The Digitalisation of the European Agricultural Sector

The European Commission's Political guidelines for 2024-2029.pdf (https://e6cd4328-673c-4e7a-8683-f63ffb2cf648_en%20(europa.eu)) emphasise this potential by prioritising support for the entire food value chain through investment and innovation on farms, cooperatives, agri-food businesses and SMEs.

Horizon 2020 project DEMETER

Figure 1: Digital tools in animal husbandry

How is digitalisation transforming the agricultural sector?

Digital technologies in agriculture can increase farm performance by enhancing sustainability, productivity, and resilience, especially through Internet of Things (IoT) technologies, sensors, data analytics (e.g. based on Artificial Intelligence), and decision support systems, leading to more tailored and precise farming operations.

There is a track record of European efforts towards advancing the integration of digital technologies in the European agricultural sector. The European Commission has supported several research and innovation (R&I) projects (e.g. ATLAS, (https://www.atlas-h2020.eu/) DEMETER (https://h2020-demeter.eu/demeter-approach-towards-an-agricultural-interoperability-space/)) as well as deployment actions, such as the Common European Agricultural Data Space, which shape digitalisation in EU agriculture.

The agricultural value chain includes manufacturers, agro-chemical providers, food processors, retailers, and consumers. Through digitalisation, stakeholders benefit from greater transparency and streamlined processes along the value chain, with better communication, automated data transfer, and technologies like blockchain, allowing product tracking. Moreover, digital technologies can increase efficiency and cost-effectiveness at all stages of the value chain, reducing inputs (such as energy) and emissions.

Innovative SMEs and start-ups can emerge and thrive, providing new solutions, ideas, and perspectives on the agri-food ecosystem and its challenges.

Despite the many benefits, digitalisation can also create digital divides, such as between farmers with access to cutting-edge technologies and those without. These divides can be influenced by remoteness, turnover of holdings, skills and age of farmers.

Why is data in agriculture important?

The increased use of digital applications in agriculture leads to greater amounts of data, which are highly specific and diverse. The collection of agriculture data includes land, crop, livestock, agronomic data, climate data, machine data, financial data, and compliance data. Some data might be considered personal or sensitive by farmers, such as data on tractors routes or factors leading to a successful production. Other data might be seen as confidential by agro-businesses. Agricultural data, especially if available to many farms, is economically important not only for farmers but also for the entire value chain, e.g. for market forecast, product development, and insurance. Farmers are concerned that their data might be used by third parties without their consent or knowledge. Protecting trade secrets is essential.

It is therefore crucial to ensure safeguards for data sharing, data sovereignty, and data security to build trust and not jeopardise the further development and acceptance of smart farming.

To facilitate fair data sharing across sectors, the EU adopted the Data Act, which will enter into force in 2025. The EU Code of Conduct.pdf (https://croplifeeurope.eu/wp-content/uploads/2021/03/EU_Code_of_conduct_on_agricultural_data_sharing_by_contractual_agreement_2020_ENGLISH.pdf) on agricultural data sharing, set up by a group of associations from the EU agri-food chain, provides guidance on the use of agricultural data, particularly the rights to access and use it.

In the European strategy for Data (https://digital-strategy.ec.europa.eu/en/policies/strategy-data), the Commission announced the Common European Agricultural Data Space (CEADS) to facilitate trustworthy sharing of agricultural data between private stakeholders (e.g. farmers, machinery companies, data service providers) and public authorities. The implementation follows a step-wise approach, starting with a preparatory action “AgridataSpace” (https://agridataspace-csa.eu), followed by a deployment action, both funded under the Digital Europe Programme. (https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/digital-europe-programme_en)

Overall, several EU policies and legislation frame the use and re-use of data relevant for the agricultural sector.

How can we boost digital innovation in agriculture in the European Union?

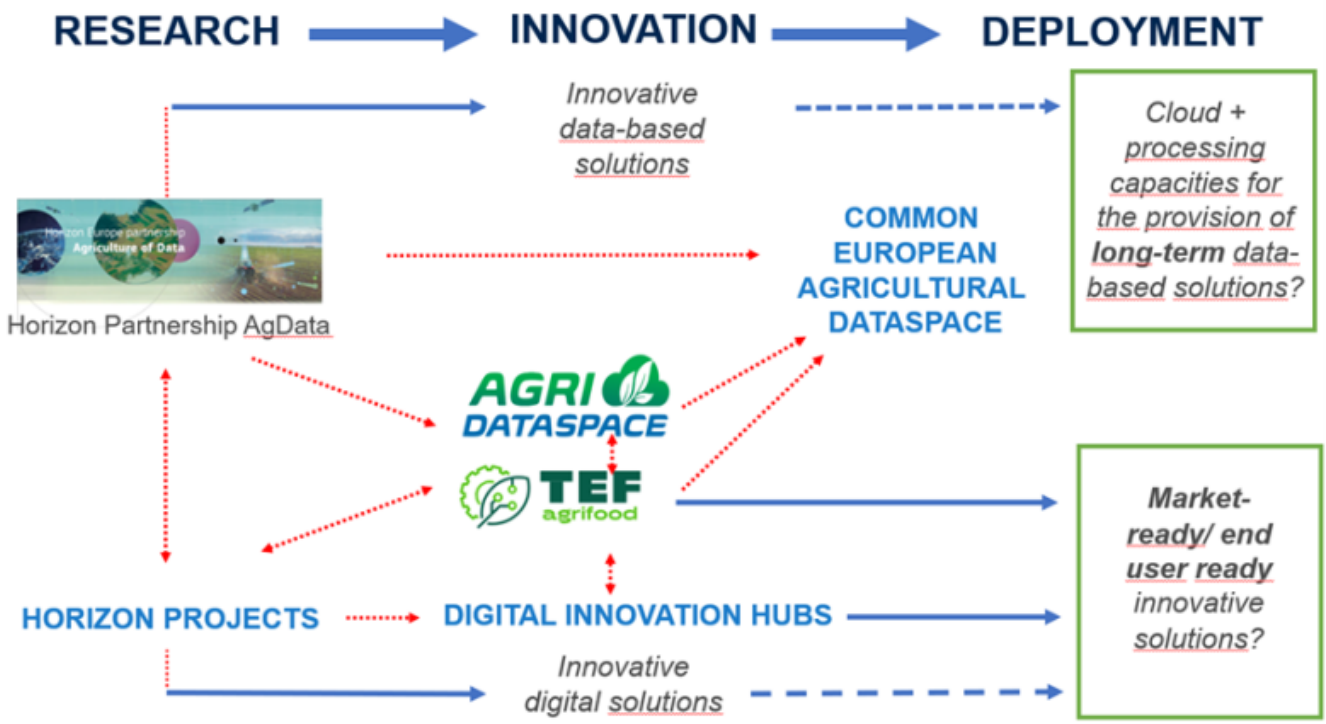

Figure 2: A strategic approach towards bringing research and innovation to deployment stage in the field of digitalisation in agri-food

Several EU programmes contribute to boosting the uptake of innovative digital technologies in agri-food. A strategic approach towards programming is an asset. The figure above shows how this ambition is fostered at EU level: Actions in Research and Innovation (R&I) are complemented by deployment actions to ensure a scaling of innovative solutions bringing them to the market, and to the end users respectively. Key EU-funded actions include in the field research and innovation a number of Horizon Europe projects.pdf (https://agriculture.ec.europa.eu/document/download/4a31711f-3235-4b8a-9f58-9cfa67bdba6a_en?filename=factsheet-agriresearch-digital-transformation_en.pdf), the Horizon Europe partnership.pdf (https://research-and-innovation.ec.europa.eu/system/files/2023-08/AgData%20SRIA%20final_version.pdf) Agriculture of Data, and the European Testing and Experimentation Facilities (TEF) for AI in Agri-Food.pdf (https://agrifoodtef.eu/?trk=public_post-text), European Digital Innovation Hubs (https://digital-strategy.ec.europa.eu/en/activities/edihs) as well as in the field of deployment the Common European Agricultural Dataspace (https://agridataspace-csa.eu/). Other complementary programmes and policies provide, e.g. support to the capacity building of end users, e.g. to the farmers under the Common Agricultural Policy.

Benefits and challenges of digital and data technologies in agriculture

The use of digital technologies in agriculture can bring several **benefits**:

- **Production optimisation**: Digitalisation can support farmers in making better decisions, optimise operations, and increase productivity, leading to higher profits and a more sustainable agricultural sector. Precision farming technologies reduce inputs and production costs and the environmental footprint of agricultural activities, by optimising resource use, and reducing waste.

- **Enhanced animal welfare**: Digital applications can increase animal welfare, e.g. by tracking health conditions (see Figure 1).

- **Increased working conditions:** Automation and optimisation through digital technologies, including robotics, reduce the physical and mental workload of farmers, leading to improved working conditions.

- **Increased transparency:** Specific digital technologies, like blockchain improve traceability and transparency of

agricultural products in the value chain, enabling consumers to make more informed choices.

- **Increased competitiveness**: Digitalisation helps the European agricultural sector stay competitive globally by providing innovative solutions and creating new business opportunities for all actors along the value chain.

Despite the benefits, **challenges** remain:

- **Lack of awareness and skills**: Many farmers may not be aware of the potential benefits of digitalisation and may lack the necessary skills and resources to use new technologies.
- **Digital divides**: Many rural areas still lack reliable and affordable internet access, hindering the adoption of digital technologies, which is one key factor inducing “digital divides” between farmers.
- **Lack of cost-effectiveness**: The cost of implementing certain digital technologies might be higher than the potential benefits, especially for small-scale farmers.
- **Need of trust in data sharing**: Concerns about data privacy and ownership among farmers can hamper data sharing between different actors in the agricultural sector.
- **Shortcoming in interoperability**: Lack of interoperability between different systems, as many digital applications or machines from different brands may not be compatible, making it difficult to share data and integrate data.

To ensure that digitalisation is inclusive and accessible for all, policymakers, industry leaders, and technology providers must work together to promote the benefits of digitalisation transparently and support farmers with training, resources, and incentives to adopt new technologies. By doing so, the European agricultural sector can maximise the benefits of the digital age, improving sustainability and profitability while addressing pressing issues such as food security and climate change.
