DRONES, DIGITALISATION AND ROBOTICS

The use of advanced machines and advanced cropping systems is required to meet the challenges of the future. Innovation spoke to Hans-Peter Schwarz, professor of viticultural equipment at Geisenheim University, who researches intriguing growing techniques that he also tests out on his farm near Gießen, which he runs as a sideline business.

Prof. Dr Schwarz, you are a farmer who holds a professorship of viticultural and horticultural equipment at Geisenheim University. Can you tell us how this came about?

My father ran what we call an "outpost farm" here in Germany, but it wasn't a viable option for me after I had finished my studies. It was by chance that I was offered a position at the Institute for Farm Machinery at Justus Liebig University (JLU) in Gießen, where I also did my Ph.D. In 2005, the University of Geisenheim offered me the professorship at their viticultural and horticultural equipment faculty. My family runs our farm as a sideline business.

As a professor, you have worked on many technical innovations and as a farmer you have been able to test out some of them on your own farm. Can you tell us about those innovations?

IWell, I changed our own farming system to ploughless minimum tillage and started experimenting with various drilling techniques. I was inspired to do so by my former colleague Dr Tebrügge, a co-founder of the GKB Society for Conservation Farming e.V. We often tested a number of prototype cultivators and implements on our farm, including systems that spread seeds into the standing crop, an approach that proved to be successful in oilseed rape.

Prof. Dr. Hans-Peter Schwarz on his farm in Hessen.

Can you tell us more about sowing into the standing crop?

This means you drill the main crop – in our case oilseed rape – into the standing crop (winter wheat) without doing any type of primary or secondary cultivation. This is a viable option for establishing oilseed rape in mountainous regions, for example, where the harvest commences rather late in the season. By sowing the next crop before the harvest, the new crop can become established early on.

So after the wheat had bloomed, we used the fertiliser spreader to spread oilseed rape in a mix with mineral fertiliser. The initial seed rate was only 8kg/ha to ensure that the seeds would have plenty of space to establish. At harvest/When we harvested the wheat, we chopped the straw and spread it onto the young oilseed rape plants, covering them with a thick mat of straw. At that time, the plants were in the

4-leaf stage and didn't suffer any damage from the combine. I should, however, also mention that in some patches the oilseed rape stand was too lush. This was due to the fact that we increased the seed rates from the initial low rate. Nevertheless, we were able to harvest 3,000-3,500kg of oilseed rape from every hectare without any tilling pass.

» THE GREATEST SUCCESS WAS CERTAINLY THE INTRODUCTION OF DRONES WHICH ARE USED IN MANY DIFFERENT WAYS TODAY.«

Prof. Dr. Schwarz

Why is this system relatively unknown among conventional farmers?

At the time, the common thinking was that fields had to be ploughed or at least cultivated. In addition, oilseed rape is not typically grown in regions where the harvest takes place rather late in the season. And there were also failures, whereby an entire crop was destroyed by the large mouse population. The reasons for this were twofold: on the one hand, the standing wheat protected the mice from predators, and, on the other hand, the mice were not disturbed by tillage equipment. This is why farmers did not adopt the system and the research programme was then discontinued.

What reasons support precision drilling in your opinion?

My son and one of his farmer colleagues are trialling various types of drilling techniques and drills - a precision drill, a universal drill and a hybrid drill. The precision drill has emerged as the winner in terms of overall costs. Another advantage is that it can also drill sugar beet and grain maize in our six-crop rotation, which makes it more productive for us. This technique is supported by genetics and lush varieties that require fewer amounts of seed. By placing the fertiliser granules under the seeds und in so doing loosening the soil, the oilseed rape is able to develop a straight vigorous taproot before the winter.

Drones, like this one from Agronator, can be used in a variety of ways.

What was your greatest success in your farm machinery trials?

The greatest success was certainly the introduction of drones which are used in many different ways today. They are deployed for releasing ichneumon flies in maize fields, for detecting biomass and pests and for monitoring nutrient and water supplies with the help of sensors. If equipped with thermal imaging cameras, they can be used to protect and rescue fawns during forage harvesting. They are also available with fertiliser and seed application technology which offers exciting solutions for sowing grass in greening areas. This service is already provided in the US. In this context, we might be looking at a revival of those pre-harvest drilling techniques. But the single most attractive use of drones is in the application of herbicides – both conventional and organic. Yet, as a first step, the EU has to come up with the necessary legislation and ordinances for this technology.

What kind of future do you perceive for arable farming and farming in general? What is your outlook for the future?

I see various paths into the future for arable farming. The first is a clear focus on digitilisation and Farming 4.0. This approach, however, requires systems that are very user friendly, as well as effective data security and data protection, of course. Legally approved data logging functions and the information that can be generated from these data will help us illustrate the flow of materials and also determine the CO_2 footprint of the product if necessary. Such features would make German and European products easier to promote and sell.

Another path into the future would be a more extensive way of farming in the EU and especially in Germany, which would, however,require the appropriate legislation. This route would take us to a point where innovation is no longer required and comes to a standstill. As a result, German farm equipment manufacturers would lose market shares in their international markets. If farming ceases to be a viable business both in terms of productivity and ecological precision, farmers will be less competitive, meaning subsidies and payment schemes would have to increase.

Finally, I can envisage the use of more autonomous machines, learning systems based on AI, robotics and renewable energies. Intelligent harvesters will harvest the fields autonomously and self-reliantly, boosting the quality of the crop and filling in for labour that will be even harder to find in the future/filling in for the inevitable labour shortage of the future. —

Thank you for the interview.