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CHALLENGES OF DIGITALIZATION IN THE BUSINESS WORLD



Proceedings Book from Second International Scientific Conference "Challenges of Digitalization in the Business World"



Belgrade, November 23rd, 2023

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DIGITALIZATION IN AGRICULTURE AND APPLICATION IN SERBIA¹

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Abstract: The subject of the paper is analysis of the possibility of application of new digital technologies in all production and processing stages and sectors. The goal of paper is to show that digitalization in agriculture entails the changes that may be positive and negative. Positive changes are reflected in the shortening of the time required for submission of request for subsidies and their payment. Negative changes refer to the age and level of education of the holder of agricultural holdings who should implement digitalization on their holding. Also, in paper has given comparative review of resulting legal changes in agriculture and rural development based on the two analysed Laws on Incentives in Agriculture and Rural Development in 2016 and 2023. The research used the following methods: induction, deduction, analysis, synthesis, description and desk research. The results of the research show that the application of new digital technologies has more advantages than disadvantages, which is why it is increasingly represented in all forms of society's functioning.

Keywords: digitalization, agriculture, subsidies, software solution.

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INTRODUCTION

Digitization largely participates and sometimes replaces human activities in numerous processes and activities. Therefore, its application records positive results, both from the point of view of the economy and from the point of view of protecting biodiversity and the environment (Rolandi et al., 2021; Vasile, 2012; Vial, 2021).

Digitalization in agriculture can be considered as the result of the fourth industrial revolution. The application of the latest digital achievements in agricultural and food production can also be explained as a consequence of climate change. Therefore, at the global level, the entire society (economy and public administration) is implementing technological transformations. In this way, digitalization throughout the world will contribute to greater transparency of public data (Androniceanu et al., 2022). Information and communication technologies in agricultural production play an important role in the modern world because they significantly affect all aspects of life (social, economic, and political). Ultimately, it affects the state as a community (Sinitsa et al., 2021).

Digital agriculture can also be called precision agriculture, taking into account its following aspects (Goldman Sachs Group, 2016):

- *a) Precision planting* it is important from the aspect of reducing the loss of seeds used for sowing/planting, and for increasing the yield;
- *b) Precision fertilizer application* it is significant because it influences yield maximization while minimizing fertilization costs;
- *c) Drones* it is faster to collect data from the field and get results using drones than the human factor could go around on foot;
- *d)* Data integration it is necessary to create a software solution that would monitor meteorological indicators, provide information on the condition of crops during the growing season, and forecast the profitability of production.

All of the above are not the only activities related to precision agriculture, so we would also mention precision irrigation, field monitoring, and precision spraying. Data collected by sensors, satellites, and drones on the state of the soil, plants, and weather conditions can also provide economic benefits, as they affect the increase in production, product quality, and farmers' incomes (Rolandi et al., 2021; Jha et al., 2019; Vinuesa et al., 2020).

Group of authors Radović et al. (2021) states that precision agriculture is a form of application of high technology to support agricultural production in the form of monitoring soil conditions, increasing yields, and creating lower economic costs.

Agricultural activity is very important for the Serbian economy for two reasons. First, it has various natural potentials and climatic conditions. The second one constantly achieves a surplus in foreign trade, that is, it records a positive balance in the exchange of agricultural and food products with other countries of the world. (Popović, Grujić, 2015; Grujić et al., 2021). Therefore, we should invest in the digitization of agriculture in Serbia, because the application of digital technologies is at a low level. Authors Radović et al. (2021) believe that the biggest problem with the greater representation of digitization in Serbia is the unfavorable educational structure of the population and that it is necessary to implement digital literacy of the rural population while harmonizing with labor market tendencies (Vukadinović et al., 2022). Authors Jurjević et al. (2019) believe that only large agricultural farms oriented toward the market have investments in new technologies to compete with foreign agricultural producers.

1. METHODOLOGY

The methodological framework of this research is the desk research method and includes deduction and induction in drawing conclusions. Also, the method of content analysis of scientific works, published texts, and documents and systematization of collected information according to research objectives was used. The main goal of this paper is to present the changes that occurred in agricultural activity before and after the introduction of digitization in Serbia, including their advantages and disadvantages.

The initial hypothesis is that digitization in agriculture accelerates the payment of incentives and the production of food. The originality of the work was achieved through analysis aimed at the set goal of the research and critical evaluation of knowledge. The added value, first of all, is reflected in the attractiveness of the topic and the importance of the defined objective of the analysis.

2. RESULTS AND DISCUSSION

Agricultural producers in Serbia spent a lot of time collecting data and documents for the purpose of trading on markets, registering seasonal workers, applying for certain incentives, measures, etc. In the following, we will talk about some digital solutions in agriculture that Serbia has already implemented with plans for the coming years.

During 2019. an electronic platform for registering seasonal workers in agriculture was introduced (NALED, Registration of agricultural holdings in a few clicks). Given that it took a long time to register a seasonal worker, this platform accelerated the process and contributed to an increase in the number of registered seasonal workers by about 95% (Ministry of finance, Tax administration, Portal of seasonal workers). Activities on the development of this platform began in 2015, and already in 2019. She started working. This decision is also in accordance with the Law on Simplified Employment of Seasonal Jobs in Certain Activities (Official Gazette of RS, No. 50/2018).

At the beginning of April 2020, when the COVID-19 pandemic began and a state of emergency was introduced in Serbia, the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia launched the electronic green market platform ePijaca (Serbian language). The Ministry decided to take this step because it saw that the COVID-19 pandemic has affected many agricultural producers due to the inability to take their products and sell them on the market (Ministry of Agriculture, Forestry and Water Management, Ministry Announcements). This "interactive" market offers a wide variety of products (fruits, vegetables, flour, pasta, milk and dairy products, meat and meat products, eggs, honey, alcoholic beverages, etc.), and agricultural producers deliver their products directly or by courier. services. The eMarket platform was also written about in the Netherlands. Namely, on the website Ministry of Agriculture, Nature and Food Quality in Holland the news was published that the *ePijaca* platform was launched in Serbia, which should connect farmers and buyers during the state of emergency, but they did not consider the sustainability of this platform after the end of the state of emergency (Ministry of Agriculture, Nature and Food Quality in Holland). By accessing the electronic database *ePijaca* (Ministry of Agriculture, Forestry and Water Management, ePijaca) we saw that there are 1,388 registered agricultural producers from all over Serbia who sell the most diverse agricultural products (status on day 24.08.2023).

Back in 2019, the idea of the National Alliance for Local Economic Development (NALED) was to introduce an electronic register of agricultural farms, payment of incentives, and renewal of farm registration. This idea was born on the basis of the fact that farmers spend a lot of time collecting and submitting documentation for applying certain incentives and measures. Also, officials waste a lot of time checking the submitted data. Therefore, the eAgrar software solution was designed, which would control the correctness of the entered data by viewing the electronic database of the real estate cadastre, the Ministry of Internal Affairs, the Agency for Business Registers, the Veterinary Administration, and other relevant institutions. Therefore, the holders of agricultural holdings would themselves enter data about the holding, the members of the holding, the plots on which they produce, the animals or the crops they grow (NALED, e-Agriculture).

In the meantime (since 2019), such a program has been developed, and from March 2023. the electronic register of agricultural holdings (eRPG), which is part of *eAgrara* (Ministry of Agriculture, Forestry and Water Management, eAgrar). It is important to mention that as a result of the COVID-19 pandemic, the planned activities for the implementation of the program "Improving the management of the register of agricultural holdings and approving national incentives in agriculture through the development of the portal - *eAgrar*" have slowed down. After the end of this crisis, Serbia managed to launch the *eAgrar* software on time, given that the agriculture and food industry sectors were not significantly affected by the crisis (Kisin et al., 2021).

At the end of 2022. the introduction of the electronic field book for tenants of agricultural land was announced in the next two to three years (the assumption is by 2024/2025). (https://naled.rs/vest-prijava-poljoprivrednih-gazdinstava-u-par-klikova-od-2023-7388). This announcement is aligned with the provisions of the Law on Amendments to the Law on Agricultural Land from 2017 (Official Gazette of RS, No. 80/2017). According to this Law, the tenant of state-owned agricultural land is obliged to establish a crop rotation and keep a field book for plant production.

After the introduction of the eAgrar software, Serbia was obliged to pass an amended law on incentives in agriculture that would include the application of the mentioned software solution. Accordingly, Table 1 provides a brief overview of the changes in the Law on Incentives in Agriculture and Rural Development that were adopted in 2016 and 2023.

Characteristics	Law on Incentives in Agriculture and Rural Development, 2016	Law on Incentives in Agriculture and Rural Development, 2023
Initiation of the procedure for exercising the right to incentives	In person at the Administration for Agrarian Payments	Electronically, through the eAgrar software solution.
Payment of incentives	To the designated account of the beneficiary of the incentive	To the designated account of the beneficiary of the incentive
Register of incentives in agriculture and rural development	It is conducted in electronic form	It is conducted in electronic form

Table 1. Changes in the Law on Incentives in Agriculture and Rural Development of Serbia between the two adoption periods, 2016 and 2023

Source: Law on Incentives in Agriculture and Rural Development, which was in force until April 29, 2023. year (Official Gazette of RS, No. 101/2016); Law on Incentives in Agriculture and Rural Development adopted on April 29, 2023. year (Official Gazette of RS, No. 35/2023).

Until the establishment of the eAgrar software solution, all applications for exercising the right to incentives were submitted in paper form. With the adoption of the amended Law on Incentives in Agriculture and Rural Development (2023), the submission of applications for incentives in paper form is abolished, and from the current Law on Incentives in Agriculture and Rural Development, we have singled out important facts that were introduced and refer to the functioning of the eAgrar software:

- Obligations for the incentive of the line ministry must not be greater than the approved value for a specific appropriation in that budget year;
- The eAgrar software solution is established and managed by the Administration for Agrarian Payments;
- The technical correctness and functioning of the eAgrar system is ensured by the state administration body responsible for these tasks;
- The software solution has a high level of reliability and trust in the time of electronic business and communications;

- In certain procedures for exercising the right to incentives through the eAgrar program, the competent authorities have the authority to assign marks of an internal nature to certain requests;
- If requests for exercising the right to incentives are not submitted through the eAgrar program, the director of the Administration for Agrarian Payments rejects them by decision;
- In order to exercise the right to incentives, all additional documentation is exchanged electronically.

Based on these facts, we conclude that the eAgrar program can significantly contribute to speeding up the procedure of receiving, reviewing, supplementing documentation (if necessary) and making a decision on accepting/rejecting the payment of incentives based on the Request.

In the continuation of the work, the Systematization of changes in the Laws on Incentives in Agriculture and Rural Development adopted in 2016 and 2023 is given. (Table 2).

Characteristics	Law on Incentives in Agriculture and Rural Development, 2016	Law on Incentives in Agriculture and Rural Development, 2023
Agricultural policy at the AP and LGU level (direct payments, namely rebates for storage costs in public warehouses, rebates for artificial insemination, as well as rural development)	~	✓
Direct Payments/Milk Premium (quantity per quarter; milk premium amount)	At least 3,000 l of cow's milk per quarter, or at least 1,500 l of cow's milk per quarter produced in an area with difficult working conditions in agriculture; the premium amount for milk is 0.06 EUR/l* of milk	There is no defined limit for the amount of milk delivered as a condition for payment of incentives; the premium amount for milk is 0.09 EUR/l*

Table 2. Systematization of amendments to the Law on Incentives inAgriculture and Rural Development of Serbia, 2016 and 2023.

		of milk
In livestock production, in addition to other incentives, there were incentives for lactating cows in the minimum amount of EUR 170.54* per head	~	
In livestock production, in addition to other incentives, an incentive for female calves from quality first-calf breeding cows is included in the amount of EUR 213.18* per head		✓
Basic incentives for plant production of 51.16 EUR/ha*, and only the area of land in own ownership up to 20 ha is taken into account	✓	~
For the basic incentives in crop production (per ha), the land that was leased based on a public tender is counted		~
In organic plant production, incentives are increased by a minimum of 40% in relation to the amounts of incentives for plant production and rebates for fuel and/or fertilizer and/or seeds.	~	~
In organic livestock production, incentives are increased by a minimum of 40% compared to the amounts of incentives in livestock	✓	~

*The original currency is RSD, but for the purposes of writing the paper, their values were converted into EUR according to the middle exchange rate of the National Bank of Serbia (NBS) as of April 28, 2023, because the new Law began to apply on April 30, 2023 (1 EUR = 117.2719 RSD).

Source: Law on Incentives in Agriculture and Rural Development, 2016; Law on Incentives in Agriculture and Rural Development, 2023.

Given that the current Law on Incentives in Agriculture and Rural Development shows the classification of incentives, acceptable measures, obligations of the beneficiaries of incentives and their payment, we can conclude that the initial hypothesis has been confirmed, i.e. to accelerate the process of production of agricultural products and food due to the accelerated procedure for submitting requests for incentives and their payment.

3. ADVANTAGES AND DISADVANTAGES OF DIGITALIZATION IN AGRICULTURE

According to the previous points, it was observed that the mentioned software solutions have more benefits than disadvantages, and we single out the most important ones:

- speed up procedures and application procedures on different grounds;

- no waiting in lines to submit various requests;

- timely adoption of decisions on the payment of subsidies based on submitted requests;

- There are no trips to other institutions in order to obtain certificates and collect documentation, but the data of the relevant institutions are combined;

- The introduction of such software solutions into the most diverse streams of society is desirable from the aspect of harmonizing national legislation with European standards,

- reduction of administrative costs.

When it comes to the shortcomings of the analyzed software solutions, as the biggest drawback in their implementation, we point out the age structure of the owners of agricultural farms and the level of their computer literacy, bearing in mind that they will use these applications. Radičić (2022) states that these problems can be solved by holding seminars, and trainings, opening call centers for assistance, visits to farmers, etc.

If we look at the advantages and disadvantages of digitization in agriculture, we highlight the views of Lioutas et al. (2021). They divided the advantages of digitization in agriculture into two groups, namely those originating from farms and those related to the environment of the farm. In this part of the paper, we highlight the following advantages of digitization in agriculture:

greater efficiency of agricultural holdings, increased production, reduced environmental pollution, globalization in food production, etc.

According to the previously mentioned authors, we highlight the disadvantages of digitization in agriculture, which they divided into three groups, namely: social (divisions between small and large farmers, as well as countries according to the level of development, workers with a low level of education hardly adopt changes); ecological (loss of traditional plant cultures); cultural (deviation from traditional agricultural production).

In general, we conclude that the implementation of digitization in agriculture, including aspects of precision agriculture, has more advantages than disadvantages, it is only a question of what goals we set in order to engage in agricultural production.

CONCLUSION

This paper gave an overview of research on digitization in the broadest sense, which was an introduction to the story of digitization in agriculture in theory and practice.

Serbia has shown that digitization has a positive impact on all aspects of society, and therefore on the progress of the entire country. A country's progress in the digital world will determine its efficiency and well-being due to the impact it has on the economy.

In this paper, certain activities that have been carried out in the direction of digitization in agriculture have been pointed out, but it has also been hinted at which activities are planned for the next period (2-3 years).

We concluded that social sciences alone cannot contribute to a greater representation of digitization in agriculture, which is why they need to be in constant contact with natural and social sciences. That is why future research on digitalization in agriculture should focus on multidisciplinarity in investigations, in order to unite different scientific areas and obtain adequate results.

The introduction of digitization in agriculture has also shown us that it contributes to greater data transparency, given that the electronically linked data are all from the relevant institutions and that the data is collected ex officio.

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