
PERCEPTION OF SMALL FARMERS IN SERBIA REGARDING THE USE OF ICT AND POSSIBILITIES OF ORGANIC AGRICULTURE

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ARTICLE INFO

Original Article

Received: 29 November 2019

Accepted: 12 December 2019

doi:10.5937/ekoPolj1904989I

UDC 631.1.017.3:631.147(497.11)

Keywords:

organic agriculture, small farmers, information communication technologies, education, Serbia

JEL: C12, C83, O13, Q10

ABSTRACT

During the last two decades there is a growing awareness of the importance of introducing organic agricultural production in Serbia due to issues of health, environmental protection and need for more sustainable agriculture. There is a need for education of small farmers on the possibilities of organic production and significance of information technologies for education, production and marketing. This paper aims to examine the perception on the possibilities of organic production and ICT use concerning their level of education. The study has included 143 farmers from Raška district, municipality Kraljevo. The statistical ANOVA analysis has been done by using the software package SPSS18 to explore an impact the education has on the perception of small farmers on the use of information technologies in education, production, and marketing of agricultural products. The results show statistically significant difference in the perception of small farmers on the usage of information technologies regarding their level of education.

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Introduction

The need for the better-quality agricultural products is on the rise, for both conventional and organic products. And one of the main questions that worry today's population is: are we eating healthy agricultural products (Tasiopoulou et al., 2007). Thus, the need for organic agricultural products is increasing not only in the developed countries, but in the emerging markets, as well.

During the last two decades, in many countries, there is a growing awareness of the importance of introducing organic agricultural production due to the issues of environmental protection, a need for more sustainable agriculture, population health concerns, etc. Organic production, among others, includes using less or no pesticides and synthetic fertilizers, using bio fertilizers, breeding free range livestock and poultry, decreasing the pollution (Milenković, Tasić, 2013; Nikolova, 2013; Vlahović et al., 2015; Mladenovic et al., 2016; Golijan et al., 2017; Krstić et al., 2017; Yildirim et al., 2018). Organic products are richer in vitamins and minerals, and are of a better quality than the conventional ones (Komorowska, 2014; Barjaktarović et al., 2016; Nikolić et al., 2017). Selling organic agricultural products at the local markets has an impact on economic development of the region and on environmental protection as it saves energy and decreases air pollution levels (Dantsis et al., 2009).

The production of organic goods is rapidly increasing in the 21st century, thus becoming important economic factor, and the demand in the EU countries grows between 20 and 25 per cent annually and the share of organic agricultural lands increases about 10 per cent annually (Barjaktarović et al., 2016, Branzova, 2017).

Agriculture's contribution to Serbia's GDP constantly remains high. (Pažun et al., 2016a), but still is necessary adjusting economic policy due to prices and competitiveness of domestic agricultural products (Pažun et al., 2016b; Kranjac, Tomić, 2017). Officially, organic production in the Republic of Serbia has begun in the late 1980s and early 1990s (Tomaš-Simin, Glavaš-Trbić, 2016) and it is regulated by the Law on organic production from 2010 (Zakon o organskoj proizvodnji, 2010). Just in last couple years, in Serbia, the organic area increased approximately fourteen times compared to 2008, when began to keep a record of organic production. (Djelic et al., 2019)

Like in other countries in Europe (Kyrylov et al., 2018), especially developed countries, the demand for organic agricultural goods in Serbia is rapidly increasing, nevertheless the domestic organic production is not following the growing demand for the organic agricultural commodities (Ljumović et al., 2015). Overall, Serbian agriculture is in the process of adjusting to the market conditions (Langović Milićević, et al., 2014), there is diverse agriculture production in Serbia, but the share of organic agricultural products is still rather small. The most promising organic agricultural products in Serbia are fruits, namely plums, raspberries, apples, (Milenković, Tasić, 2013).

The possibilities for organic agriculture products' export are almost limitless, as many European countries (Germany, Austria, Sweden, Switzerland, and Denmark) have

a great demand for organic agricultural products (Gajdić et al., 2018). Other than environmental, climate, and market issues, the most disruptive factors for organic agricultural production are lack of funds (Ljumović et al., 2015) that would cover conversion and other costs, inexperience in products' marketing (Gajdić et al., 2018), and all of that can be applied to the Republic of Serbia.

The other problem is lack of interconnections between small agricultural producers in Serbia, as well as the communication with the processing industry representatives and the market. (Ljumović et al., 2015). Also, lack of government and local government financial aid and doubts about nongovernmental institutions and financial institutions funding plays an important role in deciding against converting into organic agricultural production of the small agricultural producers. Many countries are aware of this problem, and, for example, Turkey from 2005 has developed numerous programs of subsidizing the organic agricultural producers in order to increase the economic feasibility of organic agricultural production (Konyali et al., 2018). There is a notion that the younger farmers are more likely to undertake a long and expensive project of converting to organic productions for the reasons of economic prosperity, environmental protection and health issues, so the most programs are aimed at younger population.

On the other hand, information technology is changing the world, therefore agricultural sector. Digital technologies have a strong influence on all aspects of society, therefore can offer valuable solutions to problems and thus provide various opportunities for improving the agricultural sector, both in developed and developing countries. New paradigm regarding high technology development, natural resource protection, is so called precision agriculture, which has been the main challenge for EU agriculture (European Parliament, 2014). The focus is on optimization of agricultural production and profitability.

Materials and methods

The purpose of this research is to analyse the perceptions of small farmers of Raška district, municipality Kraljevo, villages Lazac and Samaila on the possibilities of organic production and the use of information technologies in education, production, and marketing of agricultural products concerning their level of education.

The villages Samaila and Lazac are situated between towns Kraljevo and Čačak. While Samaila is situated mostly on the flat land, Lazac is in the mostly hilly area. Samaila is spreading on 23.33 km², and Lazac is spreading on 21.75 km² (Municipality of Kraljevo, 2017). According to the Municipality of Kraljevo (2017) official documents, Samaila consists of 485 families and 1466 inhabitants and Lazac of 249 families and 695 inhabitants. The population has been decreasing during the last fifty years, according to the Serbia Survey data (Municipality of Kraljevo, 2017). The survey included 143 adult respondents of the above-mentioned population that have been fully or partially involved in agricultural production.

The research has been conducted from July 18th until August 10, 2019. The structured questionnaire has been developed via the Google forms platform. Because of the occasional disruptions in Internet connection and the often older population, the data has

been collected in three methods: in the first approach, two volunteers have been carrying laptops with the access to the forms and the participants filled the forms by themselves; in the second method, the volunteers have been reading the questions or statements and the possible answers to the participants (mostly elderly) and the participants declared the proper ones that the volunteers marked in the proper form; and in the third approach, in the areas, predominantly in Lazac village, with the insufficient access to the Internet, the volunteers have been carrying the paper forms, which the participants filled out and then the volunteers have placed them into the Google form in an exact manner.

In the first part of the survey, the participants have had the opportunity to state their opinions on the organic agriculture and its value, the most suitable products, commitment to organic agriculture and their attitudes toward organic agriculture funding and the possibility of participation in various educational programs. In the second part of the survey, the main research questions have been devised in regard to their perception of the use of information technologies in education, production, and marketing of agricultural products.

For the main research questions, the five-point Likert scale was used to assess the statements (coded as follows: 1 – I disagree completely; 2 – I disagree; 3 – I am neutral; 4 – I agree; 5 – I agree completely). The constructed scale was subjected to the test of reliability and it had strong (0.979) Cronbach's Alpha value, which indicates an excellent level of internal consistency for the scale with the specific sample used for the study.

It is assumed (H_1) that there is statistically significant difference in the opinion of small farmers in both villages, taking into consideration the level of education, regarding the use of IT in organic production, based on pre-assumption that mostly older or less educated population wants to live in rural areas and wants to work in this field. Several sub hypotheses have been developed further, stating that there is statistically significant difference in the opinion of small farmers on the usage of information technologies in assisting small farmers in:

- H_{1a} : Education on organic production methods;
- H_{1b} : Projections/analysis of the organic products' market;
- H_{1c} : Managing organic production costs;
- H_{1d} : Organic products marketing;
- H_{1e} : Inclusion in the appropriate database of certified producers.

H_0 states that there is no statistically significant difference in the opinion of farmers taking into consideration the educational level, regarding the benefits of ICT usage in order to assist in education on organic production methods; projections/analysis of the organic products' market; managing organic production costs; organic products marketing; inclusion in the appropriate database of certified producers.

Collected data were tabulated and subjected to statistical analyses by using statistical package SPSS v. 18.

Results and discussion

The total sample size has been 143 and 53.8% of the participants have been from Lazac (n=77) and 46.2% (n=66) from Samaila. Among the participants, 48.3% have been female (n=69), and 21.7% male (n=71). The participants have been divided into various age groups, as well as four educational levels, ranging from elementary education to higher education (college or university), as it can be seen at Table 1.

Table 1. The respondents' age and level of education

Respondents age (years)	Frequency	%	Highest educational level achieved	Frequency	%
From 18 to 25	15	10.5	Elementary school	20	14.0
From 26 to 35	32	22.4	Vocational high school (three years)	34	23.8
From 36 to 45	15	10.5	High school	85	59.4
From 46 to 55	20	14.0	Higher education	4	2.8
From 56 to 65	39	27.3	Total	143	
Over 65	22	15.4			
Total	143				

Source: Authors

The most of the respondents have stated that they lived in the households consisting of two to three (37.1%) and four to five (33.6%), and as much as 16.1% of the respondents have stated that they lived in the households of more than five members, which indicates that there is still the institution of extended family that gathers three or more generation. Also, 13.3% of the respondents have stated that they lived in one member homes (mostly elderly). Among the total number of household members, the most of the families have had two members involved in agriculture (38.5%), followed by 19.6% households having one and three members included in the agricultural production respectively. There is the significant number of households that included four (14.7%) or five (7.7%) members included in the agricultural production that also indicates the existence of extended family.

The most of the respondents have stated minimal use of chemical fertilizers or at least the usage with the assistance of agricultural experts or producers' instructions for use which is shown at Table 2. It is necessary to emphasize that 30.8% of the respondents have stated that they don't use or have never used chemical fertilizers.

Table 2. The usage of chemical fertilizers

The usage of chemical fertilizers	Frequency	Percent
Yes, minimal	37	25.9
According to the producer	8	5.6
According to my personal judgment	11	7.7
According to the agricultural expert	43	30.1
I don't use chemical fertilizers	30	21.0
I have never used chemical fertilizers	14	9.8
Total	143	100.0

Source: Authors

Besides the use of the chemical fertilizers, only 2.8% of the respondents have stated that they use preventive antibiotics and hormones in livestock breeding, 56.6% of the respondents have stated that they don't use preventive antibiotics and hormones and 43.4% have stated that they use only antibiotics if prescribed by the veterinarians.

The most of the respondents (42.7%) have stated that organic agriculture is difficult to implement in terms of effort and finance, and as much as 21% of the respondents agreed that organic production is "fashionable", 13.3% have stated that organic production is an excellent idea, but not implementable in Serbia, 8.4% have stated that organic agriculture is an excellent idea, but for the younger generations of the producers, and 14.7% agreed that organic production is necessary for the ecological future of the country.

As much as 98.6% of the respondents considered financial issues as the main reason for not involving in organic agriculture and 71.3% have emphasised the long period for the soil conversion. Also, the concerns have been raised in the market maturity, and there is distrust in the institutions present. From the total sample, 63.6% of respondents have stated that they would consider involvement in organic agriculture, and 65.7% have stated that they would start organic production under the assistance of state funds, 51.7% under the assistance of EU funding programs, and 44.8% under the assistance of non-governmental institutions' funding programs.

What is very interesting is that 28% of the respondents have stated that they collect herbs and wild berries. The respondents mostly recognized fruits (plums, apricots, pears, apples, blackberries, blueberries, strawberries, raspberries), garden vegetables (cucumbers, onions, tomatoes, carrots, potatoes, arugula, spinach, broccoli, radishes, squash, zucchini), and aromatic herbs (basil, oregano) as the most suitable crops for agricultural production.

Regarding the possibilities of inclusion in educational programs on the possibilities of organic production, as much as 37.8% of the respondents would be a part of a free educational program delivered at the premises of the local community centre or school, 18.2% would attend a free educational program regardless the location, 2.1% would attend a free educational program in the city of Kraljevo, 9.1% would attend an internet based free education, and only 2.1% of the respondents would pay for an educational program on organic production.

As depicted in Table 3, a majority of the farmers, 23.8%, agreed, and 28.7% of the respondents strongly agreed that ICT usage can be a useful source due to getting knowledge on organic production methods. The very similar situation is with benefits regarding projections and analysis of the organic products' market, where majority completely agreed about issue, and neutral respondents were in percent of 27.3. Farmers' opinion about the last two questions differ in some way, that is there is no strong agreement about IT benefits in marketing process as well as in inclusion in the appropriate database of certified producers.

As it can be noticed in table, despite all the associated benefits, 23.1% to 27.3% of farmers remained undecided on the effectiveness of ICT as the source of agricultural prosperity. Further, only a small segment of respondents did not agree with the usefulness of ICT tools. Possible reason could be inappropriate network infrastructure older habitants, or the lack of education. However, overall, it can be seen that technology has provided multi-dimensional benefits to the small farmers and it helps in all activities, interaction, accessibility, and quick exchange of data.

Table 3. Perceptions of farmers towards ICT usage

Statement	1		2		3		4		5	
	N	%	N	%	N	%	N	%	N	%
The usage of information technologies can assist small agricultural producers in: Education on organic production methods	15	10.5	19	13.3	34	23.8	34	23.8	41	28.7
The usage of information technologies can assist small agricultural producers in: Projections/analysis of the organic products' market	14	9.8	15	10.5	39	27.3	35	24.5	40	28
The usage of information technologies can assist small agricultural producers in: Managing organic production costs	15	10.5	14	9.8	38	26.6	38	26.6	38	26.6
The usage of information technologies can assist small agricultural producers in: Organic products marketing	16	11.2	14	9.8	36	25.2	41	28.7	36	25.2
The usage of information technologies can assist small agricultural producers in: Inclusion in the appropriate database of certified producers	16	11.2	19	13.3	33	23.1	42	29.4	33	23.1

1 – I disagree completely; 2 – I disagree; 3 – I am neutral; 4 – I agree; 5 – I agree completely; % - percentage; N – number of respondents.

Source: Authors

Before beginning One way ANOVA, the Levene's test for Equality of Variances has been carried in order to verify the assumption of equality of variance and it has shown that the assumption of equality of variance has not been violated for all research questions as Sig. values are above .05. The results are presented at Table 4.

Table 4. Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Education on organic production methods	1.451	3	139	.231
Projections/analysis of the organic products' market	1.967	3	139	.122
Managing organic production costs	1.854	3	139	.140
Organic products marketing	1.670	3	139	.176
Inclusion in the appropriate database of certified producers	.473	3	139	.702

Source: Authors

One way ANOVA has been applied to formally test the hypotheses and to explore an impact the education has on the perceptions of small farmers on the use of information technologies in education, production and marketing of organic agricultural products. Significance level (α) has been set as .05. The results are presented at Table 5.

Table 5. One Way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Education on organic production methods	Between Groups	56.891	3	18.964	13.968	.000
	Within Groups	188.718	139	1.358		
	Total	245.608	142			
Projections/analysis of the organic products' market	Between Groups	53.039	3	17.680	13.907	.000
	Within Groups	176.709	139	1.271		
	Total	229.748	142			
Managing organic production costs	Between Groups	51.299	3	17.100	13.321	.000
	Within Groups	178.435	139	1.284		
	Total	229.734	142			
Organic products marketing	Between Groups	63.635	3	21.212	17.553	.000
	Within Groups	167.974	139	1.208		
	Total	231.608	142			
Inclusion in the appropriate database of certified producers	Between Groups	60.374	3	20.125	16.085	.000
	Within Groups	173.906	139	1.251		
	Total	234.280	142			

Source: Authors

The results are highly significant as p value is less than .001. It is shown that there is statistically significant difference in the perceptions of small farmers on the usage of information technologies regarding their level of education on all research questions. The similar results were conducted in research by Aldosari et al. (2017) where it is shown highly significant relationship between the education of the respondents and the application of radio as information source, but level of education of the respondents had no significant relationship with the application information received through TV. Despite small opposite results, that has been explained as that educational level gives the ability to perceive, interpret and respond to new information much faster than others with lack of education. The study done by Das (2014) has found that farmers mostly rely on ICTs sources for accessing production-related information.

Even though the conducted analysis has shown a statistically significant result, it has still been necessary to examine the effect size through calculating eta squared. The results show, according to Cohen (1988), the large effect size, ranging from .29 for statement 3 to .38 for statement 4 (the statements from the table 3).

Post hoc comparisons using Tukey test has indicated that regarding the statement 1, there is a statistically significant difference between the participants with elementary education and three-year high school ($MD = -.976^*$, Std. Err. = .328, $p = .018$) and the participants with elementary education and three-year high school ($MD = -.753^*$, Std. Err. = .236, $p = .000$). In terms of statement 2, there is statistically significant difference between the participants with elementary education and high school education ($MD = -1.615^*$, Std. Err. = .280, $p = .000$) in addition to three-year high school education and high school ($MD = -.818^*$, Std. Err. = .229, $p = .003$). In regard statement 3, there is statistically significant difference between the participants with elementary education and high school ($MD = -1.579^*$, Std. Err. = .282, $p = .000$), elementary school and three-year high school ($MD = -.856^*$, Std. Err. = .319, $p = .041$) along with high school and higher education ($MD = -1.679^*$, Std. Err. = .580, $p = .022$).

Concerning statement 4 there is statistically significant difference between the participants with elementary education and three-year high education ($MD = -.968^*$, Std. Err. = .310, $p = .012$), elementary education and high school ($MD = -1.815^*$, Std. Err. = .273, $p = .000$), three-year high school and high school education ($MD = -.847^*$, Std. Err. = .223, $p = .001$), high school education and higher education ($MD = -1.465^*$, Std. Err. = .562, $p = .050$). Regarding statement 5, there is statistically significant difference between the participants with elementary education and three-year high school ($MD = -.859^*$, Std. Err. = .315, $p = .036$), elementary education and high school ($MD = -1.682^*$, Std. Err. = .278, $p = .000$), three-year high school and high school education ($MD = -.824^*$, Std. Err. = .227, $p = .002$), as well as high school education and higher education ($MD = -1.882^*$, Std. Err. = .572, $p = .007$).

Conclusion

Agriculture is the most important part of Serbia's economy and it facilitates development of rural areas. This research has tried to point out that even in undeveloped rural communities in Serbia, there is an awareness of the importance of using ICT. Presumption of this research has been that younger generations are more educated and that the connection between educational level and the perception of using ICT and organic production is an important insight.

We can conclude that there is statistically significant difference in the perception of small farmers on the usage of information technologies regarding their level of education on all research questions. This confirms that the hypothesis (with sub hypotheses), according to which the education of the small farmers affects their opinions on the use of information technologies in education, production, and marketing of organic agricultural products is confirmed. The results show that the main difference in perception exists between the farmers with elementary education and the farmers with further education (high school or higher education). Therefore, various funding programs for organic production can be developed for more educated population and the less educated population can benefit from educational programs on the organic production and the use of ICT.

Like the most studies, this research study has limitations too. The sample is small and additional and extensive research is needed in order to further explore the perception of small agriculture producers in Serbia in regard to the possibilities of organic production and the use of information technology. This research could include more villages in the Raška district or the other districts, as well as different forms of information communication technology, due to generating a platform not only for resolving some of mentioned challenges, but also for accelerating the efforts to achieve the Sustainable Development Goal (SDGs) by 2030.

Acknowledgements

The authors would like to thank to Milica Seočanac and Jovana Novaković for their kind assistance in collection of data.

Conflict of interest

The authors declare no conflict of interest.

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