DIGITIZATION OF FARMS IN THE AGRICULTURAL SECTOR – STRATEGIC PRIORITY OF EUROPEAN POLITICS

Violeta Blazheva[1]
v.blazheva@uni-svishtov.bg

Abstract

Digital technologies are transforming the world at an unprecedented rate. The aim of the present research stems from the need for open science and open access to scientific results in the conditions of a single digital market. The unpredictable environment is a prerequisite for upgrading existing knowledge, creating new knowledge and introducing innovative modern practices to ensure the sustainability of the economy. Science, innovation and technology drive economic development. In search of solutions for turning knowledge into an economic result, attention is directed to digitalization of the economy, respectively the agrarian sector, in the context of markets, management and innovation in the knowledge economy.

Keywords: digitization, digital technologies, European policy, agricultural sector.
JEL: O13, O38

Introduction

Digital agriculture reflects the evolution of the sector from the introduction of precision agriculture to the implementation of smart networks and data management tools. The aim is to use available information and experience to automate activities and processes in the agricultural sector.

Data management is at the heart of what has emerged as a new type of management in agriculture. This makes the sector sustainable and competitive.

Digitization of the agricultural sector is a strategic priority in the conditions of the common European policy.

Digital farming – fundamentals

For the purposes of the present study, it is necessary to derive characteristics of some main productions:

Precision agriculture – technological management of land use, by measuring and accounting for differences between fields, respectively animals. It uses large data sets. If a corresponding algorithm is followed, the processes are robotic. Aerial imagery, sensors, weather forecasts and more are used.

[1] Assoc. Prof, PhD. Department of Agricultural Economics, Faculty of Industry and Commerce, Tsenov Academy of Economics, Svishtov, Bulgaria, ORCID 0000-0002-4132-6440.

Smart agriculture optimizes the complex systems of agricultural production with the application of information technology. Its essence is expressed in the intelligent use of the collected information. Digital agriculture is expected to create significant added value from the application of data.

Digital agriculture unites the two concepts – precision agriculture and smart agriculture.

Digital agriculture is characterized as „the consistent application of precision farming and smart farming methods, internal and external networking and the use of web-based data platforms with big data analytics"(2020).

The development of the agricultural sector is supported by various categories of systems, applications and others, some of which are:

- *autonomous robots* for carrying out basic agricultural tasks – robotic systems, the so-called „robotic hand“ for farmers. The activities and processes in the farm are automated through laser photoidentification technologies.

- *drones and/or software-based technologies* for computer monitoring of crops and soils. 3D images enable data analysis and prediction. The person is only required to set a plan of work.

- *machine analytics* – models for tracking and predicting various impacts on the environment and yields, for example temperature, precipitation, wind speed, solar radiation and others. Artificial intelligence with the help of neural networks collects various data, analyzes them and creates specific conclusions based on them.

- *IoT sensors* – a network of smart devices. Sensors and image recognition technologies collect various data and metrics. They send updated information in real time. This makes it possible for farmers to make timely decisions (2021).

Extensive testing and application of emerging applications in the agricultural sector is essential as it is affected by environmental factors that cannot be controlled.

Evolution of the digital development of the agricultural sector

Digital agriculture is expected to create output value. In this connection, the stages (phases) of the sector's development are being followed (2017):

Agriculture 1.0 – known as the „manual era“. This stage covers the early years of the 20th century. This stage is characterized by hard physical work and low productivity. One third of the population is engaged in agricultural activity.

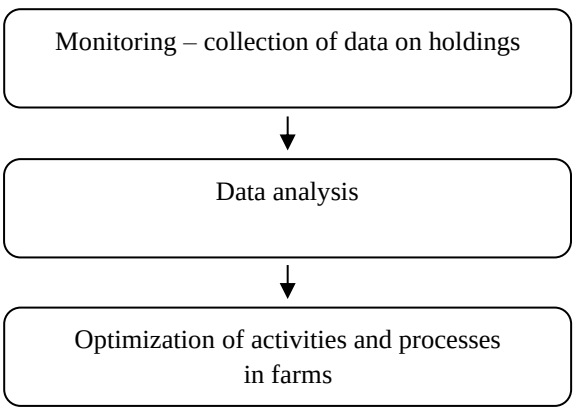
Agriculture 2.0 – this stage, known as the „green revolution“, covers the 1950s. With the so-called industrialization, new practices are introduced in production. By replacing manual labor with mechanized labor, production costs are reduced. With the use of nitrogen fertilizers and synthetic pesticides, yields are significantly increased.

Agriculture 3.0 – this stage spans the mid-1990s. GPS technology allowed the so-called „precision farming“ cost optimization. Improved accuracy of field operations and animal care.

Agriculture 4.0 – agriculture enters this stage around 2010 of the 21st century. Data transfer is automated. Smart technologies are being implemented. This stage sets the stage for the next evolution in the sector using unmanned operations and autonomous systems.

Agriculture 5.0 – a new stage in the development of the agricultural sector – a stage of artificial intelligence, robotics and total automation of production management. It is related to the priority implementation of the Internet of Things (IoT), artificial intelligence (AI) and big data analysis with an emphasis on reducing the impact on the environment.

Modern technologies combine smart devices with autonomous behavior and connectivity. This allows the conditional model display (Figure 1):



Source: Autor

Figure 1. A model of autonomous connectivity of modern technologies in farms

European rules and measures to regulate and support digitization in the agricultural sector

A modernized, competitive and sustainable agricultural sector requires the implementation of digital technologies.

In this direction, under the Common Agricultural Policy of the European Union, funds are provided for investments in the agricultural sector for:

- precision agriculture,
- information and communication technologies.
- purchasing digital technologies at every stage of the supply chain,
- consulting services in the field of digital aspects in agriculture and rural areas,
- digital skills training, exchange of experience using digital technologies (eg demonstration farms).

More than 274,000 farms are expected to be supported to adapt to modern digital technologies (European Union, 2024). For the successful absorption of funds, farmers need access to knowledge and training.

As of 2015, investments in digital technology reached $4.6 billion. The rapid rate of increase in world population requires increased production by 60% by 2030. (2020).

At the national level, in support of agricultural producers, the so-called Knowledge and innovation systems in agriculture (AKIS) (Ministry of Agriculture and Food, 2024):

- are a major source of information – Knowledge sharing and innovative applications are important. For this purpose, consultants must have access to the latest developments. This will allow upgrading of own interactive and digital skills. The consultants disseminate information about the results of the implemented projects.

- support the transition to digitalization in agriculture. In order to prevent the digital divide between farmers, consultants must help them navigate the modern digital world.

The digital transformation of an agricultural holding requires: consulting the farmer, acquiring digital skills from the farmer, testing the digital technology, realizing the investment.

Conclusion

In the conditions of climate change, agriculture requires new forms of production and efficiency – appropriate use of resources and care for the environment.

In conclusion, the evolution of agriculture from manual labor to high-tech practices is remarkable. Through real-time analytics, agriculture 5.0 offers a scenario for a more sustainable, efficient and productive food system. With autonomous and predictive decision-making, productivity gains and environmental impact reductions are expected in the future.

We can summarize that the future of agriculture depends on its digital transformation.

References

European Union. (2024). Digitalisation of agriculture and rural areas in the EU. [Online]. Available at: Agriculture and rural development: https://agriculture.ec.europa.eu/sustainability/digitalisation_en (Accessed: 10 January 2024)

Ministry of Agriculture and Food. (2024). National Agricultural Advisory Service. [Online]. Available at: Agricultural Knowledge and Innovation Systems (AKIS): https://www.naas.government.bg/inovacii-i-transfer-na-znaniya/p3918/p4549 (Accessed: 1 October 2024)

Agri.bg The National Agriculture Network [Online]. https://agri.bg/novini/digitalno-zemedelie-evolyutsiyata-na-sektora-pod-lupa (Accessed: 27 December 2017)

Agri.bg The National Agriculture Network [Online]. https://agri.bg/novini/top-5-na-inovatsiite-v-zemedelieto (Accessed: 14 February 2021)

Agrosalon.bg [Online]. https://agrosalon.bg/Kakva-e-razlikata-mezhdu-pretsizno-inteligentno-i-tsifrovo-zemedelie-.p7429 (Accessed: 23 July 2020)

Agrohub.bg [Online]. https://agrohub.bg/whats-trending-on-designers-charts-this-spring/ (Accessed: 21 April 2020)

Agro.bg [Online]. https://agro.bg/novini/osp---nauchi-poveche/eto-kak-tryabva-da-se-sluchi-tsifrovata-transformatsiya-na-zemedelskite-stopanstva/ (Accessed: 15 July 2022)