DIGITAL TRANSFORMATION IN ROMANIA'S AGRICULTURE IN THE PERIOD 2023-2027

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Abstract

The influence of new technologies and digitalization in general on the agriculture sector is a topic of great discussion these days. Digitalization of agriculture and so-called precision farming appear to be the intended answers to a number of problems, like the need for higher output, the desire to become greener, or the declining population. The paper aims to analyze the influence of new technologies and digitization on the agricultural sector, focusing on the opportunities and challenges of precision agriculture. The study will examine how the digital transition can address the challenges of sustainable agricultural production, ecological impact, and human resource management, given the National Strategic Plans implemented by the EU through the post-2020 Common Agricultural Policy (CAP). The main results indicate that the digitization of agriculture has led to a significant increase in productivity (up to 20%), a reduction in the use of environmentally harmful resources (fertilizers and pesticides by 15%), but high initial costs and a lack of adequate infrastructure challenges small farmers over time that financial support and post-2020 CAP mechanisms are essential to accelerate the transition to precision agriculture.

Key words: digitalization, new technologies, Common Agriculture Policy (CAP), National Strategic Plan

INTRODUCTION

Since we are living in a digital transition era, the contemporary era is being labelled as one of great transformation. The EU economy and labor markets are being transformed by digitization and accelerated technological progress; an increasing number of EU firms are classified as highly digitalized. We are living in a time of ever-more-capable systems, ever-more-integrated technology, and ever-more-quantified society, which together comprise the digital life world [5]. In agriculture, where technical advancement is matched by machine intelligence that is beginning to surpass human intellect, technological innovation is evolving into a meta-trend that pervades every other element of human life [9]. This led to the debate over the Common Agricultural Policy's overhaul throughout Europe. The talks, which began well in advance of the COVID-19 pandemic, aimed to build a more resilient CAP with the overarching goal of modernizing the industry through knowledge-sharing and stimulation, innovation and digitization in agriculture and rural areas, and adoption of these measures [1].

The European Union began addressing the issue of agricultural resilience in the wake of the COVID-19 epidemic. The issue of the ecological and digital dimensions of resilience was highlighted in the first annual Strategic Foresight Report of 2020, which also highlighted the alarming digital divide between urban and rural regions. This was covered in the Foresight Report for the next year, which discussed the need to use new technology to maintain a robust and sustainable food system.

When the European Commission revealed what should be the main lessons learned from agriculture in terms of digitization in 2022, we finally got a peek at what smarter and greener agriculture will entail.

[12] affirmed that digitization in agriculture needs to "improve the construction of agricultural digitization infrastructure, to pay

attention to the differences in the development degree and demand between regions and to improve the quality of the rural labor force and the input of scientific and technological talents in the agricultural industry.

The purpose of the research is to analyze the influence of new technologies and digitization on the agricultural sector, focusing on the opportunities and challenges of precision agriculture.

MATERIALS AND METHODS

Official EU documents, regulations, and strategies have been analyzed, especially the post-2020 Common Agricultural Policy (CAP) and the member states' National Strategic Plans (NSPs), with an emphasis on Romania. Also, it was evaluated the way in which these legislative and financial frameworks support the digitization of agriculture, with an emphasis on the promotion of agriculture and on adaptation to the national particularities of each member state. Bibliometrics with VOSviewer for digitized agriculture involves using methods and materials to support rigorous and applied research.
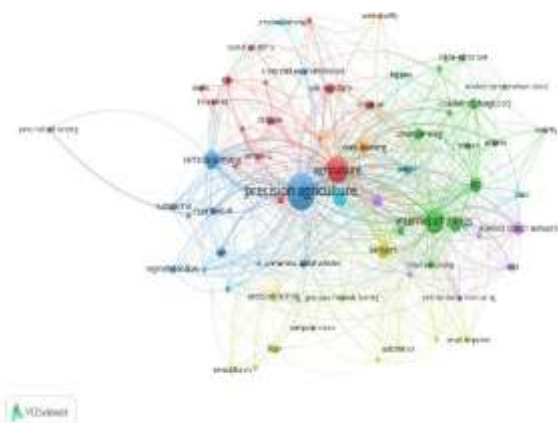

Fig. 1. The directions of digitization in agriculture
Source: Authors' own determination.

Here are some essentials related to the material such as:
-Specialized literature, Books, scientific articles and case studies that address digitized agriculture, emerging technologies and their impact on agriculture.

-Reports and studies of international organizations (FAO, OECD) on trends in the digitization of agriculture.
Coupling using the keywords: precision agriculture and digitization, we found how the directions of digitization in agriculture could be synthesized in Figure 1.

RESULTS AND DISCUSSIONS

This study's foundation is a thorough literature survey and an examination of recent publications and research on emerging technologies and the Common Agricultural Policy.
To do this, we have examined several official European Union papers as well as research and reports written for both public and private organizations.
In light of the epidemic and the conflict in Ukraine, the article aims to first provide the theoretical foundation for understanding how new technologies affect society as a whole and then discuss how the Common Agricultural Policy will evolve beyond 2020. Additionally, consideration was given to the current real-world instances that may support the audience in this endeavour.
One of the most significant developments in the industry is the growing significance of the digitization question. It is also viewed as a potential solution to the central agricultural challenge of "how to produce the most food with the least cost in time, labour, and money." The digitisation of agriculture, or the incorporation of cutting-edge digital technology into the farm production system is one potential solution [4].
Although we still don't completely understand the results, we can already make certain inferences. The effects of digitalization on agricultural knowledge will be one of the effects. The Agricultural Knowledge and Innovation System (AKIS) as a whole will thus be disturbed, although there may be more opportunities than anticipated.
The most important thing to keep in mind while analyzing the effects of new technology is who the major players are and how do they fit into the process.

Thus, these players have been identified and their roles have been summarized in a number of studies. These players all have important roles to play, albeit they are not all the same (Figure 2).
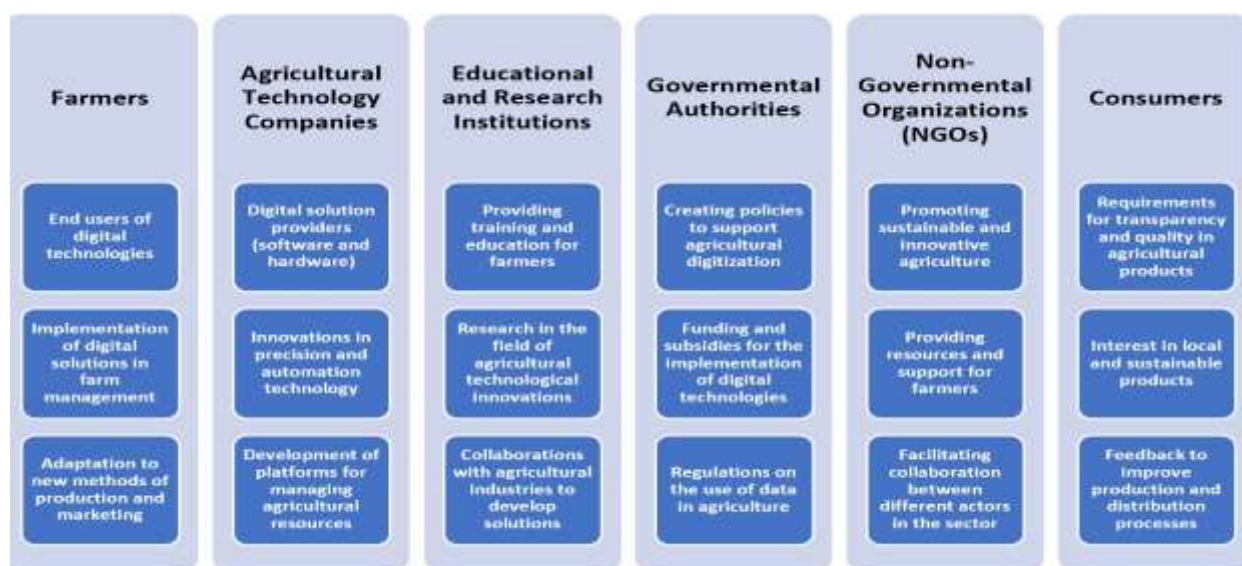

Fig. 2. Key actors in the process of digitalization of agriculture
Source: Authors' own determination.

By 2019, a common declaration of cooperation on digital agriculture, signed by several EU Member States, including Romania, made it clear that progress had been made in that area and that formalization was necessary. The declaration listed the essential actions that needed to be taken, including maximizing impact, building an innovation infrastructure, strengthening research support, and creating a European data space for smart agrifood applications. As can be seen below, this has had a clear and tangible effect on the financing of several European initiatives that looked into how the new technology were affecting agriculture. As a result, the Horizon Europe program has a significant digitalization component that funds several initiatives across the EU.

Arable crops, dairy farming, fruits, meat, and vegetables are the five sectors that comprise the Internet of Food & Farm 2020 (IOF 2020) project, which aims to investigate the possibilities of IoT technology for the European food and farming industry through thirty-three use cases. In addition to its useful daily uses, the project offered several pertinent suggestions for the then-upcoming CAP reform initiative, which was primarily intended to make it easier for farmers to access big data, data platforms, etc [8].

Demeter is a similarly funded initiative that aims to better promote sustainable farming in Europe through the large-scale implementation of interoperable, farmer-driven smart farming IoT-based systems. A further development made by the EU in this regard is the ongoing existence of the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI), which was established in 2012 with the goal of streamlining the use of funds allocated to research by preventing duplications and optimizing the flow of innovation at the EU level [3].

This platform for sharing knowledge is proving to be very helpful in spreading much-needed information about how to improve the CAP from a digital perspective. For example, it can be used to develop farmers' competencies in the process of digital transition by offering incentives for digital uptake (supporting enhanced connectivity, etc.), incentives for training (more training, more support, etc.), activities for developing skills (digital advisory services, etc.), ecosystem, cooperation, and partnerships. Stronger agricultural knowledge and

innovation systems (AKIS), intended to facilitate the development of innovative initiatives, were one of the main outcomes of the new CAP.
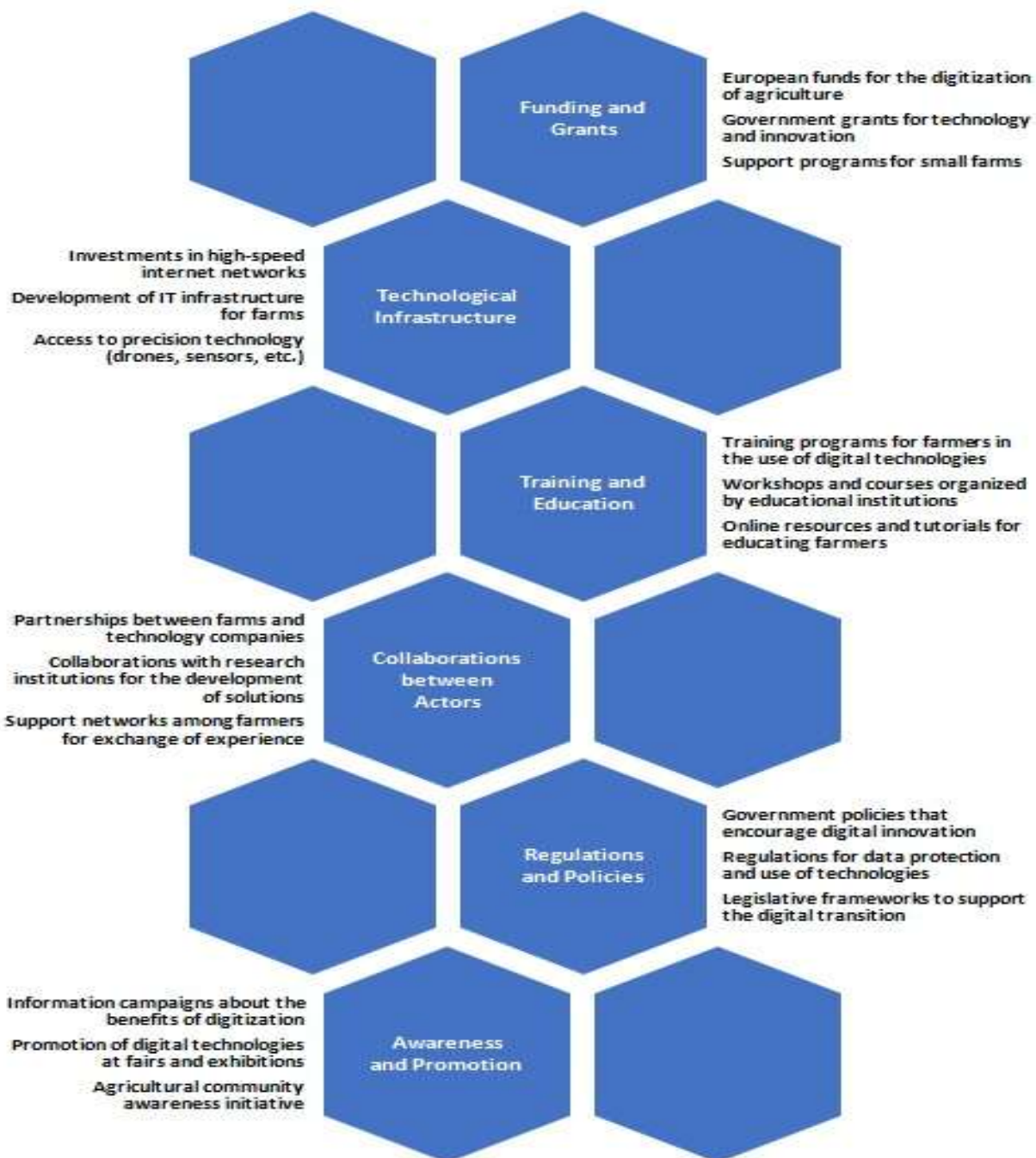

Fig. 3. Support digital transition in agriculture
Source: Authors' own determination.

A number of actions that should be made to assist the digital transformation in agriculture were suggested by the preliminary study [3]. The development of a new methodology and the use of a new instrument, the so-called CAP National Strategic Plan, are what are new to the CAP post-2020. A national CAP strategy plan that integrates money for market measures, rural development, and income assistance must be developed independently by each EU Member State. The ten CAP post-2020 objectives must be the focal point of each of these plans, and in order to guarantee that each goal is carried out on schedule and under the required circumstances, a number of policy measures must be developed for it.

They should be aware of the country's resources, the laws that are in place there, the ambition of the national government, and the general goals of CAP. The possibility of using EU subsidies to support EU farmers' development of precision farming or precision agriculture is highlighted by the CAP reform after 2022. Therefore, it is anticipated that the National CAP Strategic Plans 2023–2027 would present a range of interventions intended to boost precision agriculture, such as investments in rural development (e.g., machinery), farm consulting services and training, or eco-scheme payments [11].

One notable development, for example, was the introduction of the eco-schemes of an agricultural practice—precision farming and its offshoots—that may be supported by CAP after 2020. The creation of publicly owned platforms for data sharing has advanced, as evidenced by the FaST tool, which aims to build a dynamic data infrastructure that will enable farmers to access a range of digital functionalities (weather forecasts, fertilization advice, integration of static data about the farms, etc.) [6].

The discussion in Europe over the application of new technology in agriculture is not new to Romania, and official governing plans have indicated some paths in this regard. For example, the government has approved a policy to encourage farm-level investments in cutting-edge precision farming technologies. The task of creating a suitable legal framework for the use of agricultural drones, including for plant protection-related activities, is acknowledged. The low level of education and training in rural regions was one issue that Romania's SWOT analysis revealed, which might postpone the adoption of precision farming. The study was conducted in order to design the National Strategic Plan.

Alongside this, there was an increasing gap between large and small farms, and skilled workers were moving from rural to urban regions in pursuit of better prospects. The National Rural Development Network's activation and full utilization, additional educational funding, etc., might be a potential answer. Other potential options include building technology transfer centers, digital hubs, and enhanced communication [2].

The research findings were considered at the government level, and Romania's National Strategic Plan included a number of initiatives aimed at digitalizing farms. Encouraging the growth of digital ecosystems is essential, as is tying counseling and knowledge systems together, enhancing performance via knowledge and creativity, etc. The digitalization of agriculture, which is defined as the proportion of farms that gain from CAP funding for digital technologies, is one important point to note. Throughout the agricultural deliberations held in Romania as part of the Conference on the Future of Europe, similar points were made. Investing in new agricultural technology appears to be one of the primary answers to both the demographic challenge and the need to boost production. Among the proposed solutions that were provided to the general public were a presentation of such technologies, which included semi-autonomous and autonomous tractors, drones for precise treatment, satellite usage in field management, etc. [7].

Thus, among the priorities of Romanian citizens in the framework of the Conference on the Future of Europe was the use of new technology in agriculture.

It should be noted that certain voices of concern have expressed concerns that the new CAP would put further pressure on farmers and that it may be difficult to predict expenses at this time.

Fig. 4. Digitization Barometer 2020 – Agriculture and Food Industry
Source: Authors' own determination.

Some researchers have previously voiced this concern, highlighting the necessity to create a transition mechanism that would assist

farmers during this process, even though the change may appear gradual and come with associated expenses.

Furthermore, market research indicates that farmers in Romania are aware of the realities of digitization [5].

Although some of them have not yet been thoroughly investigated in the CAP beyond 2020, precision farming is still not risk-free. One of them—the application of the data gathered—may not seem pertinent to agriculture at all, but it is crucial and has to do with trust. Many farmers have major trust-related concerns, which also include issues with transparency and distribution regarding which stakeholders would have access to and use the data collected from farmers. As a result, these concerns often lead to skepticism regarding the benefits of "smart" technologies [8].

Other authors have also identified a series of dynamic and complex dimensions of precision agriculture that are hindering its development [9]:

(1) data ownership and control (who owns the data produced and who benefits from them?);

(2) the production of technology and data development (the farmers have little input into and control over the development process – is typically directed by big companies);

(3) and data/cyber security (who protects the farmers from hackers and other malevolent actors).

The necessity to approach digitization via social science perspectives has become clear as it transforms agricultural production systems, value networks, and food systems. Because it's not only a technological examination, factors like power, ownership, privacy, and ethics in digitalizing agricultural production systems and value chains are also taken into account. Thus, concerns about the necessity of developing CAP policy responses to address power disparities and the digital gaps brought about by quick, unchecked technology progress. The impact of digital agriculture on animals is another concern. For example, in dairy farming, robotic milking systems are being developed, and technologies are being used to replace animal husbandry tasks [10].

A number of researchers are also examining the design of technology, specifically if the use of Big Data in agriculture does not perpetuate a sequence of production patterns that, for example, provide big agri-food firms with a disproportionate gain.

The expenses of big data and the Internet of Things in the agriculture industry are another topic that comes up after the literature study. The issue of ethics in the global agricultural competition also arises, not only in relation to other regions but also intra-European Union farming, since many small and medium-sized farms in Central and Eastern Europe cannot afford the costs of this precision farming.

This is because data-driven agriculture has high data acquisition costs, and the technical requirements for using the advanced technologies are mostly suited for large factory-like farms such as those in North America and Europe.

How to adapt this is still a functional component of the post-2020 CAP strategy.

The problem of how to teach people about digitalization in agriculture—the so-called "digi-grasp"—and how to implement and understand it in a given agricultural organization remains unsolved, not just in Europe but all across the world.

"Agricultural knowledge and innovation system should better support agricultural knowledge providers in digi-grasping and developing a digitalization strategy, by anticipating possible futures and reflecting on the consequences of these for value propositions, business models, and organisational identities of agricultural knowledge providers," according to research conducted in New Zeeland, for example [10].

CONCLUSIONS

Given the breadth of the subject and the variety of viewpoints to address, this article does not aim to definitively address whether the agricultural sector's digital shift is impacting the CAP after 2020. However, a number of draft concepts emerge, such as the notion that this transitional process is really a continuation of an earlier one that was

initiated years ago rather than a completely new one. Additionally, the costs of this shift are frequently too expensive for small and medium-sized farms, which means that EU financial help is required; the post-2020 CAP amendments recognize this fact. The new CAP National Strategic Plans tool is intended to support this process, which is being customized to the unique national characteristics of the Member States. Thus, the digital transition's transversal goal is best suited for implementation. Participating actively in this European bargaining process is Romania as well. It appears that all pertinent parties understand the necessity of a prompt digital shift toward precision agriculture, as well as the advantages and disadvantages this presents for Romanian farmers. We are in the midst of an irreversible transition into an unwritten future. Now is when the seeds and forms of things to come are being formed, and it is up to us if we can build a future where everyone, no matter how big or small, can live in a respectful environment where customs and regional differences are valued, or if we lose this wave of change and end up only being consumers rather than digital producers and shapers.

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