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Joint research and development project improves herbicide treatment with high-performance sensors

Optical technologies & artificial intelligence: University of Hohenheim, Bosch, Amazonen-Werke, and BASF Digital Farming conducts research into high-performance sensors for smart herbicide treatment.

For efficient use of herbicides: A joint initiative has been launched by Bosch, BASF Digital Farming, Amazone, and the University of Hohenheim in the form of the HoPla project, will conduct research into the use of high-performance sensors for smart herbicide treatment. The aim is to investigate how optical technologies and artificial intelligence can assist with the targeted application of herbicides as a means of effective, agronomic weed control. The initiative is supported by the Federal Ministry of Education and Research (BMBF) as part of its program "Photonics for a digitally connected world – rapid optical control of dynamic processes". The project was started in September and is to run until August 2025.

The United Nations expects the world's population to cross the 9 billion barrier by 2050, which will necessitate an at least 70% increase in global food production. Farmers must face this challenge by utilizing the limited amount of available farmland as sustainably as possible, while also minimizing their use of resources. An important aspect of these efforts is the efficient use of herbicides, particularly to combat crop-reducing weeds, without endangering or reducing the farmers' yields.

In many parts of Europe, herbicides are still applied to entire fields. However, a more targeted treatment of undesired plants ensures much more efficient use of herbicides without affecting crop yields.

This targeted application is already possible today thanks to intelligent technologies such as smart spraying. While passing over the field, smart camera and software technology attached to the field sprayer differentiates between crop plants and weeds, thus ensuring that the herbicides are applied only where they are needed. This enables reliable detection of weeds in row crops, such as corn, sugar beets, and sunflowers, meaning that herbicide use can be reduced by up to 70 percent, depending on the field situation and weed pressure.

Holistic system solution with enhanced photonic sensors, automated data analysis, and interpretation

In their "HoPla" collaborative project, the experts from the fields of industry and research will work together to explore and enhance the photonic sensors, automated data analysis, and interpretation for needs-based crop protection as a holistic system solution. The aim is to improve the optical sensor system and processors so that the plants can be identified even faster than with current solutions when passed over with the field sprayer.

These advances will primarily be achieved by reducing the latency of real-time processing on the agricultural machinery and by applying new AI algorithms. Only then will it be possible to identify weeds in fine grains such as wheat and barley both efficiently and cost-effectively.

In addition, the new technology will massively lower the costs involved in the identification and targeted treatment of problematic weeds, which have a significant impact on the crop yields of farmers. As a result, the use of herbicides for such crops, which are particularly prevalent and important in German and European agriculture, can also be optimized significantly.

Joined expertise of specialized partners

Each of the partners is contributing their own individual expertise to the initiative. Bosch and the University of Hohenheim are working together to explore and further the development of the necessary sensors and AI software, while the current state of research is being expanded with the publication of scientific papers for this area. BASF Digital Farming is responsible for developing the digital agronomic decision logic based on its xarvio FIELD MANAGER crop optimization platform, which will help ensure the best and most efficient herbicide treatment. Finally, Amazone is looking into the integration of the sensor system into a field sprayer and the precise execution of the technology's application decision.

In the event of a successful outcome, the project results are to be introduced to the market directly via the products of the partners Bosch, BASF Digital Farming and Amazone, while the University of Hohenheim will focus on furthering research and education in the field of AI-assisted agricultural technology.

Background

Mobility Solutions

Mobility Solutions is the largest Bosch Group business sector. It generated sales of 45.3 billion euros in 2021, and thus contributed 58 percent of total sales from operations. This makes the Bosch Group one of the leading automotive suppliers. The Mobility Solutions business sector pursues a vision of mobility that is safe, sustainable, and exciting, and combines the group's expertise in the domains of personalization, automation, electrification, and connectivity. For its customers, the outcome is integrated mobility solutions. The business sector's main areas of activity are injection technology and powertrain peripherals for internal-combustion engines, diverse solutions for powertrain electrification, vehicle safety systems, driver-assistance and automated functions, technology for user-friendly infotainment as well as vehicle-to-vehicle and vehicle-to-infrastructure communication, repair-shop concepts, and technology and services for the automotive aftermarket. Bosch is synonymous with important automotive innovations, such as electronic engine management, the ESP anti-skid system, and common-rail diesel technology.

Bosch Group

The Bosch Group is a leading global supplier of technology and services. It employs roughly 402,600 associates worldwide (as of December 31, 2021). The company generated sales of 78.7 billion euros in 2021. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiary and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. With its more than 400 locations worldwide, the Bosch Group has been carbon neutral since the first quarter of 2020. The basis for the company's future growth is its innovative strength. At 128 locations across the globe, Bosch employs some 76,100 associates in research and development, of which more than 38,000 are software engineers.

AMAZONE

AMAZONEN-WERKE H. DREYER SE & Co. KG is based in Hasbergen-Gaste in Germany and manufactures agricultural and groundcare machinery. The owner-managed company employs around 2000 people at nine different production sites. The agricultural machinery range includes soil tillage implements, seed drills, fertiliser spreaders and crop protection equipment. SCHMOTZER Hacktechnik has been part of the AMAZONE Group since 2019. Based on these core competencies, AMAZONE is now the specialist for intelligent crop production in agriculture.

Universtiy of Hohenheim

The University of Hohenheim is the oldest university in Stuttgart. Founded in 1818 in response to devastating famines, the University of Hohenheim is not only engaged in intensive basic research, but has traditionally also been committed to developing innovative solutions to some of society's most pressing problems. Today, the University of Hohenheim is Germany's leading institution for agricultural research and food sciences, while also holding a strong and unique position in the fields of natural, social, business, economic, and communication sciences. The University is home to around 9000 students, who can choose from almost 40 different degree programs. A common focus of the research and teaching conducted in all disciplines is bioeconomy. Bioeconomy is a holistic concept for a sustainable economy of the future, with new products and new production processes using raw materials derived from plants, animals, or microorganisms.

xarvio® Digital Farming Solutions – a brand by BASF Digital Farming GmbH

xarvio® Digital Farming Solutions is at the forefront of the digital transformation of agriculture, optimizing crop production. xarvio® offers digital products, based on a global leading crop modelling platform. The technology delivers independent, field-zone-specific agronomic advice that enables farmers to produce their crops most efficiently and sustainably. The products - xarvio® SCOUTING, xarvio® FIELD MANAGER and xarvio® HEALTHY FIELDS are used by farmers in more than 100 countries worldwide. More than 99,000 farmers and consultants have signed-up for xarvio® FIELD MANAGER, setting-up a field area greater than 15 million hectares in 18 countries. xarvio® SCOUTING has been downloaded by more than 7 million users.

Press release

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Further information

- University of Hohenheim