

# IN WHAT WAY DO SENSORS facilitate weed control management?



**Benoît de Solan:** “To facilitate weed control, there is no need for a sensor to identify weed species.”

**Fitted to drones, robots or tractors, sensors, nowadays, help to distinguish weeds from cereal plants.**

**Benoît de Solan, sensor expert at ARVALIS, gives us his opinion on their place in weed control.**

## **Perspectives Agricoles: How do currently available sensors work?**

**Benoît de Solan:** The sensors most commonly used to monitor crops measure the way natural or artificial light is reflected. We can capture images with natural colour and even colour infrared. This information helps to distinguish the soil from the vegetation.

The sensor alone cannot recognise a weed from a cropped plant. The data it produces must be analysed using a classification algorithm. Besides colour, the position in relation to the row, as well as the plant shape are two other essential pieces of information taken into account for accurate weed detection, and even specific identification; for example, a plant growing outside the row, with a very jagged outline, is very unlikely to be a wheat seedling.

## **P. A.: How can sensors be used?**

**B. de S.:** Detection methods vary depending on the stage the crops have reached. The simplest case scenario is when the treatment occurs during the intercropping season, when all plants detected can be considered as weeds. Then, drone mapping seems to be the best solution; it also helps to estimate, before spreading, the amount of product required, and therefore minimises the amount of surplus solution at the bottom of the tank.

Detection after emergence in cereal crops is more difficult, because the plants are very small. At that stage, inter-row hoes guided by an optical detector are a valuable solution when conditions allow this type of soil cultivation. In that case, the sensor does not detect weeds but rows, and steers the hoe's tines to avoid damaging the crop.

At a more advanced stage, it is no longer possible to see rows. It is however possible to identify large perennials (thistles, cleavers...) among the crop, from their shape and colour. Drone mapping or direct detection using on-board sensors fitted to a tractor are then a possibility.

## **P. A.: How are they integrated into agricultural equipment?**

**B. de S.:** At the moment, there are few systems available to carry out precision weed control in cereal crops, other than hoes. However, for plants with a large inter-row (maize, vines), there are onboard weed detection systems fitted to tractors, such as the WeedSeeker, but they are more widely used in the United-States than in Europe. Tests are also ongoing using drones in situations presenting specific constraints, such as a requirement for high ground resolution and a very precise flight window.

Once weeds have been accurately identified, the last link in the weed control chain is the availability of agricultural machinery capable of precisely carrying out the required operation. Direct injection seems to be the ideal technical solution and complements those precision detection techniques, as it most accurately adjusts the volume of spray prepared and applied. It is still at an experimental stage and manufacturers are actively working on it.

Alternatively, weed control robots can be used to simultaneously manage weed detection and mechanical or chemical control. They have been tested for vegetable crops, but their use in arable crops is still subject to numerous technological and regulatory limitations.