



STATE AND CHALLENGES FOR THE DIGITALIZATION OF AGRICULTURE IN BULGARIA

N. Kostadinova*

Faculty of Economics, Trakia University, Stara Zagora, Bulgaria

ABSTRACT

Digital agriculture in Bulgaria began its development in the last decade with the introduction of new technologies such as ground sensors, satellite imagery, GPS receivers in agricultural machinery and more. There are a number of companies in the country that create software products and applications aimed at the agricultural sector and especially at specific customers and according to their requirements. Software companies create web-based products and mobile applications for information visualization in order to control the work done and track activities on a farm.

One of the priorities for the new programming period of the EU CAP is to improve the dissemination of knowledge, innovation and digitalisation in agriculture and rural areas, which will significantly contribute to increasing the competitiveness of the agricultural sector and will ensure a higher return on investment. The aim of this study is to examine the state and challenges of digitalization of the agricultural sector in Bulgaria.

To achieve this goal, the following tasks are solved: to analyze the state of digitalization in Bulgarian agriculture; to identify trends in this area; to identify problems and challenges for the development of the agricultural sector in this direction.

Key words: agriculture, competitiveness, innovation

INTRODUCTION

The priorities in the field of EU information and communication technologies are presented in the following more important documents: Digital Agenda for Europe, adopted in 2010; Digital Single Market Strategy for Europe adopted in 2015 and Europe 2020 A strategy for smart, sustainable and prevailing growth. At European level, the main institution responsible for digitization in agriculture is the European Innovation Partnership on Agricultural Productivity and Sustainability (EIP-AGRI). According to the European Commission at EU level, there is a significant difference between

broadband coverage between rural and urban areas - in 2016, about 40% of households in rural areas have access to such internet. In Bulgaria at the moment there are no statistics on the degree of use of the Internet and digital technologies in the agricultural sector, which creates difficulties in analyzing this process.

According to Eurostat data for the period 2008–2018, the access of Bulgarian households to the Internet has significantly improved - respectively for households in densely populated areas (500 inhabitants / km²) - from about 40% to over 80%; for households in medium urban areas (from 100 to 499 inhabitants / km²) - from 20% to 70%; for households in sparsely populated areas (less than 100 inhabitants / km²) - from 15% to 60%. This upward trend in internet connectivity can be

*Correspondence to: N. Kostadinova, Faculty of Economics, Trakia University, Stara Zagora, Bulgaria, e-mail: nadya_kostadinova@yahoo.com

assumed to be valid for both rural households and farmers' households. (Bashev, 2020).

METHODOLOGY

The methods used to achieve the goal and solve the problems are analysis and synthesis, induction and deduction, axiomatic method, structural-functional approach, statistical calculations.

RESULTS AND DISCUSSION

According to Eurostat data on Internet access of households in EU countries in 2018, Bulgaria ranks last in all categories of regions compared to other member states of the union. But for the same year, compared to 2012, according to NSI data, the use of mobile devices for access to the Internet, outside the home or workplace - mobile phone, laptop or other mobile device - as such were used by about 70% of the at age population – in the group aged from 16 to 74 years only about 8% have not used such devices. It can be assumed that a significant proportion of farmers and members of their households use such devices to access the Internet.

Access to a standard broadband network should be provided for almost all households in rural areas (99%), as noted in the Rural Development Program of the Republic of Bulgaria 2014-2020. However, in sparsely populated areas, only 60% of households have access to the fixed broadband network, with the national average being 90% (MAF, 2015). In rural areas, only about 10% of households have access to next generation networks, and about 37% of these households have an internet subscription.

Bulgaria lags far behind other EU member states in terms of the use of digital technologies in the economy and society. For 2017 and 2018, the country ranks 26th in the EU in the integrated index of digital technologies in the economy and society - Digital Economy and Society Index (DESI, 2019). According to a large number of the observed common indicators under DESI, Bulgaria is significantly below the average level for the Union, and it can be assumed that for enterprises in the agricultural sector and the rural areas the situation is similar and even worse.

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In November 2018, the Ministry of Agriculture, Food and Forestry conducted a survey among agricultural countries on the digitalization of Bulgarian agriculture. The respondents are 258 agricultural holdings with a total arable area of about 602 thousand decares, of which over 11,200 decares of permanent crops, over 35,300 decares of pastures and meadows, as well as about 11,900 cattle and buffaloes, 12,800 sheep and goats, nearly 5900 pigs, 1 294 500 birds and 5400 bee colonies.

To the question "Are you familiar with the nature of digital agriculture?", At most - 49% of respondents answered that they are not familiar; 27% are partially familiar; 19% are moderately familiar and only 5% believe that they are familiar to a large extent (MAF, 2019). Relatively few - 14% of respondents use modern digital technologies on their farms - mainly GPS navigation systems, and the remaining 86% answered that they do not use such digital technologies. Regarding the question "Do you have a department or a specific employee who is specifically responsible for digitalization in your farm" only 8% answered that they have such an employee (about 20 of the surveyed farms), and the remaining 92% do not have such an employee.

To the question "Do you intend to link your production to digital technologies in the future" - at most - 38% answered that they do not intend to digitize production; 33% will digitize only some stages of it, and the remaining 29% intend to introduce digital technologies in the next 5 years. Regarding the question "What do you think would be the benefits for your farm in the introduction of digital technologies?" - at most - 22% answered that the efficiency of production will increase; 16% state that they will achieve better planning and management; 14% agree that productivity will increase; 12% - chose data acquisition and analysis; according to 9% competitiveness will be maintained; 4% -increase in turnover; 2% - indicate greater added value and the possibility to individualize the products; 1% indicate an acceleration of "time - to - market" and only 1% do not see the benefit of the introduction of digital technologies.

To the question "In which areas action is needed by the state administration regarding the introduction of digital technologies?" - the highest percentage - 21% indicate support for measures for additional training of employees, also 21% indicate tax incentives when planning measures and digitization of the activity; 18% - promotion of young professionals; 11% - introduction of internationally recognized processes for standardization and certification; also 11% - adaptation of data protection legislation; 11% - provision of highly reliable and high-speed networks; 7% - promotion of development activity.

In 2019, under the Horizon 2020 program, AgroHub.BG was established in Bulgaria. The main goals of this digital innovation hub are the digitalization of Bulgarian agriculture and rural areas through technologies such as blockchain, Internet of Things, etc .; increasing digital innovative technologies in the agri-food chain; providing access to up-to-date knowledge; testing and experimenting with digital innovations; cooperation with Bulgarian companies in order to assess the needs for digital skills and provide access to these skills.

Various interrelated measures have been taken in recent years to digitize the administration in the country's agricultural sector. The Ministry of Agriculture, Food and Forestry has established a large number of information systems, databases, registers such as Registers serving the general administration, Registers within the scope of Geographic Information Systems and others.

Also in 2019, a Strategy for digitalization of agriculture and rural areas of the Republic of Bulgaria was adopted. Its main goal is to turn the Bulgarian agricultural sector and related business into a high-tech, sustainable, highly productive and attractive area that will improve the living conditions of farmers in rural areas.

An expert assessment carried out in the same year (Bashev, 2020) found that there is significant variability in the degree of implementation of different types of innovation in the agricultural sector. The prevailing opinion is that the degree of implementation of new production methods,

new forms of organization and marketing, technologies of precision agriculture, process automation, incl. implementation and use of computers, internet, software, etc. There is a variation in the degree of use of digital services in different sub-sectors of agriculture, in agricultural holdings of different legal type and size, and in different regions of the country. Experts estimate that digital technologies, software, etc. are the most important and should be used to a larger extent in field cropproducting and significantly less in grain production and animal husbandry. In their opinion, the most important factors in the digitalization of agriculture and rural areas of the country at this stage are market demand, prices, competition, subsidies for new investments, and the activities of the Agricultural Advisory Service. The largest number of experts believe that improving the dissemination of knowledge, innovation and digitalisation in agriculture and rural areas outstandingly contributes to the realization of sufficient agricultural income and sustainability, increasing market orientation and competitiveness. According to the expert assessment, the level of public expenditures and investments for digitalization in the agricultural sector and for the introduction of innovations in this sector is low or very low.

Since Bulgaria's accession to the EU in 2007 to 2018, the European Agricultural Fund for Rural Development in the country has invested over half a billion euros in modernization of agricultural holdings. But for the last two programming periods, investing in digitalization has not been a priority. As a result, there is insufficient information on how much of the investment involves digitization and precision farming technologies. At present, the funds for such investments are private in nature and depend on the financial capabilities of farmers or entrepreneurs.

CONCLUSIONS

As a result of the study, several main conclusions can be summarized:

- The access of Bulgarian households from different regions to the Internet has significantly improved in recent years, but compared to EU

countries, Bulgaria is still dragging behind the pack;

- there is a great variability in terms of digitalization in the agricultural sector, in its individual sub-sectors, farms of different types and sizes, as well as in different regions of the country;

- the amount of investments, data security, as well as the qualification of the employees are the main obstacles according to Bulgarian farmers in the introduction and use of digital technologies in the agricultural sector.

The measures to be taken by the state in connection to the digitalization of the agricultural sector should be focused on increasing the digital skills of farmers and employees in the sector; encouraging young professionals; improving access to trainings and consultations; creating financial incentives by reducing the tax burden when implementing digital solutions at the agricultural or settlement level.

Digital technologies are the future of agriculture. They will facilitate the work of farmers and make their production more profitable. Combined with innovative genetics, and the risks related to climate change farmers will seek newer solutions to help improve production and resource use in agriculture.

REFERENCES

1. Bashev, Hr., 2020., Digitalization of agriculture and regions in Bulgaria. *Economics and Management of Agriculture*, issue 2, pp. 3-15
2. Nikolov, D., et. al., 2018, Innovative models for management of agricultural holdings in mountainous areas. IAI.
3. Fidanska, B and others. 2020; Search for digital services in Bulgarian agriculture, *Economics and Management of Agriculture*, issue 4, pp. 40-49
4. Bachev, H., Mihailova, M. (2019). State, Efficiency and Factors of Development of the System of Knowledge Sharing, Innovation and Digitalization in Agriculture. *Economics and Management of Agriculture*, 64 (4), 3-23 (Bg).
5. Bachev, H., Mihailova, M. (2019) Analysis of the state of the knowledge sharing and innovation system in agriculture in Bulgaria. *EconPaper*.
<https://econpapers.repec.org/d,er/pramprapa/94230.htm>
6. Trendov, N. M., Varas, S., Zend, M. 2019; Digital technologies in agriculture and rural areas. Briefing paper. Rome: Food and Agriculture Organization of the United Nations.
7. MAFWE. (2015) Agricultural and Rural Development Program, MAF.
8. MAFWE. (2019) Strategy for digitalization of agriculture and rural areas of the Republic of Bulgaria.
9. National Statistical Institute. (2019). https://infostat.nsi.bg/infostat/papes/module.jsf?x_2=12&lang=bg
10. DESI. (2018) .Bulgaria Report.
11. Eurostat. (2019). <https://ec.europa.eu/eurostat/data/browse-statistics-by-theme>