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DIGITALIZATION OF AGRICULTURE PUBLIC SERVICES IN SERBIA

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Abstract. *Digitalization, being one of the major drivers of change in the 21st century, has fundamentally altered the way the global economy and society thought to be developing. The digital transformation of agricultural systems will most certainly have effects on the creation of information and knowledge, the institutional environment and management, as well as relations between stakeholders, both private and public. Digitalization of public services in the agricultural sector is the part of a broader strategy of digital transformation of this economic activity, the expected outcome of which is the transition of traditional agriculture to agriculture 4.0 and digitalization of farms. Timely provision of appropriate information to farmers is essential to increase the efficiency and sustainability of small farms. Strengthening market activities, improving interaction with key stakeholders, better connecting agricultural producers and empowerment through access to information can be considered as the main benefits of ICT application in agriculture. However, critical factors for the success of digitalization of public services in agriculture, such as connectivity, usefulness of information content and the ability to make decisions based on information provided using ICT, affect the success of acceptance of changes, especially in developing countries.*

Key words: *digitalization, public services, agriculture, e-government, maturity models*

JEL Classification: Q16, L86, O33

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1. INTRODUCTION

Digitalization, as one of the most significant drivers of change in the 21st century, has fundamentally transformed the concept of development in the global economy and society. Information and communication technologies (ICT) have transformed products, processes, organizational structures, and business models in various industries. In agriculture, the role of ICT is evident in enhancing the precision of mechanization, automation, and the decision-making process. However, it is clear that the digital transformation of agricultural systems will also impact the creation of information and knowledge, the institutional environment and management, as well as the relationship between stakeholders, both private and public. Thus, in the era of ICT development, governments are faced with the important task of enhancing communication with citizens and business entities through the use of modern technologies. A large number of governments worldwide have implemented information and communication technologies to enable more efficient, cost-effective, and up-to-date communication with various stakeholders, as well as to develop e-government systems. In the broadest sense, e-government is defined as the use of ICT and the Internet to provide information to citizens, businesses, and other stakeholders (Mergel et al., 2019). More specific definitions of e-government emphasize the use of ICT by government agencies at various levels to redesign and transform relationships, as well as to provide services to different stakeholders (Abu-Shanab & Shehabat, 2018). These stakeholders include business entities (G2B), citizens (G2C), government agencies (G2G) and government and its employees (G2E) in all economic sectors.

The digitalization of public services in the agricultural sector is part of a broader strategy for the digital transformation of this economic activity, with the expected outcome being the transition from traditional agriculture to Agriculture 4.0 and digital farming. Timely provision of relevant information to farmers is crucial for enhancing the efficiency and sustainability of agricultural production, especially in the case of small farms. Strengthening market activities, improving interaction with key stakeholders, better connecting agricultural producers, and empowering them through access to information can be seen as the main benefits of applying ICT in agriculture. However, e-government in developing economies, especially in the field of agriculture, is still at the low level of maturity and its implementation faces numerous challenges (Meiyanti et al., 2018). Critical factors for the success of digitizing public services in agriculture, such as connectivity, the usefulness of information content, and the ability to make informed decisions based on ICT-provided data, play a significant role in the acceptance of change, especially in developing countries. Therefore, the aim of this study is to analyze the type of the services provided by e-government websites and web portals and to assess the level of digitalization of public services in agriculture in Serbia and other developing Balkan countries. Accordingly, the structure of the paper consists of three parts. The first part of the paper explains the potential of ICT for agricultural development and highlights the importance of government support in the digitalization of agricultural services. The second part presents briefly the models used for evaluation of the maturity of e-government services, while its implementation in the third part leads to assessment of Serbian e-government portal for agriculture and comparative analysis of the maturity state of e-government practices in the field of agriculture in the Balkan countries.

2. INFORMATIZATION AND E-GOVERNMENT SERVICES IN AGRICULTURE

Agriculture is a sector of strategic importance in many developing economies, and its sustainable development is becoming the most important goal, as it represents a critical source of livelihood. The high level of information of adequate quality becomes a principal condition for improving all areas of agriculture making the usage of ICT critical for generation, storage, analysis and dissemination of agricultural information (Zhang et al., 2016). Consequently, the contribution of ICT to agricultural development can be direct, in terms of enhancing productivity and minimizing environmental impact of agricultural activities, and indirect, in terms of empowering farmers to make informed and effective decisions which will positively influence the practices and outcomes in agriculture and related economic sectors (Ribeiro et al., 2021). In such circumstances, agriculture could be seen as a network of all sector-relevant entities, which, in modern business conditions, are increasingly connected by the need for information (Dhanaraju et al., 2022). Agricultural networks are often closed, with information being limited to specific purposes or inadequately managed for future access. This limited access hinders the flow of valuable data across the sector, preventing stakeholders from fully benefiting from shared insights. Inadequate management of information systems can lead to data being isolated or outdated, diminishing its potential to support long-term decision-making and innovation. For agriculture modernization, it is essential to develop open, well-managed, and accessible information systems that can evolve and be leveraged for future growth and sustainability. However, data generation and access remain the substantial impediment to development of knowledge-based agricultural information system (Antle et al., 2017). Considering the fact that agriculture system is affected by geographical, biological, environmental, technical, social and economic factors, decision makers in this economic sector require different kind of variables and attributes on factors determining agriculture business activities. Based on the level of decision-making, agricultural data can be generated at the micro (farm-scale) and macro (landscape-scale) level (Antle et al., 2014) by traditional and contemporary data sources (Janssen et al., 2017).

Agricultural data are traditionally collected by governments. Those sources publicly offer data that are standardized in format and gathered periodically. This data includes bio-physical data (crop varieties, yields, weather, climate and soil data, as well as other physical data describing a specific location), economic data (prices, information on products, suppliers and clients, payments, as well as policy information) and farm-specific data obtained from periodical surveys. The structured approach to generation of this type of data ensures consistency and reliability, allowing policymakers to track trends, assess outcomes, and make informed decisions based on up-to-date information. Other conventional data can be derived within research projects and special-purpose surveys for farmers and service operators' needs. This data is often of limited access, unstructured or not well managed for future usage. Considering that this data is collected for specific needs it may be inadequate for farmers' and policy makers' use if it is spatially or temporally inexplicit or irrelevant for decision-making, or collected with statistically non-representative samples.

Contemporary sources of agricultural data consider new data technologies, such as mobile technology, crowdsourcing and remote sensing, which enable collecting *in situ* data. Usage of mobile phones, GPS and other portable devices are especially important for gathering localized contextual information, since these devices act as sensors that directly place location- and time-based data in a cloud database (Milovanovic, 2023).

More location specific data can be collected using remote sensing technologies located on aircraft or satellite platforms, which enables gathering aerial and satellite images of the Earth's surface or specific objects to obtain the necessary data about the recorded surface or object. Recently, remote sensing has become increasingly used to monitor crop growth, soil moisture levels, and other critical factors that influence crop health and quality (Weiss et al., 2020). The various applications of remote sensing stem from the specific needs of interested parties, which may involve different spatial scales (e.g., local, regional, or global observation), temporal scales (ranging from real-time data to multi-year data), and precision levels (from low-resolution images to high-resolution and multispectral images). Crowdsourcing initiatives in agriculture involve non-professionals in collecting data through voluntary efforts. In this manner, citizens, small farmers and different kinds of organizations can provide data for their own purposes, while contributing to public databases. Data, information and knowledge inputs collected by crowdsourcing may be categorized in eight groups: land-use data, soil data, weather data, crop phenology, data on pests and diseases, yield and data on vegetation status, prices, and general agricultural knowledge (Minet et al., 2017).

The new types of data can significantly enhance agricultural statistics, whether for farm- or landscape-scale analyses purposes, by improving the definition of sample units and stratification. It can also be used to optimize sample allocation and sampling unit sizes (Carfagna & Gallego, 2005), contributing to spatial and temporal management of agricultural production. Enhanced agricultural information systems may also promote rural healthcare, education, training, social and business linkages (Lu et al., 2015), making it one of the most important driving forces of rural development. Therefore, agricultural informatization is often regarded as an indicator of agricultural development. It refers to the level of transformation of agriculture through the effective use of ICT and represents a long-term stimulus for its development. Both developed and developing countries' governments vigorously support expansion of agricultural information systems in order to enhance rural informatization. For a long time, most governments have provided a variety of services in agriculture, primarily through extension agents who serve as a link between farmers and the government (Barakabitze et al., 2017). The beginning of 21st century marked a significant period of liberalization and structural reforms in agriculture, which led to the introduction of numerous agricultural information system initiatives in developing and emerging economies. Strategical reforms were driven by the need to enhance market efficiency, decrease information asymmetry, and provide farmers with timely and locally information to reduce uncertainty in decision-making. Rapid development of ICT in the recent years enables expanding of the range of e-government services while changing fundamentally the way public services are deployed, delivered and managed (Ntaliani et al., 2010).

On the other hand, due to the fact that digital economy continues to grow, the digital divide becomes an increasingly significant issue. The digital divide refers to the gap between individuals who have adequate access to ICT and those who have limited or no access to it (Lythreatis et al., 2022). The factors influencing the digital divide in agriculture are primarily sociodemographic (e.g., age, gender, ethnicity, population density, geographic disparity, urbanization, remoteness, and country size), socioeconomic (e.g., education, employment status, occupation, and income), as well as personal characteristics of farmers, such as trust, motivation, privacy concerns, risk perceptions, values, attitudes, beliefs, and religion (Lythreatis et al., 2022). Thus, farmers may perceive e-government as an administrative burden rather than an efficiency increasing system (Reissig et al., 2022). In order to ensure successful implementation of e-government in agriculture, governments

should provide technical infrastructure and compelling content and services that meet farmers' requirements, while aligning the dynamics of e-government portals' development with the specific determinants of its adoption.

3. Evaluation of the Maturity Level of e-Government Services

Existing e-government maturity models, their advantages and disadvantages have been examined by systematic literature review since 2000. This review shows that e-government-maturity models are adequate for evaluation, measurement and benchmarking of e-government portals. Maturity model determines development stages and provides mechanism for measuring maturity of the e-government portal and benchmarking provided services and functionality. Those maturity models enable ranking and benchmarking of e-government portals, detecting weaknesses and providing information for enhancing their quality. Evolution of e-government portals is usually an iterative process from immature to mature e-government using sequential steps, with added and improved features and functionalities.

In this paper we are concerned about the similarities, differences, weaknesses and strengths of most cited models. Systematic literature review of large number of most cited e-government maturity models emphasized 4 main characteristics related to the e-government maturity models (Okan, 2024): number of stages, stage names, focus and features. All the maturity models present large similarities between them; in spite of different number of stages and stage names in various most popular maturity models their content may have numerous similarities (Hujran et al., 2023). Early maturity models contained 4 stages, while later models introduced 5 or 6 stages. Almost all of these models have 4 initial stages:

- Presence - online availability and presence of the portal
- Interaction – portal users (citizens) can interact with governments via the portal
- Transaction – complete transactions between the citizens and governments are supported
- Integration - information sharing between agencies (horizontal and/or vertical).

More recent models have introduced advanced features such as personalization, e-participation, and political participation. (Tejedo-Romero et al., 2022). Table 1 presents e-government maturity stages, their focus and features.

The first stage of all maturity models is based on providing online presence. Although most maturity models use different terms such as web presence, presence on the web, information, emerging information, information interaction, information dissemination, information publishing, online presence, cataloging, etc., the focus of this initial stage is primarily on publishing the necessary information.

The second stage of all maturity models focuses on enabling citizens to find the information they need on the portal and, more importantly, to interact with the government or even complete transactions with government units. Portals at this stage provide the following services: (1) enabling interaction between citizens and government, (2) transaction - allowing citizens to complete transactions online with government units, and (3) enhanced information – enhancing the quality of information.

The third stage of all maturity models focuses on transforming the e-portal into a true "one-stop shop" where citizens can seamlessly interact and transact with the government.

In this stage the most important feature is integration with single point of entry portals, with horizontal and/or vertical interoperability of several e-portals and systems.

The fourth stage of numerous maturity models is primarily focused on making the e-portal integrated and personalized to meet citizens' individual needs. Personalization means that each user (citizen) is able to tailor the look and content of the portal according to their own needs and interests. This stage is also characterized with allowing transactions between citizens and government units.

Table 1 E-government maturity stages, their focus and features

Maturity stage	Stage	Focus	Functions and features
1	Presence on the web	Presence	Presence on the web, information presence, information interaction, Web presence, information dissemination, information publishing, online presence, catalogue, cataloguing and basic site
2	Find information in the portal / interact and transact with the government	Interaction	Citizens can interact or communicate with the government
		Enhanced information	Enhanced quality of information
		Transaction	Citizen can make complete transactions over the web
3	Citizens interact and transact with the government	Transaction	Citizen can make complete transactions over the web
		Interaction	Citizens can interact with the government
		Integration (transformation, single point of entry)	Single point of entry portals (systems and e-portals are interoperable and work in harmony) "one-stop shop" e-portals
4	Transact with the government e-portal integrated and personalized	Integration (transformation)	Systems and e-portals are interoperable and work in harmony
		Transaction	Citizens can make complete transactions over the web
		Personalization	This means that the e-portal can be personalized according to the citizens' needs
5	E-participation and portal integration	E-participation (political participation)	Citizens can participate in forums, online votes and surveys
		Integration	Systems and e-portals are interoperable
6	Political participation and e-portal integration	Political participation	Citizens can vote and participate in surveys
		Integration	Systems and e-portals are interoperable and work in harmony

Source: Authors' illustration

The fifth stage of all maturity models is primarily focused on e-participation and portal integration. E-participation enables citizen' engagement in government decision-making and strengthens collaboration between governments and citizens through digital platform services such as online consultations, e-voting, and social media engagement (Shaikh et al., 2023). Its objective is to promote participation in policy-making with benefits for individual citizens and the society as a whole. Portals at this level provide different means for e-participation such as forums, surveys and collaborative methods

like participatory budgeting, citizen assemblies, citizen panels, community councils, and round tables (Tejedo-Romero et al., 2022).

The sixth stage of maturity models focuses on enabling political participation and further integrating the e-portal. Political participation includes online voting and participating in opinion surveys. Engaging citizens is beneficial to governments throughout the public policy process, from defining problems and identifying acceptable policy options to receiving feedback during the monitoring and evaluation of public policy initiatives and their outcomes.

Regarding the features of the maturity models' stages, several key elements can be identified as mutual and important across the most cited maturity models. These features include:

- "One-stop shop" - e-portal is a starting point for all e-government services, after a single sign on, all integrated services are available.
- User centricity - the services of the portal are designed with a focus on user needs
- Interoperability - allowing governments units to work together and providing mechanism for exchanging information
- Personalization - offering the possibility to the users to customize the e-portal's functionalities and layout, and to personalize content according to their needs and interests
- Payment – portals enable citizens to make secure payments by using credit cards or electronic banking
- E-participation - citizens are involved in the e-government policy making through various tools such as forums, online surveys, voting, and petitioning.

The first stage of almost all most cited and accepted maturity models focuses on web presence, while in the second and third stage it focuses on interaction. Transactions through the portal were introduced at stages 2, 3 and 4, while Integration is a part of stages 3 and 4. Advanced features such as e-participation and political participation are a part of the advanced stages 4, 5 and 6, depending of the number of stages. On the basis of analyzed models, a coding scheme was adopted to assess the maturity level of observed agricultural web portals and websites supported by the governments.

4. E-GOVERNMENT SERVICES FOR AGRICULTURE IN SERBIA

Agriculture in Serbia has a strategic role in economic development. However, despite the availability of natural, human, and scientific resources, its productivity remains at an unsatisfactory level (Mitrović et al., 2017). Thus, agriculture as well as rural development in Serbia is focused on two key objectives (Strategy of agriculture, 2014): (1) advancing agriculture through knowledge, new technologies, and standards, and (2) ensuring the sustainable management of rural areas. The proposed path of agricultural development in Serbia requires adherence to several key principles: sustainable development, encompassing economic, ecological, and social sustainability; polycentric development, which involves recognizing the specific needs and development priorities of microregions, various types of farms, and different population groups; modernization of agriculture; and stability and consistency in the agrarian state budget. An important determinant of the agricultural development process is the digitalization, which is in Serbia, as in other developing countries, supported by the government.

Serbia, as well as other countries in the Balkan region, started late with the development of e-government. The first strategy dedicated to e-government was introduced in 2009, and since then, significant efforts have been made to close the gap in e-government development between Serbia and the rest of Europe. The progress of e-government services can be assessed by the UN eGovernment Development Index (EGDI). The index is made up of three core components: Online Services Index (OSI), Human Capital Index (HCI) and Telecommunications Infrastructure Index (TII). According to the reports from 2014 to 2022, Serbia is ranked among the countries characterized by very high overall level of e-government development (fig. 1) supported by very high level of government online services development, level of education, and quality and accessibility of telecommunications infrastructure.

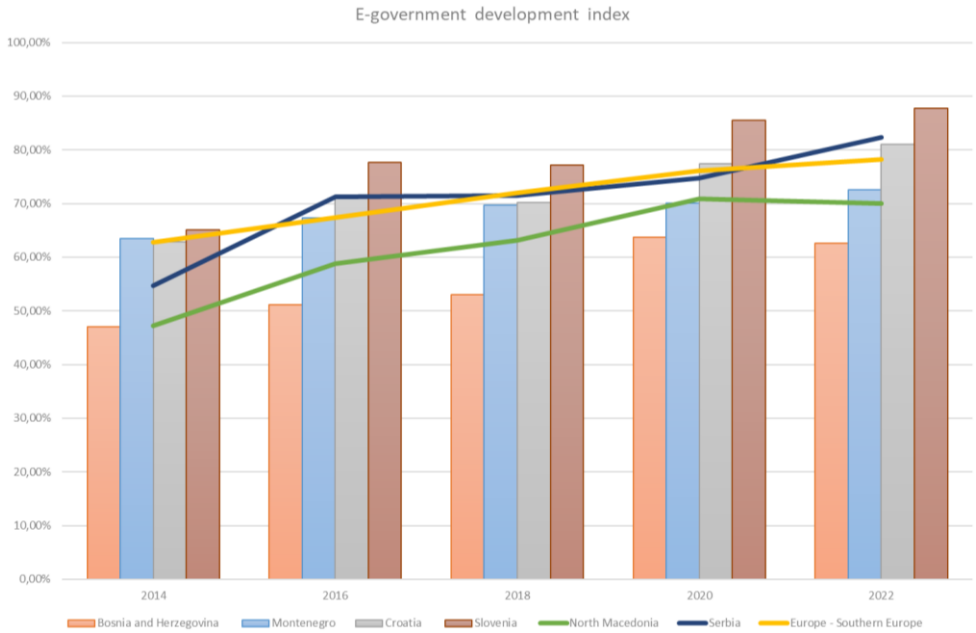

Fig. 1 EGDI for Balkan countries in the period 2014 - 2022
Source: Authors' illustration based on the data retrieved from UN E-Government Knowledgebase

Digitalization of specialized public services for agriculture in Serbia has been implemented quite recently. The *eAgrar* platform was launched in February 2023 by the Ministry of Agriculture of the Republic of Serbia, with the goal of simplifying the process of farm registration and submission of subsidy applications for farmers. Registered farmers are able to access and manage farm data through the portal on a daily basis, and submit online requests for registration, modification, and deletion of data from the Agricultural Register (AR) as well as requests for agricultural subsidies. This public service should enable time savings in processing requests due to the introduction of automatic verification of formal requirements and electronic processing of requests. It will lead to faster approval of subsidies and quicker payments, as well as reducing risk of

errors in the submission and processing of requests. Elimination of the need for printing and archiving paper documentation makes reporting and monitoring of subsidy statistics more efficient.

Gathering and analyzing data to acquire necessary information and knowledge on important issues in agriculture is crucial for both policy-makers and farmers. The most significant information they obtain comes from Serbia's agricultural census. The census is conducted every decade through farm visits, where enumerators collaborate with the owners to complete forms that are subsequently processed. The *eAgrar* should enable regulators to gather information more efficiently, but the capacities of this web portal are not fully used (table 2).

Table 2 Agricultural Census data and available data on the *eAgrar*.

No	Thematic areas	Agriculture Census	*eAgrar*
1	Agricultural holdings	+	+
2	Land	+	+
3	Irrigation	+	-
4	The use of mineral fertilizers, organic manure, and plant protection products	+	-
5	Soil cultivation and land maintenance	+	-
6	Livestock fund	+	+
7	Organic production	+	-
8	Agricultural machinery and equipment	+	-
9	Agricultural buildings	+	-
10	Labour force	+	-
11	Other farm data	+	-

Source: Authors' presentation based on comparative analysis of the data provided by the eAgrar and statistical publication based on agricultural census in 2012

In order to evaluate the level of maturity of e-government for agriculture in the Republic of Serbia, the content and provided services of web portal *eAgrar* were explored. Moreover, individual websites and web portals providing public services for agriculture in the Balkan region countries were analyzed (table 3). Comparative analysis of the frequencies of identified content or services ("+" symbolizes that service or content is offered, and "-" symbolizes the lack of service or content) is adopted to assess the level of development of agricultural e-government portals. It can be observed that governments in this region provide variety of services for agriculture, which are in Serbia (SRB) and North Macedonia (MKD) offered through specialized web portals, while in Republic of Srpska (BIH-SRB), Slovenia (SVN), Croatia (HRV) and Montenegro (MNE) agricultural e-government services are part of general e-government portal. The most common types of services are e-registration, user guidance, notifications, helpline and email consultation. All websites and web portals provide insight into rules and regulations and policies information, as well as application documents. Specialized services, such as weather reports and research surveys, are offered by only one web portal (MKD), while integration with other public services can be observed only in the case of MKD agricultural e-government portal. Online payment transactions are not supported via observed agricultural e-government websites and web portals.

Table 3 Types of services provided by e-government websites for agriculture in the Balkan region countries

Type of service	Stage	SRB	BIH-SRB	SVN	HRV	MKD	MNE	%
Useful links	1	+	+	+	+	+	+	100.00
Notifications / results	1	+	+	+	+	+	+	100.00
Helpline	2	+	+	+	+	+	+	100.00
Rules and regulations	1	+	+	+	+	+	+	100.00
Email consultation	2	+	+	+	+	+	+	100.00
User guide	1	+	+	+	+	+	+	100.00
Policies information	1	+	+	+	+	+	+	100.00
Application forms	2	+	+	+	+	+	+	100.00
E-registration	2	+	+	+	+	+	+	100.00
Downloads forms and other documents	2	+	+	+	+	+	-	83.33
Reports	1	-	+	+	+	+	+	83.33
Complaints	2	+	+	+	+	+	-	83.33
Publications	1	+	+	-	+	+	+	83.33
Information about acts and laws of relevant department	1	-	+	+	+	+	+	83.33
Press release	1	-	+	-	+	+	+	66.67
Archives	1	+	-	-	+	+	+	66.67
FAQs	2	-	-	-	+	+	+	50.00
Info desk	2	+	+	-	-	+	-	50.00
Tender notice	2	-	-	-	+	+	-	33.33
Attached departments	4	-	-	-	-	+	-	16.67
Projects details	1	-	-	-	-	+	-	16.67
Organ gram	1	-	-	-	-	+	-	16.67
Weather reports	1	-	-	-	-	+	-	16.67
Research survey	2	-	-	-	-	+	-	16.67
Annual plans	1	-	-	-	+	-	-	16.67
Online payment	3	-	-	-	-	-	-	0.00

Source: Authors' illustration

Analysis of collected data on the offered type of public e-services for agriculture showed that observed websites and web portals are not equally developed (table 4). None of the observed portals support complete transactions via web site. North Macedonia has the highest level of supported services (almost all observed services in the stage 1, and completely provided services in the stages 2 and 4). Croatia ranks second with significant coverage of services at stages 1 and 2. The observed websites of the Republic of Srpska and Montenegro have rather similar level of development with slight difference in the

Table 4 Development level of e-government websites by elaborating types of services

Country	Stage 1 Presence	Stage 2 Interaction	Stage 3 Transaction	Stage 4 Integration	Total
North Macedonia	92.86%	100.00%	0.00%	100.00%	92.31%
Croatia	78.57%	80.00%	0.00%	0.00%	73.08%
Republic of Srpska	64.29%	70.00%	0.00%	0.00%	61.54%
Montenegro	71.43%	50.00%	0.00%	0.00%	57.69%
Serbia	50.00%	70.00%	0.00%	0.00%	53.85%
Slovenia	50.00%	60.00%	0.00%	0.00%	50.00%

Source: Authors' calculation

range of services and content provided within stage 1 and 2 – the BIH-SRB website is more interactive, while the HRV website is more informative. The SVN website of agriculture e-government provides the narrowest group of services and content to the users.

When it comes to Serbia, the website of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia provides general information and almost all of types of services listed in Table 3, including documents (regulations, laws, market reports), public procurements and financial plans and reports, administration and organizational structure, forms and useful documents for local support programs for agriculture and rural development. However, *eAgrar* portal is more oriented towards farms registration, online application and processing of requests for subsidies, premiums and other incentives in agriculture. Agricultural web portal in Serbia is designed as a standalone, without direct connection with Serbia's general e-government portal *e-Uprava* and without integration of services offered by that general portal. It covers 50% of the observed services at stage 1 and 70% at stage 2. Low level of provided services could be justified by the fact that most of these services are part of general web portal, while only limited number of services are offered by agricultural web portal. Future development of the *eAgrar* portal should provide transaction services (Stage 3) and, more importantly, integration (Stage 4) with data of the real estate cadaster (within the official records of the Republic Geodetic Institute) and tax administration, as well as government administrations for agricultural land, agrarian payments, veterinary administration etc.

5. CONCLUSION

The intensification of agriculture, which is essential to meet the demands of a growing population and address the challenges of climate change, on the one hand, and the lack of timely and relevant information and services related to agricultural practices, on the other, has gained significant attention from policy-makers in recent decades. In today's globalized market economy and increasingly complex agribusiness landscape, the traditional approach to information dissemination and service delivery, which mainly depends on extension agents and conventional media, has become inadequate in addressing the growing needs for information and services within the farming community. Information and communication technologies offer promising opportunities for sharing information and providing services to rural communities. Various ICT-based government interventions, part of e-government initiatives, are currently reshaping the agricultural landscape in developing countries. Compared to traditional methods, ICT-based delivery ensures the timeliness, accuracy, and quality of information and services, while minimizing costs.

This study based on the content analysis of e-government websites and web portals in developing countries in the Balkan region showed that these countries have rather immature e-governance practice in the field of agriculture. With the exception of the agricultural e-government web portal in North Macedonia, all observed e-government websites and web portals are at the second stage of maturity. Serbian e-government web portal is restricted to a limited set of government services, and the most important ones are registration of farms and online submission of forms for subsidies. Users can find up-to-date information about available calls for various subsidies and can interact or communicate with the government through different channels (i.e. info desk, email consultations and helpline), enhancing the efficiency of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia. Accordingly, *eAgrar* provides basic information about registered farms, while

online payments are not included in its service. Very high EGDI ranking of Serbian e-government implies strong capacities for further development of e-government in more specific areas, such as agriculture.

Further development of agriculture e-government services will be determined by the dynamics of agricultural development and sociodemographic trends in rural regions in the Republic of Serbia. The current state shows that family farms managed by individuals older than the age of 65 make up approximately 99% of all agricultural entities in Serbia. The average cultivated area by family farms is 4.59 hectares, while the most dominant farms are those with holdings up to 2 hectares (47.23%) and holdings from 2 to 5 hectares (28.86%). The level of applied mechanization in agricultural production is low and equipment is rather obsolete. In such circumstances, there are no adequate infrastructure and incentives from farmers to adopt the more sophisticated agricultural information systems and enhanced e-government services. Thus, it can be expected that full potential of *eAgrar* will be used in the future period.

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DIGITALIZACIJA JAVNIH USLUGA U SEKTORU POLJOPRIVREDE U SRBIJI

Digitalizacija, kao jedan od najvećih pokretača promena u 21. veku, u potpunosti je promenila koncept razvoja globalne privrede i društva. Digitalna transformacija poljoprivrednih sistema će, vrlo izvesno, imati efekte na kreiranje informacija i znanja, institucionalno okruženje i upravljanje, kao i odnose između stejkholdera, kako privatnih tako i javnih. Digitalizacija javnih usluga u poljoprivrednom sektoru je deo šire strategije digitalne transformacije ove privredne delatnosti, čiji je očekivani ishod tranzicija tradicionalne poljoprivrede ka poljoprivredi 4.0 i digitalizaciji poljoprivrednih gazdinstava. Pravovremeno pružanje odgovarajućih informacija poljoprivrednicima je od suštinskog značaja za povećanje efikasnosti i održivosti malih poljoprivrednih gazdinstava. Jačanje tržišnih aktivnosti, poboljšanje interakcije sa ključnim stejkholderima, bolje povezivanje poljoprivrednih proizvođača i osnaživanje kroz pristup informacijama se mogu smatrati osnovnim benefitima primene IKT u poljoprivredi. Međutim, kritični faktori uspešnosti digitalizacije javnih usluga u poljoprivredi, kao što su povezanost, korisnost informacionog sadržaja i mogućnost da se donose odluke na osnovu informacija prikupljenih uz pomoć IKT, utiču na uspešnost prihvatanja promena, posebno u državama u razvoju.

Ključne reči: *digitalizacija, javne usluge, poljoprivreda, e-uprava, modeli zrelosti*