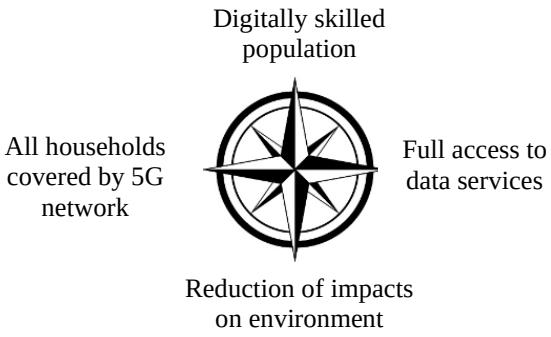
B11. Precision agriculture and EU policies within EU Digital Agenda

What is precision agriculture?

A series of global changes are placing the agri-food system under strain. The growing population of 9.5 billion people in 2050 must be fed while adapting to a context of increasing devastation: climate change, collapse of biodiversity, and reduction of resources such as soil, fresh water, and phosphorus. Agriculture must also accelerate changes to implement livestock production systems that are more respectful of animal welfare and reduce its impact on the environment.

In March 2021, the European Commission published the 2030 *Digital Compass*: the European Way for the Digital Decade communication which sets out its long-term strategy for the digital transformation of the European Union. The strategy, which includes a set of quantitative targets, seeks to define a set of rights and principles for Europeans that will "empower businesses and people in a human-centred, sustainable and more prosperous digital future".



In its strategy for the development of the EU until 2030, the European Commission mentions accelerating the transition to the *digitalization* of European society as one of the important measures. Digital technologies are now imperative for working, learning, entertaining, socialising, shopping, and accessing everything from health services to culture.

Digital technologies can significantly contribute to the achievement of the *European Green Deal* objectives. The uptake of digital solutions and the use of data will help in the transition to a climate neutral, circular and more resilient economy. Instead of the term "*digital society*", one can also analogically talk about the implementation of the *4th industrial revolution* or IT.4.

The goals cover four main areas by 2030: *digital skills*, *digital infrastructure*, *digital transformation of businesses* and *digitalisation of public services*.

- The EU will have a digitally skilled population and 20 million ICT specialists.
- All European households should be covered by a Gigabit network, with all populated areas covered by 5G.
- The European production of cutting-edge and sustainable semiconductors should represent at least 20% of world production in value.
- At least 10,000 edge nodes should be deployed in the EU, to guarantee access to data services with a low latency wherever businesses are located.

Precision agriculture is the result of the implementation of *digital technologies*, which are gradually growing into all social activities and turning today's society into a digital society.

Precision agriculture is a management strategy that gathers, processes and analyses temporal, spatial and individual data and combines it with other information to support management decisions

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according to estimated variability for improved resource use efficiency, productivity, quality, profitability, and sustainability of agricultural production.

> This definition of the "precision agriculture" above was submitted by the "International Society of ¨Precision Agriculture - ISPA" in 2019. ISPA is a non-commercial institution that brings together all those interested in precision agriculture. Today there are many organizations and companies involved in the development, promotion and education of this promising field of agriculture.

Digitisation can increase profitability, improve working conditions for farmers, and reduce the environmental impacts of agriculture.

What are the basic components of precision agriculture?

They are:

- Sensors
- Robots
- Satellites systems monitoring
- Drones
- Decision support tools
- Digital marketing
- Digital Innovation Hubs (DIHs)

The set of *sensors* is intended for monitoring liquid, gaseous, non-aggressive media in the soil, or even soil temperature. The temperature sensors are insulated against the penetration of liquids, but they ensure sufficient thermal coupling with the environment. To monitor the required area of the crop, a network of sensors must be created that monitor the ratio between the soil and water content, usually in a volume of 1 m^3. At the same time, the temperature of the soil and its conductivity are also measured. The sensors are buried to the required measurement depth, so that the original composition of the soil is not disturbed. Sensors are usually inexpensive.

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Robots are being designed to help farmers in their day-to-day work. Robot pepper pickers work in the hot and humid environment of greenhouses where producers often struggle to find workers willing to endure the conditions. Milking robots allow cows to choose when they need to be milked, improving both animal and farmer welfare, and weeding robots save on backbreaking work and herbicides. These are just a few of many examples.

A satellite's crop monitoring technology allows it to perform online crop monitoring on different fields, located in different areas, regions, even countries and on different continents. The technology's advantage is a high automation level of agriculture area condition and its interpretation in an interactive map which can be read by different groups of users. Satellite crop monitoring facilitates real-time crop vegetation index monitoring via spectral analysis of high-resolution satellite images for different fields and crops which enables to track positive and negative dynamics of crop development. The difference in vegetation index informs about single-crop development disproportions that speaks for the necessity of additional agriculture works on particular field zones.

Drones, also known as unmanned aerial vehicles (UAVs), allow farmers to closely monitor and precisely manage crop conditions on a smaller area of land. They can help farmers discover issues such as crops not being properly irrigated or identify an area of a field that needs intensive scouting. Drones can also be used for soil and field analysis, showing moisture content and soil erosion through accurate 3-D maps.

Source: https://www.youtube.com/watch?v=I3cGXhgelms

Satellite and drones crop monitoring technology users are:

- Agronomists and the managers of agriculture companies' (crop vegetation control, crop yield forecasting, management decisions optimization).
- Business owners (business prospects estimates, making reasonable decisions on capital investments, providing information for management decisions).
- Investors and investment analysts (investment potential estimation, making investment decisions, making sustainable forecasts).
- Insurance brokers (data collection, clients claims verification, scale of rates and insurance premium amounts calculation).
- Producers of agricultural machinery (integration of crop monitoring solutions with agriculture machinery board computers operations, functional development).
- State and sectoral organisations engaged in agriculture, food security and ecological problems.

Decision support tools use many European farmer-innovators that can support them in their daily work at field and management level. These tools collect, combine and analyse a range of data

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including for example field data from sensors and satellite images, and provide data-driven support and information on how to optimise production and/or quality.

Digital marketing can be an excellent potential source of business for the farm. Mobile devices and high-speed broadband can make it easier to get access to the internet. In addition, a wide range of mobile apps has opened the way to reach new customers, to set up webshops, to create a personal community on social media and to shorten the supply chain.

Today, many farmers are already using digital technologies such as smartphones, tablets, in-field sensors, drones, and satellites. These technologies provide a range of farming solutions such as remote measurement of soil conditions, better water management, and livestock and crop monitoring. By analysing the data collected, farmers can for example gain insight into likely future crop patterns or animal health and welfare. This enables them to plan more effectively and be more efficient.

Digital Innovation Hubs (DIHs) ensure the connection between the ICT and the farming communities by bringing together IT suppliers, the farming sector, technology experts, investors, and other relevant actors. This leads to new applications that are adapted to the real needs of farmers. National and regional authorities can play a key role in encouraging the setting up of DIHs and the creation of a regional innovation ecosystem.

Concerning legal problems: the European Commission and the EIP-AGRI network are fully aware of the potentially disruptive impact digitisation might have. This is why issues like *data ownership, data use and re-use* have been addressed to find answers.

SMEs have a central role in this transition, not only because they represent the bulk of the EU companies, but also because they are a critical source of innovation. With the support of over 200 Digital Innovation Hubs and industrial clusters, by 2030, SMEs should have the opportunity to access digital technologies or data easily and on fair terms, ensured by appropriate regulation, and benefit from adequate support to digitalise.

Summary

Precision farming is a management approach that focuses on (near real-time) observation, measurement, and responses to variability in crops, fields, and animals. It can help increase crop yields and animal performance, reduce costs, including labour costs, and optimise process inputs. All of these can help increase profitability. At the same time, precision farming can increase work safety and reduce the environmental impacts of agriculture and farming practices, thus contributing to the sustainability of agricultural production. Digitalisation endows people with new sources of prosperity, allowing entrepreneurs to innovate, set up and grow their business wherever they live, opening markets and investments across Europe and globally, and creating new jobs at a time when an increasing number of Europeans feel threatened in their economic security or environment.

Links to relevant topics

International Society of Precision Agriculture“ info@ispag.org

https://eufordigital.eu/library/2030-digital-compass-the-european-way-for-the-digital-decade/

https://www.youtube.com/watch?v=I3cGXhgelms

https://www.techtarget.com/whatis/definition/precision-agriculture-precision-farming

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Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 2030 Digital Compass: the European way for the Digital Decade, COM/2021/118 final.

ISPA. ISPA Precision Agriculture Definition. 2019. Retrieved from https://ispag.org/.

Key words

Digital Compass
digitalization
Green Deal
digital skills
digital infrastructure
digital transformation of businesses
digitalisation of public services
digital agriculture
digital technologies
digital society
4th industrial revolution
sensors
robots
satellites systems monitoring
drones
decision support tools
digital marketing
innovation hubs
data ownership
data use and re-use

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