DIGITAL TRANSFORMATION IN THE AGRICULTURAL FIELD IN THE CONTEXT OF THE NEW CAP 2023-2027. DEVELOPMENTS AND PERSPECTIVES.

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RESEARCH ARTICLE

Abstract

An important aspect discussed nowadays is the impact of new technologies and digitalization as such on the agricultural sector. Faced with numerous challenges such as the need for increased productivity, the need to become greener or the dwindling demographics the digitalization of agriculture and the so-called precision farming seem to be the envisaged solutions. This process of transition is not without any challenges as the pressure on change is high and the costs are similar. The desk review analysis used identified a series of relevant studies and articles that have shown both the pros and cons of this process. The EU through the CAP post-2020 is creating the necessary mechanisms to support this transition and the implementation of this new tool of the National Strategic Plans, in full respect of the subsidiarity principle, is meant to provide to each Member State its framework for the transition adapted to the national specificities. Romania is no longer a newcomer in this process and already the wheels of change are in motion, as more and more experts realize the importance of using the European toolbox in the area of CAP to promote a timely and optimal digital transition toward new agriculture, where no one is left behind.

Keywords: (max. 5) digitalization; new technologies; Common Agricultura Policy; National Strategic Plan; Romania

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INTRODUCTION

The current period is being defined as a period of immense transformation as we are living in a time of digital transition. Technological change is accelerating and digitalization is transforming the EU economy and labor markets: more and more workplaces in the EU are categorized as highly digitalized. What are the implications of the digital revolution for agriculture? (Eurofound. 2021)

We are living in a period that is characterized by *increasingly capable systems*; *increasingly integrated technology* and *increasingly quantified societies* that are the make-up of the *digital lifeworld* (Susskind, 2018).

Technological innovation is becoming a meta-trend that permeates all other aspects of human life, including agriculture, where technological progress is accompanied by machine intelligence that starts to rival human intelligence (Gaub, 2019).

In this context came the European-wide discussion about the reform of the Common Agricultural Policy. The discussions started well ahead of the COVID-19 pandemic and were meant to create a more resilient CAP with the transversal objective of modernization of the sector by stimulating and sharing knowledge, through promoting innovation and digitization in agriculture and rural areas and by encouraging the adoption of these measures (Dăianu, 2019).

In the context of the COVID-19 pandemic, the European Union started to address the question of resilience in the area of agriculture. The first annual Strategic Foresight Report of 2020 brought to the forefront the question of the green and digital dimension of resilience and

indicated the digital divide between urban and rural areas as a cause for concern (European Commission, 2020).

This would be addressed in the following year Foresight Report which spoke about the need to ensure a sustainable and resilient food system using new technologies (European Commission, 2021a).

We finally had a glimpse of what smarter and greener agriculture would mean in 2022 when the European Commission presented what should be the key takeaways in agriculture as regards digitalization (see Table 1).

Table 1

The direction of digitization in agriculture

Digitization	Possible impact
use of digital sensing in-situ (to adapt treatments to specific conditions) and EU space-based services	reduce the use of water, pesticides, fertilisers, and energy
Digital twins	provide data to manage the diversification of products and use functional biodiversity to redesign pest control
Quantum computing, in combination with bioinformatics and plant genomics	enhance the understanding of the biological and chemical processes needed to reduce pesticides and fertilisers
Digital platforms facilitating local distribution and avoiding food waste	boost local production and shorten consumption circuits
Satellite data, sensors, blockchain, and data from along the value chain	increase traceability and transparency
Open agricultural digital platforms provide a basis for secure and trustworthy data sharing and digital services, such as precision farming	strengthen fair collaboration in the value chain and create efficient marketplaces

Source: Own selection based upon European Commission, 2022a

All this debate resulted in the inclusion in the new CAP's ten key objectives of an objective dedicated to fostering knowledge and education (European Commission, 2022b).

MATERIAL AND METHOD

This research material is based on a desk literature review and an analysis of the existing reports and studies in the area of new technologies and the Common Agricultural Policy. For that purpose, we have analyzed a series of official documents of the European Union, studies and reports done for both public and private institutions. The paper intends to present the theoretical framework related to the impact of new technologies on society as such, then explain what is different with the Common Agricultural Policy post-2020 in the context of the pandemic and the war in Ukraine. Also, attention was paid to the present practical examples that may help the audience in this endeavour.

RESULTS AND DISCUSSIONS

The question of digitisation is of utmost importance starting to become one of the most important trends in the sector. At the same time, it is seen as a solution that can provide an answer to one main question related to agriculture: "how to produce the most food with the least cost in time, labour and money". And a possible answer is the digitisation of agriculture as in the use of integrating advanced digital technologies into the farm production system (Evagelos, 2021).

The results are yet to be fully understood but we can already draw some insights. One impact is going to be related to the implications of digitalisation on agricultural knowledge. Thus the whole system known as Agricultural Knowledge and Innovation System (AKIS) is going to be disrupted yet the opportunities envisaged may be greater than the expected disruption (Ingram, 2020).

When we analyse the impact of the new technologies, we need to take into consideration first and foremost what are the key actors in this process and what is their role. A series of studies have thus identified these actors and provided an overview of their role. Each of these actors has a role to play with significant differences between them (see Figure 1).

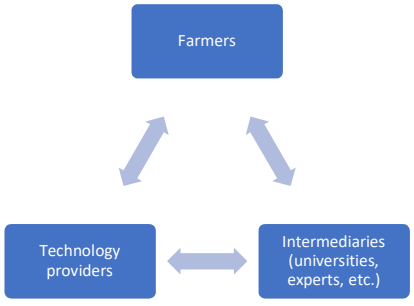

Figure 1. Key actors in the process of digitalization of agriculture (McFadden, 2022)

The progress made in that area and the need to have them formalized became obvious by 2019 when we had a common Declaration of cooperation on digital agriculture signed by several EU Member States, Romania included, mentioned the key elements where things

should be done: strengthening research support; establishing an innovation infrastructure; creating a European data space for smart agri-food applications and maximising impact (Declaration, 2019).

This has had a direct and concrete impact as a series of European projects started to be financed to check the impact of the new technologies on agriculture as seen below. Thus, Horizon Europe programme has a strong component dedicated to digitalisation which finances a series of EU-wide projects.

One such project was the *Internet of food & farm 2020 (IOF 2020)* meant to explore the potential of IoT technologies for the European food and farming industry through thirty-three use cases organised around five sectors (arable, dairy, fruits, meat and vegetables). Besides the practical day-to-day applications, the project provided a series of relevant recommendations for the then-upcoming CAP reform project meant mostly to facilitate the access of the farmers to big data, data platforms etc. (IOF 2020).

A similarly funded project is DEMETER, a large-scale deployment of farmer-driven, interoperable, smart-farming-IoT-based platforms across Europe to see how to better support sustainable farming (Demeter, 2022).

Sharing information about digital advances is crucial and another aspect that the EU has developed in this context is the continued existence of the European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI) launched in 2012 and meant to optimize the flux of innovation at the EU level and streamlined the use of funds dedicated to research by avoiding any duplications (EIP-AGRI, 2022).

This knowledge-sharing tool proves to be very useful in disseminating much-needed information on how to improve the CAP from the point of view of digital aspects, such as how to develop for instance the competencies of farmers in the process of digital transition, such as incentives for digital uptake (supporting enhanced connectivity, etc.), incentives for training (more training, more support, etc.), skills development activities (digital advisory services, etc.) or ecosystem, cooperation and partnerships (EIP-AGRI Seminar, 2020).

One key result was the incorporation in the new CAP of stronger agricultural knowledge and innovation systems (AKIS) meant to support the development of innovation projects. The preliminary report indicated a series of measures that should be taken to support the digital transition in agriculture (see Figure 2).

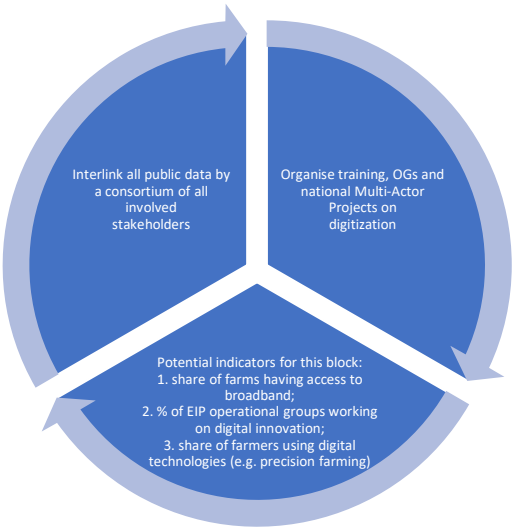

Figure 2. Support digital transition in agriculture (EU SCAR AKIS, 2019)

What is new in the CAP post-2020 is the creation of a new way of working and the use of a new tool, the so-called CAP National Strategic Plan. Each EU Member State must create by itself a national CAP strategic plan, which should combine funding for income support, rural development, and market measures. Each of these plans must be centred on the ten objectives of the CAP post-2020, and for each of these objectives, a series of policy measures should be constructed, to ensure that they are implemented in due time and within the specified conditions. They should have in mind the national capabilities, the national legislation in force, the level of ambition that the national government has as well as the overall objectives of CAP as such (European Commission, 2022c).

The CAP reform post-2022 brings to the attention the opportunity to have EU funds allocated to the development of precision farming or precision agriculture by EU farmers. The National CAP Strategic Plans 2023-2027 are therefore expected to put forward a series of interventions designed to support precision agriculture, like rural development investments (e.g., machinery), farm advisory services and training, or eco-scheme payments (Wetzels, 2021).

For instance, one significant advance was the introduction of the eco-schemes of an agricultural practice that could be supported by CAP post-2020, meaning precision farming and

its subsequent activities, (European Commission, 2021b).
Progress has been made in the development of publicly owned platforms for data sharing such as the FaST tool aiming to create a dynamic data infrastructure to provide farmers, with various digital functionalities (fertilization advice, weather forecasts, integration of static data about the farms, etc.) (FaST, 2022)
Romania is not foreign to the European debate on the use of new technologies in agriculture and some directions have been mentioned in the official governing programs. For instance, there is an officially endorsed policy and the Government level to support farm-level investments in innovative technologies related to precision farming as well as the accepted challenge of drafting an adequate legislative framework for the use of agricultural drones, including in plant-protection-related works (Romanian Government, 2021).
One problem identified at the Romanian level as the SWOT analysis needed for drafting the National Strategic Plan was underway was the low level of education and training in the rural areas, a factor that may delay the implementation of precision farming. This was complemented by a growing gap between the big and small farms and the mobility of skilled workers from rural to urban areas in search of better opportunities. A possible solution may be the activation and full use of the National Rural Development Network, further investments in education, etc. Creating digital hubs, developing technology transfer centres, improved communication are also possible solutions (MARD, 2020).
The results of the research were taken into consideration at the official level and a series of measures were instituted in Romania's National Strategic Plan as regards the digitalisation of farms. Supporting the development of digital ecosystems is key alongside the connection of counselling and knowledge systems, improving performances through knowledge and innovation, etc. One key mention is the digitalisation of agriculture understood as the percentage of farms that benefit from support for digital technology through CAP (MARD, 2022)
Similar mentions were done throughout the debates related to agriculture organised in Romania in the framework of the Conference on the Future of Europe. One of the main solutions to both the demographic crisis and the need to increase productivity seems to be the investment in new technologies in agriculture. A presentation of such technologies ranging from autonomous and half-autonomous tractors, drones for precision treatment, satellite use in field management, etc. was among the envisaged solutions presented to the general audience (Stancu, 2022).
The use of new technologies in agriculture was thus one of the interests of Romanian citizens in the context of the Conference on the Future of Europe (Mocanu, 2022).
What is to be mentioned is also the existence of some concerned voices saying that the new CAP would put extra pressure on the farmers and the costs may be hard to estimate now (Nedelcu, 2022). This was an already expressed fear by some authors who underlined the fact that although it may seem incremental the change is real as well as the costs related to it and we need to design a transition mechanism that would support the farmers in this process (Chereji et al., 2018)
Also, market research has shown that Romanian farmers are aware of the reality of digitalisation (see Table 2).

Table 2
Digitization Barometer 2020 – Agriculture and Food Industry

The influence of digitization on the company is very great	10%
The digital business models have changed to a very large extent the industry	13%
Digital transformation is a central component of the business strategy	23%
There is expertise at the management level to develop a digital business model	22%
"Our consumers are not digital" is a belief that constitutes the main obstacle to the digitization	23%
The main benefit of digitization is the operational efficiency of the company	76%

Source: Own representation based upon the results provided in Valoria, 2020

Yet precision farming is not out of risk and some of them are yet to be fully explored in the CAP post-2020. One of them may seem irrelevant for agriculture yet is of utmost importance – the use of the data collected – and is related to the aspect of trust. The issues related to trust are central concerns for many farmers and include aspects related to transparency and distributional concerns about the stakeholders that would have access to and use of farmers' data collected and these issues tend to create scepticism about the value of 'smart' technologies (Jakku, 2019).
Other authors have also identified a series of dynamic and complex dimensions of precision agriculture that are hindering its development:

(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) (Rotz, 2019).

As digitalization is becoming a transformative force in agricultural production systems, value chains and food systems, the need to use also social sciences lenses on it has become obvious. For that purpose aspects such as power, ownership, privacy and ethics in digitalizing agricultural production systems and value chains are also be taken into consideration in the analysis, as it not only a technical aspect. Thus issues related to the need to create CAP policy interventions addressing the digital divides produced by rapid, unregulated technological change and power imbalances. Another issue is how the animals are affected by digital agriculture. For instance, in dairy farming, we are witnessing the development of robotic milking systems and the use of technologies to replace animal husbandry activities (Klerkx et al., 2019).

The question of the design of technologies is also under scrutiny by a series of scholars that ask whether the design and use of Big Data in agriculture do not perpetuate a series of production designs providing for instance a disproportionate gain for powerful agri-food corporations (Bronson et al., 2016).

Another question that arises following the literature review is related to the costs of big data and the Internet of Things in the agricultural sector. As the costs the cost of data acquisition in data-driven agriculture is high and the technical prerequisites for using the advanced technologies are mostly suited for large factory-like farms such are those in North America and Europe the question of ethics in the global agricultural competition also arises, but not only in relations to other regions but also intra-European Union farming, as there is a high number of small and medium farms in Central and Eastern Europe that cannot afford the costs of this precision farming. How to change this is still a working aspect in the CAP post-2020 approach (Misra et al., 2020).

Still unresolved, not only in Europe but across the world is the way to transfer knowledge about digitalisation in the agricultural sector, the so-called 'digi-grasp', how to make sense of and enact digitalisation in the respective agricultural organization. For instance, in New Zeeland, the research conducted in the area has shown that "agricultural knowledge and innovation system should better support agricultural knowledge providers in digi-grasping and developing a digitalisation strategy, by anticipating possible futures and reflecting on the consequences of these for value propositions, business models and organisational identities of agricultural knowledge providers." (Rijswijk, 2019).

CONCLUSIONS

This paper does not intend to provide a definite answer to the question of whether the process of digital transition in the agricultural sector is influencing the CAP post-2020, given the vastity of the topic and the many angles to cover. Yet a series of preliminary ideas surface like the fact that this process of transition is not necessarily a new one but rather a continuation of a process already in motion years ago.

Also, the costs of this transition are often too high for small and medium farms and therefore EU financial assistance is a must, a situation acknowledged by the reforms of the CAP post-2020. For that purpose, the new tool of the CAP National Strategic Plans are meant to promote also this process is being designed to be tailor-made to the national specificities of the Member States. Thus, the transversal objective of the digital transition is best suited to be implemented.

Romania is also an active participant in this European negotiation process. All the relevant stakeholders seem to be aware of the need for a timely digital transition toward the so-called precision agriculture and are aware of the cost and the opportunities provided by this for the Romanian farmers.

We are facing an irreversible process toward a yet unwritten future. It is now that the seeds and the shape of things to come are formed and it depends on us whether we can create a future for all, small and big, where the traditions and local specificities are respected or if we lose this wind of change and we are becoming only consumers and not digital shapers and producers.

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