Artificial intelligence in agriculture. Opava-based startup Ullmanna invented a smart weeding machine

Ullmanna, a family-owned agricultural startup in Opava, is developing a smart weeding machine that can increase production of organic foods. Using robotics and artificial intelligence, the machine distinguishes weeds from the cultivated crop and mechanically removes them. This enables farmers to grow crops over a larger area without increasing manual labour, while also helping to reduce the amount of utilised pesticides by at least 40%. The company’s founders, Martin Ullmann and his father-in-law, participated in CzechInvest’s CzechStarter programme with the aim of consulting with experts on issues in the areas of business development, intellectual property and law.

The use of pesticides in the Czech Republic has been declining in recent years and is below the European Union average. For example, 1.4% less pesticide was used in 2019 than in 2018, which saw a decline of 8.8% in comparison with 2017. According to the 2019 annual report on the fulfilment of the National Action Plan for the Safe Use of Pesticides in the Czech Republic, farmers are using more alternative products that are more environmentally friendly. Ullmanna’s NEWMAN machine works without chemical agents.

Client story: CzechInvest & Ullmanna

Martin Ullmann and his father-in-law, co-founders of the startup Ullmanna.
“Our smart weeding machine eliminates weeds in the bud, before they appear on the surface. It also recognises the crop that’s being cultivated and enables farmers to reduce the amount of utilised chemicals by at least 40% and organic growers to significantly expand production without increasing manual labour, which is basically the most expensive part of organic farming. In one hour, the machine can do as much work in the field as sixty people. It is intended for those who want to ecologically and inexpensively cultivate organic crops on large fields,” says Martin Ullmann, co-founder of the startup, adding: “On fifty hectares of organic sugar beet, for example, the profit per hectare is up to three times higher in comparison with conventional farming, even when taking the cost of the NEWMAN machine into account. Return on investment is achieved in roughly two years.”

The NEWMAN machine uses a common three-point hitch that can be attached to a tractor or other vehicle. For each row, the machine has a camera and a computer that controls the tines. Thanks to machine vision, the software evaluates the image from the camera and uses machine learning to distinguish the crop from weeds. By controlling the tines, it hoes the crop as a human would. The machine can be used for most root vegetables that are grown in rows, such as beets, as well as for cabbage, broccoli, cauliflower, corn, lettuce, basil, squash and melons. By collecting additional image data and using deep learning, NEWMAN can be continuously improved and new crops can also be added.

Low weight, precise crop recognition and no chemicals

The use of artificial intelligence enables many more options for using the machine that were not previously possible. Unlike the competition, the NEWMAN machine is able to distinguish between crops and weeds in different positions and sizes, even though they are very close together, as recognition works on the basis of the characteristics of the given plants. Weeds may be the same size as or even larger than the cultivated crop, so NEWMAN can also be used on sown crops such as sugar beet and cabbage. It can also weed different crops simultaneously and count the number of individual plants. The advantages of the NEWMAN machine include its low weight and low energy consumption, as well as the fact that it does not have to be constantly connected to the internet or guided by GPS. The twelve-row machine mechanically controls weeds without the use of chemicals, prevents water evaporation thanks to soil aeration and can weed up to forty hectares of organic sugar beet per day, for example.

Ullmanna & CzechInvest

“The establishment of our startup was aided by the Moravia-Silesia region’s Startup Voucher business-support programme, thanks to which we received CZK 500,000. We then registered in the Greenlight accelerator of the Technical University of Ostrava, where we even won the main prize in the Greenlight Startup Show. We subsequently received additional funding from various national and European calls,” says Ullmann, adding: “There came a point when our know-how was no longer enough.”
We needed expert assistance in the areas of intellectual property, business-plan development and legal services. Therefore, we turned to CzechInvest at the beginning of 2020."

The startup’s founders registered in the CzechStarter programme, in which they received mentoring services over a period of seven months. With the help of CzechInvest’s mentors, theirs was the only project from Central and Eastern Europe to receive a grant of more than CZK 10 million for product development. This was a European grant from the Horizon2020 family, specifically the AgROBOfood project, which has the aim of accelerating the digital transformation of agriculture by adopting robotic technologies. Mentors helped Martin Ullmann with submitting the grant application, preparing a presentation for the jury and adjusting the financial plan, as well as with subsequent project management of the grant project and marketing activities.

Martin also received advice on determining the necessary roles for the development of the MVP (minimum viable product, i.e. a product with the least possible functionality, but which is fully usable and makes it possible to quickly gain feedback from customers for further development) and defining jobs for the subsequent completion of the product, including predicted wage costs. “For some positions, CzechInvest’s mentor recommended verified contacts, with whom we immediately got in touch and with one of whom we are already successfully cooperating," Ullmann says, adding: “The mentors gave us suggestions on, for example, how to test our device and how to prepare different scenarios. We consulted on resilience solutions according to the IP standard (level of protection) and certification. Those are valuable and important pieces of advice for us.”

Within the CzechStarter programme, the startup’s founders were also put in contact with the law firm JŠK Law, which helped them with legal services. They dealt with a framework agreement on cooperation between Ullmann and the cooperating sole proprietors, as well as the preparation of a consortium agreement in English that defines the individual roles within the project, how and by whom it is managed, and the manner in which intellectual property is handled.

In addition to professional assistance, the startup also received support in the form of promotion. Ullmann placed second in the CzechInvest Startup Challenge 2020.

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– Martin Ullmann,
co-founder of the startup Ullmann

The team Ullmann that invent a smart weeding machine.
“Thanks to the CzechStarter programme, we gained the necessary know-how and we were pleased that people who are interested in our product started contacting us on their own,” Ullmann adds.

The startup is currently testing its machine with farmers on sugar beet fields in the Czech Republic, Austria, Poland and Slovakia, while also developing models for other crops such as cabbage, corn, lettuce and garlic. At the same time, it is already possible to see NEWMAN at various field demonstrations and Ullmanna is in talks with the initial customers regarding both purchasing the machine and possible cooperation on the development of additional products.