

SmartSprayer joint project

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The smarter sprayer! Crop protection technology meets camera technology and expert knowledge

The joint SmartSprayer project from Bosch, xarvio TM and AMAZONE now makes it possible to automatically detect weeds in row crops in real time, using software based on economic thresholds to make an application decision and perform partial area application of the latest crop protection technology down to individual plant level. Savings potentials of between 20 and 60 % are possible, since spraying only takes place when required, according to the economic threshold principle.

Following the introduction of the UX AmaSpot trailed sprayer, which uses sensor systems to discriminate between weeds and soil and can treat individual weeds by spot applications that are part of a total herbicide treatment, the SmartSprayer is now the next development stage in the field of individual plant treatment. The UX AmaSpot can only discriminate between green and non-green and can therefore only be used during total herbicide treatments, while the SmartSprayer can detect weeds within row crops in a focused manner and can treat the individual plant. In contrast to the UX AmaSpot, this requires "green-in-green" detection, i.e. detection of weeds within the crop.

During each pass with the SmartSprayer, the whole field is photographed using the Bosch camera system installed on the AMAZONE booms. The images are processed and real-time decisions regarding application are made. The SmartSprayer can be connected to the xarvio TM FIELD MANAGER, an agricultural decision platform that connects users, consultants and digital experts. The field use is based on a data memory without network connection.

The application rate per nozzle can be adjusted very quickly and easily using the PWFM application technology of the SmartSprayer, which has already been used in the UX AmaSpot.

Weed detection by camera and artificial intelligence:

Bosch provides the camera sensors, controllers and the connectivity between the crop protection sprayer and the Cloud. The camera discriminates between crop plants and weeds using artificial intelligence. The active LED lighting ensures equally good detection rates during day and at night, so that darkness or shadows in

sunny conditions have no effect. One camera scans an area of 1.10 m and evaluations can be performed across 4 channels, i.e. on a 25 cm grid.

Application decision

The xarvio™ converts the weed density in real time to an application decision. The “Decision Engine” considers the crop, timing of the application and the field-specific strategy for the weed treatment. Application with modern crop protection technology AMAZONE translates the agricultural decision for optimised weed control into an accurate application. Pulse-width frequency modulation (PWFM) valves with SpotFan 40-03 nozzles at a 25 cm nozzle spacing facilitate maximum savings at normal working speeds up to 12 km/h.

AMAZONE PWFM valves make it possible to vary the opening times to the nearest milliseconds, so that the application rate of each nozzle can be independently determined using a specific frequency. The frequency determines the number of opening and closing movements per second. In order to achieve an even larger variation in the application rate, AMAZONE PWFM valves can also vary the frequency. Completely switching off individual valves at a spacing of just 25 cm facilitates absolutely accurate spot application, even on individual plants, and also allows for 25 cm part-width section control. The special SpotFan 40-03 nozzles have a spraying angle of just 40°, so that any overlap zones between two nozzles are minimised. Each individual nozzle applies a strip slightly wider than 25 cm to cover the relevant spot area with the maximum application rate. Resistance problems in the margins due to under-dosing are thus avoided.

The SmartSprayer is equipped with the PWFM nozzle technology and with normal application technology for full-width application, so that switching between spot application and normal full-width spraying is possible under certain conditions. Significant savings reduce the cost of production and protect the environment. Spot application, based on the economic threshold principle, combined with detection and analysis in real time allows for significant product savings and thus also cost savings. It is furthermore possible to reduce the time taken and increase the work rates. Product savings imply that one filling of the spraying tank can be used to treat a significantly larger area, so that the number of filling processes can also be reduced. Determining the economic thresholds in real time during operation saves further work time otherwise used for separate stock evaluation. This reduction in plant protection agents not only saves costs but also helps protect the environment.

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