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Challenges of Artificial Intelligence in Agriculture: Latvia Case

Prof. Dr.habil. oec. Baiba Rivza

President of Latvia Academy of Agricultural and Forestry Sciences

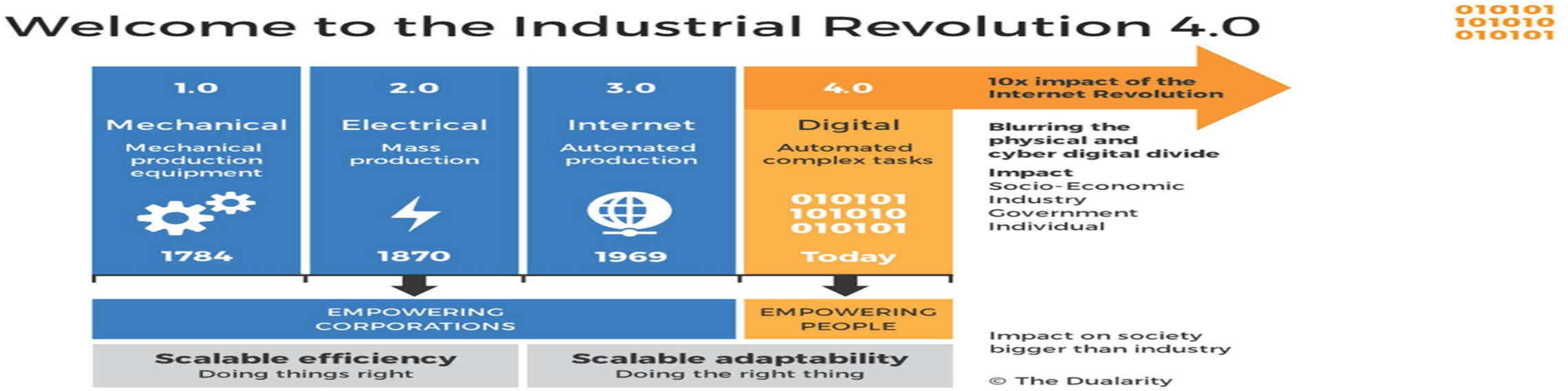
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New cycle of Industry 4.0

- **The new cycle of Industry 4.0 and digitalisation** affect the entire society – it means the **creation** of **new technologies**, software, and it also means the use of the technologies and the **development of a new type of labour force** and the training of it.
- This process has to be started **from the kindergarten** and, and it is very natural to continue integrating the knowledge of the new industrial cycle into education at **general and vocational schools and universities**.



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The challenges of smart farming

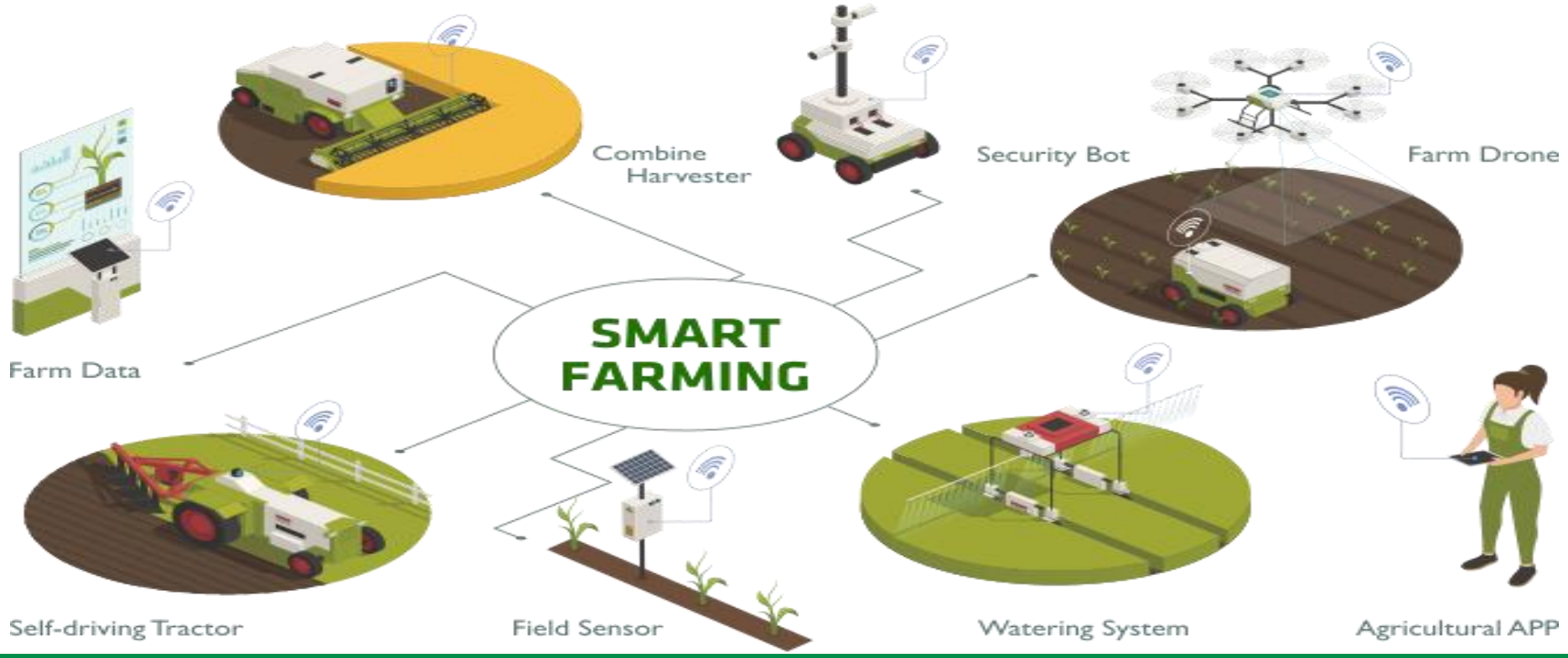
- The challenge for **all of us** is to **ensure climate and environmental sustainability**. **In agriculture**, this can be done with **precision farming and modern technology.** Precise agriculture, including increasing business efficiency, goes hand in hand with caring for **the environment**. We need to be aware that the latest technologies and artificial intelligence are rapidly entering our daily lives and **the agricultural sector is no exception**. We can already see that the **knowledge of Latvian farmers about precise agriculture and its application is growing.**



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Smart agriculture in Latvia

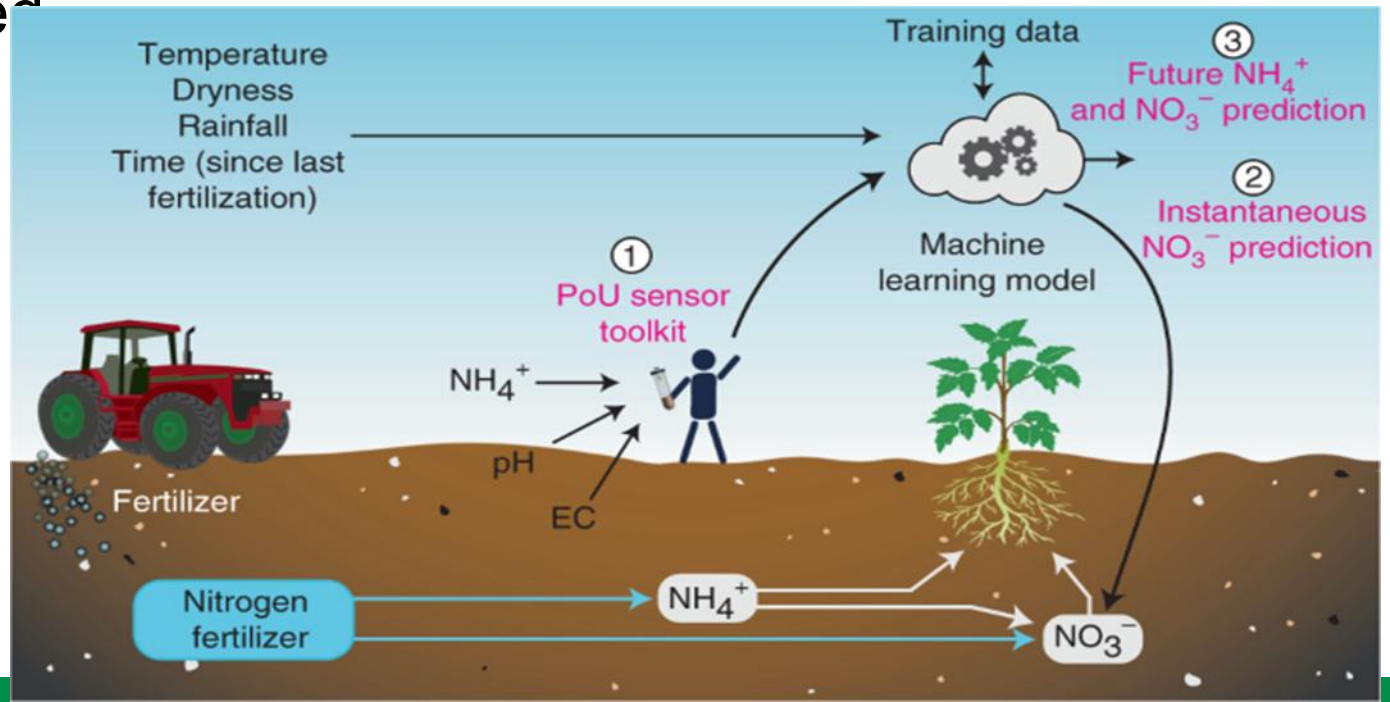
- Latvia's large farms, which use smart technologies, manage efficiently, make investments wisely and are based on data, saving the invested funds and trying to obtain the maximum yield level.
- Smaller farms are also offered financially sound solutions in precision agriculture.



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The nitrogen sensor

- **The nitrogen sensor** is the next level we recommend for farms with **300 ha** and more. Proper use of this sensor can **save nitrogen** in areas with low field potential and maximize yields in areas with high field potential, as well as produce higher quality grain.
- The nitrogen **sensor is easy to attach to the tractor**, connects to any ISOBUS display and is very easy to use - scan, enter a dose, select a strategy and get started.



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Smart farming for different farms

- Precision farming is a set of many solutions that can, of course, be used individually or as a complex solution, depending **on the size of the farm**.
- For farms starting **at 500 ha**, we estimate that all precision farming solutions are profitable, and the investment pays off in one or a few years.
- Small farms need to consider which investments to make and which not.
- It is less efficient to grow cereals on a small area, but it can be very efficient to grow **vegetables** using precise technologies.







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What are the benefits of precision farming solutions?

- The short answer is twice the profit!
- Because each kilogram of fertilizer or plant protection product does its job **1.5 to 4 times more efficiently**, because it is used at the right time and in the right dose.
- It is about the **efficiency** we get from the **raw materials** we use.
- There are many cases when we use **too little of a product**, such as phosphorus.

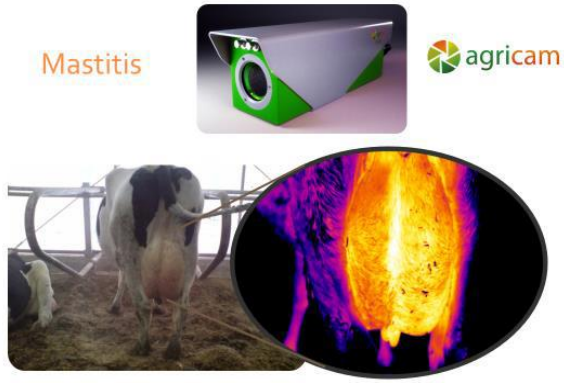
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Wireless sensor networks

- Wireless sensor networks are used in **agriculture**, as well as wireless sensors for **forestry** machinery.
- This allows precision farming technologies to be used: **field aerial photography, automated identification of fertiliser and plant protection chemical application rates, precision drainage and field levelling by using GPS data; precision livestock farming and poultry farming - microclimates in livestock buildings, animal marking, monitoring, automation of physiological processes and other advantages.**
- One of the hindering factors is the **cost of new technologies**. A discussion within a working group resulted in an opinion that modern technologies could be appropriate for farms sized at least **100 ha.**







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Data Driven Dairy Decisions for Farmers (4D4F)

4D4F
Data Driven Dairy Decisions for Farmers

•The USA and western European countries are the **leaders i**n the use of modern technologies, yet the first **sensors** in dairy farming were introduced on the LBTU research and training farm Vecauce before more than ten years.

•*The goal of 4D4F* was **to spread smart technologies**, incl. Information and knowledge of best practices regarding the use of various technologies.
•More than ten handbooks have been produced within the project.







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The importance of sensor technologies

- Sensor technologies are used in dairy farming to **electronically monitor livestock, their environment, and to collect real-time data to make more informed decisions, to improve the quality of farmers life.**



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E-commerce in agriculture

- An approach that combines **digital tools and social networks** is practised in the SME agricultural segment .
- According to research data, 70% of new enterprises have **a profile in social networks.**
- Not only the local but also the global market is available by means of IT. At present, **individuals tend to use smartphones** instead of stationary computers.
- **Direct marketing** – the enterprise itself delivers products to final consumers who establish a network and spread and distribute the products among themselves.
- This process involves **several advantages**: fresh products, communication and market studies.

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Robotic garden platform

- Within the framework of the project “Autonomous robotic platform Latvian iDārzs - for sustainable development of the plant growing industry”, **an innovative, remotely controlled platform** capable of navigating the teams assigned by the operator has been created.
- The central part of the robotic platform houses its main **operating elements, which are two optical cameras**: an RGB camera and a multispectral camera.
- **The main purpose of the platform** will be to survey a specially designed garden and **collect information on different crops.**
- The information collected will be sent to a database for further analysis



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Weed control robot

- LBTU has developed a weed robot - a device that is **able to move autonomously through the field, identify weeds and separate them from the crop, as well as using a high-energy laser** or precisely positioned mechanical unit to destroy the weed or significantly interfere with its further growth.





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Conclusions

- **Smart agriculture**, including increasing business efficiency, goes hand in hand with caring for the **environment.**
- We need to be aware that the latest technologies and artificial intelligence are rapidly entering our daily lives and the **agricultural sector is no exception**.
- We can already see that the **knowledge** of Latvian farmers about precise agriculture and its application **is growing**.
- **Latvia's large farms**, which use smart technologies, manage efficiently, make investments wisely and are based on data, saving the invested funds and trying to obtain the maximum yield level.
- **Smaller farms** are also offered financially sound solutions in precision agriculture.

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Thank you for your attention!

