fact that it is a quality sea fish, whose metabolism corresponds well to that of a closed system farm, by its gregarious nature and its habit of living in rivers and estuaries,” said the architect.

“Chefs appreciate it for its flesh, which is excellent, and its freshness, which lasts a few hours instead of the usual few weeks between the catch and the plate,” he added.

**AUTOMATED SLIDING GREENHOUSES**

Above the aquaponic cultivation is an automated high-tech greenhouse, where irrigation and light are finely distributed and controlled. On large sliding tables, several varieties of herbs grow in the surrounding heat, before being sent to stores or supermarkets.

The outdoor vegetable garden is used as a training ground for urban agriculture by attempting to socially and professionally reintegrate people who, via the Groot Eiland association, take care of the fruit and vegetables, transport them to the association’s restaurant and prepare them.

This cultivation without antibiotics, pesticides or synthetic fertilisers will soon cross the border to be emulated in France and – why not – elsewhere in Europe.

“We are planning several projects in Belgium and France, the opportunities are numerous, and we want to move forward step by step with a second project in the Hauts-de-France, and others in Paris and the surrounding area,” said Beckers.
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