

## Outlook on the future of agriculture

# Agriculture 4.0 – ultramodern and without harmful plant protection products

**The demand for organic products is continuing to grow; at the same time nature is being preserved – so why not switch completely to organic farming? The answer is simple: because not everyone can afford it, and with current consumption patterns not everyone would get enough to eat. A cooperative project is researching an alternative path, an agricultural system that falls between conventional and organic farming and that could generate high yields without chemical synthetic pesticides.**



The NOcsPS project aims to develop an alternative method of farming that lies between conventional and organic production.  
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State-of-the-art high-tech processes have long since been part of agriculture: field robots, laboratory-optimised plants and the use of IT - also known as Agriculture 4.0 - are aimed at supplying the world's population with sufficient food, and ensuring that materials and energy are used in a way that fits satisfactorily into a bioeconomy. Conventional agriculture relies not only on optimised seed varieties but also on fertilisers and plant protection products to achieve this, which is not very popular with many consumers and harmful to nature and biodiversity.

Organic farming, as a counterpart to conventional farming, is more environmentally friendly as it massively reduces the quantity of mineral fertilisers and chemical synthetic plant protection products. This is well-received by consumers. The share of organic product sales in German food retailing is constantly rising; for example, in 2019 almost 12 billion euros were spent on organic food.<sup>1</sup> Although organic products are being offered by many discounters, their availability worldwide is limited to a very small, privileged group of people. Many people cannot afford the more expensive organic products, while many

others have no access to them at all.

## Natural food at affordable prices

A completely new agricultural system could be a good compromise that would provide sufficient food at affordable prices while protecting the environment: an alternative path that falls somewhere between conventional and organic farming, known as 'LaNdwirtschaft 4.0' (editor's note: Landwirtschaft is the German word for agriculture). Since June 2019, a cooperative project called LaNdwirtschaft 4.0 Ohne chemisch-synthetischen PflanzenSchutz (NOcsPS) (without chemical synthetic plant protection products) has been working on this possibility. It is coordinated by the University of Hohenheim and involves a total of 19 subprojects. The project also involves researchers from the Julius Kühn Institute in Quedlinburg and from the University of Göttingen. The research work is scheduled to last four and a half years and will receive BMBF funds totalling almost 5.3 million euros. In addition, the network is supported by a wide range of companies involved in areas such as production, processing and consulting.

"The project is expected to lead to a form of agriculture that uses the most modern automated and digitally networked technologies, while following biological principles", explains the research association spokesperson, Prof. Dr. Enno Bahrs, head of the Department of Farm Management at the University of Hohenheim. "The aim is to achieve high biomass yields with high-quality products and good soil fertility through the environmentally friendly use of mineral fertilisers. The resulting products

could then be available at prices somewhere between conventionally and organically produced products."

## Looking at modern agriculture from all angles



Prof. Dr. Enno Bahrs from the University of Hohenheim is coordinating the NOcsPS project  
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In the project, the scientists want to look at the new cultivation system from as many different angles as possible: at the plant, plot, field, farm and landscape levels, as well as from an ecological, economic and social perspective and in comparison with other cultivation systems. This takes into account the entire value chain, ranging from plant breeding, the management of resistance and harmful organisms to business management and social perception.



The scientists are looking at the novel cultivation system from a variety of perspectives ranging from the plant to the field and landscape levels.  
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The actual laboratory and field tests are manifold, and include vessel experiments as well as surveys and operational analyses. The current state of research takes different forms depending on the subproject: "The project is structured in such a way that not all working groups start at the same time," says Bahrs. "They are usually three-year projects within a four-year framework. For example, surveys on acceptance or implementation of the test set-up at the experimental stations - i.e. the conversion to NOcsPS cultivation systems - began last year, immediately after the project was initiated. Other subprojects such as pest control without chemical synthetic pesticides or the ecological comparison of the different cultivation systems will not begin until spring 2021. In the coordinating office, we are trying to bring together as many threads as possible and mediate between science and partners in practice. However, the individual institutes should be able to work as independently as possible."

## Smart farming replaces harmful plant protection products

The impact of the new cultivation system, which uses mineral fertilisers rather than chemical plant protection products, will be assessed during the course of the project. This assessment will include the effects on pests, weeds and yield, as well as the effects on pollinating insects and soil quality. A key aspect of this will be the use of the most modern digital, automated information technology methods - called smart farming – including artificial intelligence. Examples include weed control using automated and digitally supported hoeing techniques to replace chemical herbicides or similar methods for sowing techniques and applying fertiliser. "IT is one of our key partners," the professor reports. "Whether artificial intelligence is the approach that will be used in the end remains to be seen. As things stand at the moment, we cannot say with any certainty. But at any rate this is a goal we would like to achieve with our project."

Through its individual working groups and project partners, N out the ambitions of all the dimensions mentioned in the United Nations' Sustainable Development Goals (SDGs). These include 'Zero Hunger', 'Health and Well-being', 'Clean Water and Sanitation', 'Sustainable Consumption and Production', 'Climate Protection Measures' and 'Life on Land'. "Our alternative plant production system will bring together the two markets - conventional and organic - which have been very much separate until now, and develop a new agricultural system with high potential to adapt to future conditions," says Bahrs. "Our alternative plant production system can thus ensure the sustainable production of food and renewable resources. This is a major gain, especially in terms of the sustainability goals."



### Reference:

(1) Branchen-Report 2020 Bund Ökologische Lebensmittelwirtschaft:

Use of a camera-controlled hoe in a soybean field.  
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[https://www.boelw.de/fileadmin/user\\_upload/Dokumente/Zahlen\\_und\\_Fakten/Broschüre\\_2020/BÖLW\\_Branchenreport\\_2020\\_web.pdf](https://www.boelw.de/fileadmin/user_upload/Dokumente/Zahlen_und_Fakten/Broschüre_2020/BÖLW_Branchenreport_2020_web.pdf)

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## Article

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## Further information

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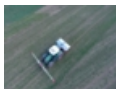
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► [LaNdwirtschaft 4.0 Ohne chemisch-synthetischen PflanzenSchutz \(NOcsPS\)](#)

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