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THE SITUATION AND TENDENCY OF IT APPLICATION IN SOUTH EAST EUROPEAN COUNTRIES

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ABSTRACT

Modern business trends in agriculture include increasing the productivity and efficiency of agricultural production in order to achieve a competitive position in the market. The growth of the population imposes an increasing need for agricultural food products, accessibility of products and the necessity of preserving the environment. In order to ensure the long-term sustainability of the agricultural sector in a dynamic environment, it is necessary to make timely business decisions. The use of information technologies in agricultural farms, primarily computers and the Internet, enables agricultural producers access to a large amount of information. The aim of this paper is to examine the current level of IT usage in the markets of the countries of South East Europe, with an emphasis on the agricultural sector, as well as to analyze future trends in the development of modern technologies. The paper uses the data of the Statistical Office of the Republic of Serbia and the EUROSTAT database. The survey covers the period 2009-2018, which analyzes the frequency of using computers, the Internet and e-commerce.

Key words: IT, market, e-commerce, Internet

INTRODUCTION

More and more globalization is increasing pressure in agricultural producers, especially in developing countries. In order to take advantage of the positive effects of globalization, it is necessary to adapt existing mechanisms of trade and transfer of technologies in the agricultural market in accordance with changed market conditions. Historically, there has been a significant transformation in the agricultural sector. In the past, agricultural production was driven by supply, while today it is driven by demand. However, in the future, agriculture will be guided by information (Milovanović, 2014). According to FACET (2013), information technologies in agriculture have influence on the improvement of competitiveness of agricultural producers by finding new customers, using market information for optimal product sales and procurement of inputs, introducing quality standards, more efficient production management, better planning of future business processes as a result of much more data analysis etc. Timely information and precise knowledge-based agriculture become the leading factors of sustainable agriculture. Agricultural producers should be aware of the opportunities offered by information technology and the Internet by providing information important for managing the process of agricultural production.

Information technologies in the 21st century are becoming a necessary condition for modern agribusiness. The recent modest use of information technology in agriculture is explained by economic arguments (Karadzic, 2003). Farmers generally prefer other strategies to increase profitability, such as buying cheaper resources or simplifying the production process. Namely, the Republic of Serbia, as a predominantly rural country, has a large share of rural estate in the total population. Agricultural production in total gross domestic product accounts for almost 11% (2018). In the structure of agricultural households, the dominant role

is played by family farms with an average land area of 4.55 hectares, which predominantly apply an extensive method of agricultural production. The level of education and the percentage of poverty in rural areas are not at an enviable level, and the degree of repulsiveness towards innovation in these areas is relatively high. The vigorous growth of market development has imposed the need for greater efficiency and productivity. In order to keep up with the changes and remain competitive, agricultural producers resort to the means by which they can intensify agricultural production with as little cost as possible. Insufficient information and low level of ecological awareness among farmers leads to excessive use of chemicals. Given that the Republic of Serbia is on the path to joining the European Union, new demands are imposed which imply certain quality standards and ecological methods of production. In order to survive on the global market, agricultural producers will have to adapt to new trends based on modern technologies, knowledge and information. Farmers will strive to apply information technologies that support operational aspects of agriculture, support for real-time decision-making via broadband wireless Internet connections (Karadžić, 2003).

The integration of information technologies into the agricultural sector resulted in the emergence of IT applications, the Global Positioning System (GPS), the Geographic Positioning System (GIS) and remote detection (Kleut *et al.*, 2018). The introduction of information technologies in agriculture enables the development of new concepts of agricultural production, first of all, the concept of precise agriculture, situational action on the occurrence of pests or the emergence of conditions for the development of the disease, etc. The precondition of precise agriculture is based on a large number of precise information necessary for decision making (Marković *et al.*, 2013). The concept of precise agriculture implies the optimal use of agricultural inputs, that is, pesticides, chemical fertilizers, water and irrigation systems, and waste management in agriculture (Legg *et al.*, 2001). The use of information technology in the agricultural sector is much less represented than in other sectors and it is necessary to give this topic a greater significance. The aim of this paper is to examine the current level of use of information technologies in the countries of Southeast Europe, especially in the agricultural sector, as well as to analyze future trends in the development of modern technologies.

MATERIAL AND METHODS

The paper uses the data of the Statistical Office of the Republic of Serbia and the EUROSTAT database. The research relates to the period 2009-2018, which analyzed the frequency of use of computers, the Internet and e-commerce. The countries of South Eastern Europe analyzed in the work are the Republic of Serbia, Croatia, Romania and North Macedonia. Standard statistical and mathematical methods have been used in this paper. The intensity of changes is quantified by calculating the rates of change with the most adapted trendlines in each country, when it comes to electronic commerce at different times. The examined data were processed with standard statistical measures: Average of value (\bar{X}), Minimal (min) and maximal (max) value of characteristics in observed period, Coefficient of variation (Cv), Annual change rate in % (r). The change rate is calculated directly from the absolute values of data of the analysed series using the following expression:

$$r = (G - 1); G = \left(\frac{Y_n}{Y_1}\right)^{\frac{1}{n-1}}$$

Where is:

r - annual rate of change

G - constant relative change of value

Y_n - the absolute value of the last member of the series

Y_1 - the absolute value of the first member of the series

n - total size of the series

RESULTS AND DISCUSSION

The introduction of innovations in any field aims to improve the current situation. The limiting factors of the implementation of information technologies in Serbian agriculture are unfavorable age and education structure. According to Kleut *et al.* (2017) in the structure of agricultural producers dominated by farmers aged 65 or more with a share of 33.05%, with the possession of only practical experience. The share of agricultural producers with completed secondary education is 32%, and the finished faculty has only 6.5% of farmers. A similar educational and age structure is also present in other countries of Southeast Europe.

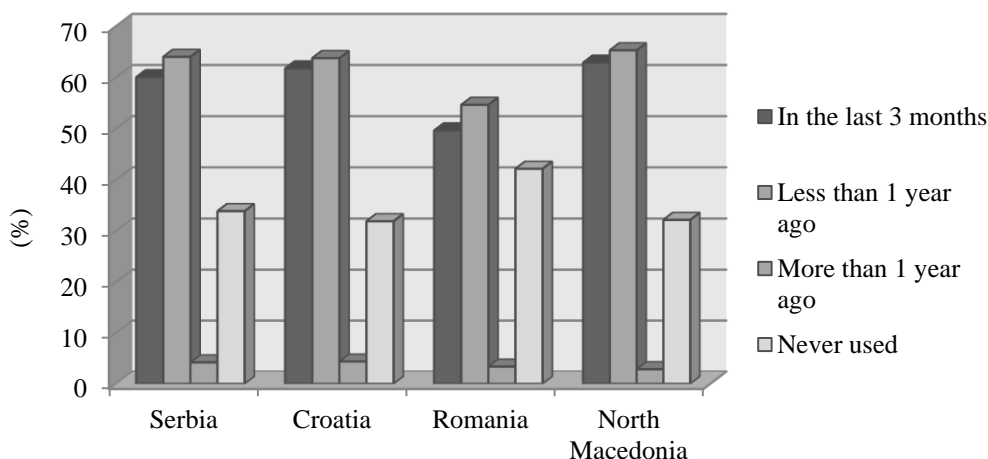


Figure 1. Computer Usage Frequency in South East Europe (%)

Source: Author's calculation

According to Eurostat data, the most common use of computers in all analyzed countries in the last year, or in the last 3 months. On average, 30% of individuals have never used a computer and this percentage is relatively uniformly represented in all analyzed countries. On average, the most common use of computers in the observed period was recorded in North Macedonia (Figure 1).

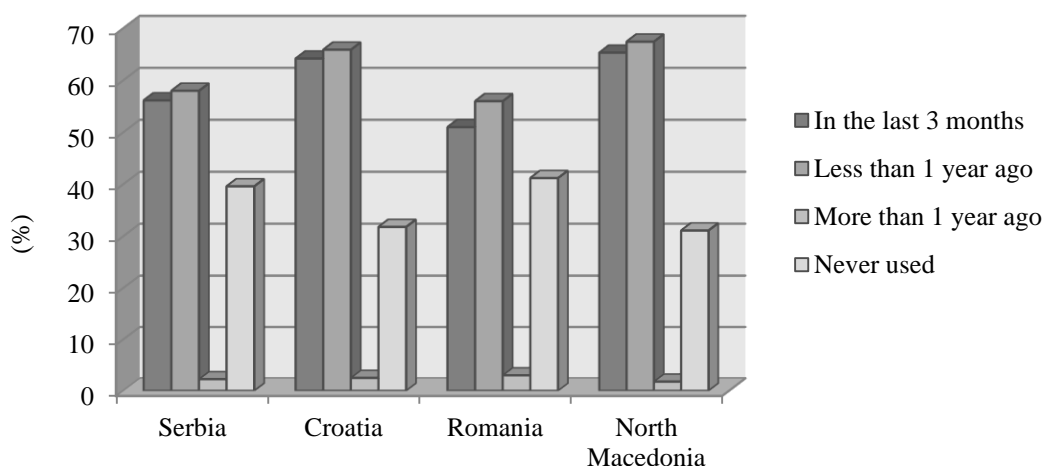


Figure 2. Frequency of Internet usage in the countries of South-East Europe

Source: Author's calculation

Considering the frequency of using the Internet in the countries of South-Eastern Europe, similar conclusions have been drawn. In the analyzed time period, individuals used the Internet most frequently in the last three months, and 36%, on average for all countries, never used the Internet. The largest share of Internet usage is also in North Macedonia, although other countries do not lag behind percentage in relation to the said country (Figure 2).

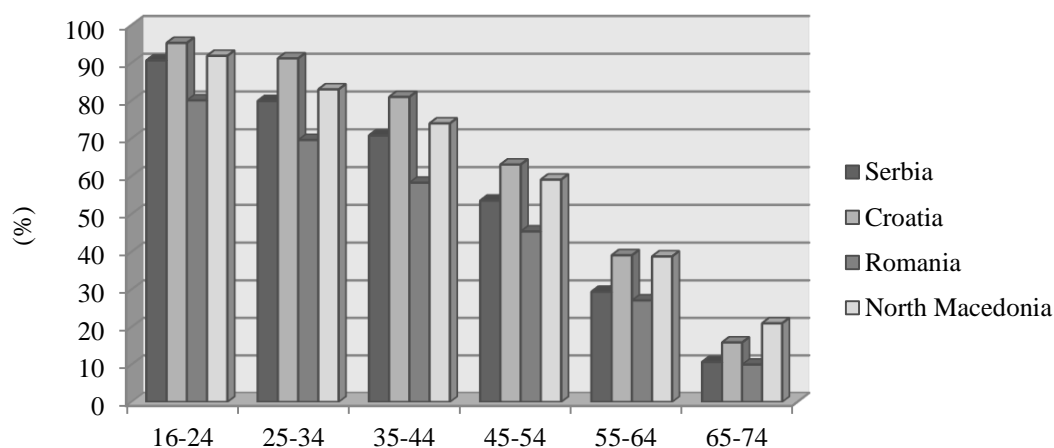


Figure 3. Internet users (in the last 3 months) by age (%)

Source: Author's calculation

For the analysis of the use of the Internet by age category, the following interval age groups were formed: 16-24, 25-34, 35-44, 45-54, 55-64, 65-74 years of age. The analysis found that the highest percentage of respondents using the Internet belongs to age groups aged 16-24 (26%) and 25-34 years of age (24%). In a further analysis, the focus will be on the age group that is most represented when it comes to using the Internet. Observing the countries of Southeastern Europe, the highest percentage of respondents in the analyzed age category is represented in the Republic of Croatia, in which in the last year of the observed period, as many as 100% of individuals aged 16-24 were using the Internet. Second place is North Macedonia with more than 92% of individuals, of the total number who used the Internet, while in this age group the least percentage of respondents using the Internet in Romania are on average, with an average of 80%, which is the lowest compared to other observed countries (Figure 3).

Electronic trading fundamentally changes its way of business. It allows retailers to target specific groups of consumers, offer loyalty programs, and more easily and quickly adapt to new trends and consumer demands (Zoroja, 2011). Agricultural producers through e-commerce can facilitate the procurement of inputs necessary for agricultural production, as well as the placement of products on the domestic and foreign markets. According to Fecke *et al.* (2018) e-commerce is still not widespread in agriculture. E-commerce of agricultural inputs should be based on trust, quality of services and timely delivery, given the specific character of agricultural production.

Table 1. E-commerce - January-March 2018 (%)

Variable	Mean	CoefVar	Minimum	Maximum	Rate of change
Serbia	18.81	47.27	6.50	30.90	18.91
Croatia	18.20	40.86	6.00	27.00	18.18
Romania	6.20	60.73	2.00	13.00	23.11
N. Macedonia	7.33	75.31	2.00	19.00	36.02

Source: Author's calculation

Table 2. E-commerce - Less than 1 year ago 2019 (%)

Variable	Mean	CoefVar	Minimum	Maximum	Rate of change
Serbia	8.91	42.67	4.00	14.60	15.47
Croatia	24.60	34.24	10.00	35.00	14.93
Romania	9.40	59.59	2.00	20.00	29.15
N. Macedonia	10.56	67.01	3.00	25.00	30.76

Source: Author's calculation

Table 3. E-commerce - Never used (%)

Variable	Mean	CoefVar	Minimum	Maximum	Rate of change
Serbia	66.12	23.28	45.40	87.40	-7.01
Croatia	37.30	9.87	31.00	42.00	-3.05
Romania	41.40	12.69	33.00	48.00	-1.36
N. Macedonia	55.89	7.61	49.00	61.00	-0.31

Source: Author's calculation

The analysis found that the highest percentage of respondents (62%), in all countries, have never used electronic commerce, or shopping over the Internet. The largest percentage of individuals who have never used electronic commerce services have been registered in the Republic of Serbia, and the largest percentage of respondents using this service has been registered in the Republic of Croatia in the last year. By data processing, the results of the survey show that in the last three months there has been a trend of growth in the use of e-commerce in all countries, most notably in North Macedonia, at a rate of 36% (Table 1). The percentage of individuals who have never used e-commerce has recorded a downward trend in all countries, especially the Republic of Serbia, at a rate of 7%, which points to the development of this service in the observed countries (Table 3).

CONCLUSIONS

The agricultural sector is a promising market for the implementation of modern technologies. Namely, the development of the economy and the food production industry can not survive without the information technologies. An essential condition for the improvement of all areas of agriculture is adequate and timely information. The importance of information is particularly high in developing countries, which seek to enter larger markets. First of all, it refers to the countries of South-Eastern Europe that intend to join the European Union. The analysis found that the highest percentage of respondents using the Internet belongs to age groups aged 16-24 (26%) and 25-34 years of age (24%). However, the age group of 16-24 years is not dominant in agricultural production, because it is too young to lead production, but announces a good prospect of using IT without prejudice and resistance. The largest percentage of individuals who have never used electronic commerce services have been registered in the Republic of Serbia, and the largest percentage of respondents using this service has been registered in the Republic of Croatia in the last year.

The quality of life in rural areas can also be improved with information that enables better decision-making. Information technology plays a major role in supporting the transformation of rural areas and agriculture. Also, the rapid development of information technology enables the expansion of electronic services in agriculture, which can contribute to increasing the competitiveness of agricultural producers.

Better communication and access to information are directly related to socio-economic development. However, agricultural producers continue to have resistance to innovations, which are unknown to them, regardless of the fact that with the help of them, they can make timely decisions on improving agricultural production. There are arguments that indicate that the economic value of information technologies in agriculture will increase, which will directly affect their acceptance by farmers.

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