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Influence of human capital on the performance of organic milk production

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Abstract

Over the past decade, a growing interest of consumers in the consumption of organic milk has been recognized, mostly because of its positive effect on human health, besides other various positive effects. The main goal of organic milk production is to bring agricultural production in close alignment with the requirements of a sustainable system. Human capital in organic farming is an important factor as it significantly influences production and financial results. As an important factor in the production, socio-economic characteristics of producers considerably determine possibilities of the future development of this system of production in a certain country. Focusing on the aspect of human capital, this paper examines the possibilities of the development of organic agricultural production in the Republic of Serbia. The research has been conducted on the territory of Serbia on individual farms which are certified for organic farming. Following the findings, the authors conclude that human capital in organic milk production of the Republic of Serbia does not represent a limiting factor in the future development of this system and that human capital in terms of learning and education, experience and expertise, innovation and creativity, and sources of knowledge has a positive relationship with the business performance.

Key words*:* organic milk; conventional milk; human capital; performance; sustainability

Introduction

Organic agriculture addresses the public demand to diminish environmental pollution of agricultural production and represents one of the fastest growing segments of production in the world (Barański et al., 2017; Mie et al., 2017). Organic milk production systems rely on ecologically based practices that virtually prohibit the use of antibiotics and hormones in the cow herd and the use of synthetic chemicals in the production of cattle feed (Bloksma et al., 2008; Puvača and de Llanos Frutos, 2021). Organic milk production systems also attempt to accommodate the animals' natural nutritional and behavioural requirements. These requirements add to production costs and create obstacles to widespread adoption, such as higher managerial costs and risks of shifting to a new way of farming, and significant time and costs associated with the transition to organic production (Tomaš-Simin and Glavaš-Trbić, 2019).

Organic production methods have been shown to have benefits for the environment, biodiversity, soil quality, animal welfare, and reduced pesticide residues (Ćosić et al., 2021; Novković et al., 2022; Puvača et al., 2020). In addition to these qualities, they may also contribute directly to human health. Organic milk production can be more beneficial to both, animals and the environment, than conventional production (Lika et al., 2021). To many people, this is an important consideration for buying organic milk. However, for others, the main reason for buying organic is the idea that organic milk and organic milk products are healthier. Bloksma et al. (2008) generally found the organic milk to be better than the conventional milk for both the conventional and holistic measures. Statistically significant differences were observed in the amount of n-3 fatty acids, the lymphocyte stimulation index, the biophoton emission, and crystallization pictures.

Nowadays the European Commission (EC) defines organic production as an integrated farm management system and food production process that combines best environmental practice, high levels of biodiversity, conservation of natural resources, and the application of high standards of animal and plant care, in line with consumer preferences for natural products and processes.

Organic production and labelling of organic products are defined by the EU Regulation 834/2007, which is binding for all EU member states and which defines the basic conditions that must be met in the process of production, certification, labelling, and processing of agricultural and food products. This Regulation defines organic farming as a way of producing agricultural products that exclude the use of external inputs and supports land use and food production that respects the application of local cultural, biological, and technical practices, which can be established on any farm after a certain conversion period (Đurić et al., 2021). Organic food production contributes to improving the quality of life and health of consumers while protecting and improving the quality of the environment (Aceleanu, 2016). According to the official statistics of Eurostat (2020), the organic areas in the European Union have accounted for about 8.5 % of the total EU agricultural land in 2019. In some EU Member States, a large share of the most popular species - cows, sheep, and goats were reared using organic methods. In 2020, more than 4.5 million organic bovine animals have been reared in the EU with Austria that had the highest share of organic dairy cows (22.0 %) followed by Greece (21.8 %) and Sweden (18.8 %). The global sales of organic milk and milk products in the last years have seen significant growth and the demand for organic products on the market is higher than supply. Global tendencies point to the fact that the demand for organic dairy products has registered significant growth even in the period of the COVID-19 pandemic (Ćirić et al., 2021; Puvača et al., 2021).

In the market of certified animal products, there is a small number of organic products such as eggs and honey, and dairy products: fresh milk, yogurt, and cheese. Group production as a new trend in organic livestock production has begun to develop and the number of organic livestock production in Serbia is growing (Veskovic Moracanin et al., 2021). In 2019, there was an increase in poultry (165%), bee colonies (225 %), sheep (18.7 %), pigs (10.7 %), etc., compared to 2018. In this regard, the highest level of processing is achieved in the processing of dairy products in Vojvodina, while the organic farming system in south-eastern, western, and central Serbia is quite low (Đurić et al., 2020; Tasić, 2018).

Following from the aforesaid, the authors considered that the human capital of individual producers, who hold the organic certificate is important for the performance of organic dairy farms and overall development of this very important sector. Only a few studies have considered human capital in the nexus of sustainable development, ecological footprint, and alike knowing fully well that ecological distortions mainly emanate from human activities and it is, therefore, of high importance to "get to know" the human capital involved in organic dairy production on local and international levels.

Dairy organic agriculture is a production system that has emerged to a position of utmost prominence in the past few decades, regarding what is a sustainable system of agricultural production. Beauchesne and Bryant (1999) define organic farming as a social and technological alternative to conventional farming, but this explicit dichotomy obscures a more complex reality. Organic production is often associated with old farming methods and therefore feels like a return to the past. Organic milk production is not a conservative concept, and it should not be understood as a return to a preindustrial, technologically backward, manner of production or rustic, traditional way of life, which entails a return to antiquated relationships in the family, between the sexes, etc.

Despite some differences in how the concept of dairy organic production is defined, the main goal of such production system is to align closely with the requirements of a sustainable system of agricultural production. Tomaš-Simin et al. (2019), emphasized that in organic production the term "sustainable" should be used in a wider sense to include economic, social, and environmental sustainability. It is a type of production that meets the requirements of environmental protection and principles of sustainability to a greater degree than any other type of production. According to Bursić et al. (2021), the fundamental point of organic production is to generate products in a way that will not be harmful to the environment and that will at the same time be safe for human consumption and contribute to maintaining health.

Human capital in milk organic production is an important factor as it significantly influences production and financial results. This element is thought to significantly affect all other elements of human capital (Steenkamp and Kashyap, 2010). As an important factor in the production, socio-economic characteristics of producers considerably determine possibilities of the future development of this system of production in a certain country. Combined with natural resources and sustainability it can be said that sustainable use of natural resources cannot be achieved without educated and skilled human capital (Ahmed et al., 2020; Zafar et al., 2019). Training and personal developments are some of the basic tools and parameters that achieve and measure the increase in dairy organic business performance. Therefore, several hypotheses have been proposed (Table 1).

It has been proven that the milk produced following the principles of organic production had a higher content of polyunsaturated fatty acids compared with conventional milk during the whole production season, while the greatest differences are noticed in the pasture season. Also, organic milk has a higher content of vitamins A, C, and α-tocopherol compared with the conventionally produced milk. Besides, Čuboň et al. (2014) indicated that organic milk has a higher fat content (4.23 %), protein (3.41 %), and lower lactose content (4.72 %). Organic milk has a higher content of calcium and higher milk heat stability. Technological and chemical parameters of organic milk are more suitable mainly for cheese production. It seems that better conditions for a healthy state are in organic farming, and this could be one of the important factors for the improvement of cow longevity in the future, together with appropriately educated human capital in organic farming in the way. The research aimed to measure the direct impact of human capital characteristics of organic milk producers and the indirect impact on-farm performance of organic milk production.

Materials and methods

In the research, the opinions of the respondents, producers of organic milk, were collected by the survey on intellectual capital according to the modified method of Bontis, (1998), and Cabrita and Bontis, (2008). The questionnaire consisted of 30 statements on the parameters of human capital, 4 statements related to the sources of knowledge acquisition of organic milk producers, and 11 statements on the business performance of organic milk producers. The questionnaire stated the facts, closed-ended statements, and the Likert scale was applied (1 - I completely disagree to 5 - I completely agree). The group of respondents consisted of organic milk producers and their employees who are certified in the Republic of Serbia according to the Ministry of Agriculture, and the associations Serbia Organica, Green Network, and GIZ (Deutsche Gesellschaft fur Internationale Zusammenarbeit). The research has been conducted from January to the end of April 2021.

Statistical analysis

After data collection, a distribution normality test was performed using the Kolmogorov-Smirnov test and the Shapiro-Wilk test. The obtained values, for all dependent and independent variables, indicated normal distribution. Following, the data were coded, processed in SPSS, and the partial least squares method (PLS-SEM). Complete answers which were received from 340 respondents (85 %) have been taken into further analysis. According to PLS-SEM, the sample size is considered acceptable (Barclay et al., 1995; Hair et al., 2014). Cronbach's alpha was used for reliability testing and the results indicate that the reliability for each construct is acceptable (Cronbach's alpha is greater than 0.9).

Results and discussion

Our research included 340 participants certified for organic production. The majority of the interviewed individuals were male, comprising 73.5 % of the sample whereas 26.5 % of the sample was female. Organic producers in Serbia can be classified into two major groups. The first group comprises independent or individual organic producers who have certified production on their farms and produce and distribute their organic products (Reganold and Wachter, 2016). The second group comprises of the so-called cooperatives whose production is subject to group certification under the Act of Organic Farming, and particular producers have a contractual relationship with a company that purchases

Table 1. Connections between human capital and successful organic dairy production

H	Proposed hypotheses	References
H1	There is a statistically significant and positive connection between learning (Human capital - HC1) and education and the performance of organic milk producers	(Hassan, 2016)
H2	There is a statistically significant and positive connection between experience and expertise (Human capital - HC2) and the performance of organic milk producers	(Jansen, 2000; Steenkamp and Kashyap, 2010)
H3	There is a statistically significant and positive connection between innovation and creativity (Human capital - HC3) and the performance of organic milk producers	(Mariz-Perez et al., 2012; Sung and Choi, 2014)
H4	There is a statistically significant and positive connection between sources of knowledge (SK) and the performance of organic milk producers	(Padel, 2001; Tomaš-Simin and Glavaš-Trbić, 2016)

their entire production intended for export and also supplies the producers with production materials (Milošević et al., 2020). Jansen (2000) found that although it appears like no one has documented this phenomenon quantitatively, many observers agree that women's participation is remarkably higher in organic farming than in conventional farming. For both, organic and conventional sectors, it has been observed in the literature that women have spearheaded the shift to more sustainable agricultural systems which are more environmentally friendly. The aspect of care in the organic system of production has been cited as one of the reasons for the larger participation of women labour in this type of farming. Namely, the care about the environment and consumers' health is seen as parallel to the role that women have in society as those who protect and care for the people in their community. However, this is not the case in Serbia in this stage of organic milk production development.

Results of the age structure of the participants in the present research are shown in Table 2. It can be observed that the largest number of participants are between the age group 41 to 50 years, whereas the least number of participants are under 20 years of age. Just as in developed countries (Khaledi et al., 2010), but also in developing countries (Djokoto et al., 2016), while organic milk production in Serbia is carried out by middle-aged persons who either had a prior occupation or converted from conventional agriculture to the organic system.

The education structure is one of the important indicators of characteristics of human capital in any line of work. According to the level of education, 42 % respondents finished high school which was confirmed by the previous findings (Djokoto et al., 2016; Khaledi et al., 2010). The largest number of participants in Serbia, however, do not have a formal education in the field of agriculture (76.5 %). According to Jansen (2000), frontrunners of the present-day organic production are most commonly younger people, which was not confirmed by this research. Having a considerable number of producers with higher education is significant for the farming system and higher participation of higher education producers is present in some countries (Chalak et al., 2017), but not in Serbia (only 9.6 % of the participants have higher education). From the aspect of production technology, organic milk production requires a continuous professional development and the application of alternative methods. As a form of agricultural production, it represents a certain break away from the established (conventional, intensive) production, and often carries some degree of risk. An important characteristic of the human capital, especially in the organic system of production, is producers' knowledge of one or more foreign languages. Knowing and being able to use a foreign language is important for organic production because the technological know-how of this manner of production is not widely known, leaving the producers to their own devices when it comes to solving the problems which they encounter in practice. Organic milk production in

Table 2. Characteristic of organic milk producers.

		Number	Percentage
Gender	Male	250	73.5
	Female	90	26.5
Age	Up to 20	26	7.6
	21-30	64	18.8
	31-40	100	29.4
	41-50	112	32.9
	51-60	38	11.2
	Over 60	0	0
Education	Attended or finished agricultural high school	37	10.9
	Attended or finished two-year agricultural college	5	1.5
	Attended or graduated from the faculty of agriculture	33	9.6
	A student in agriculture - in the process of schooling	5	1.5
	No formal agricultural education	260	76.5
Language	English	223	65.6
	German	112	32.8
	Russian	90	26.6
	Hungarian	51	15.0
Joining an association of producers/organic producers - benefits	Better production results	287	84.4
	Better information access	218	64.1
	Exchange of experience	181	53.1
	Joint market penetration	170	50.0
	Other	48	14.1
The use of computer for keeping records of production	Yes, I	154	45.3
	Yes, together	133	39.0
	We do not keep records	53	15.6

Serbia is not sufficiently developed (Jeločnik et al., 2015) and producers are insufficiently informed about new technologies.

Organic milk producers are willing to join a professional association, following the model of organic honey producers (Vapa-Tankosić et al., 2020), unlike in conventional farming. The participants are members of the following associations: Vojvodina Organic Cluster (VOC) (67.8 %), Serbia Organica (43.8 %), Organic NS (10.9 %), Teras (14.1 %), and local associations (46.9 %). A high percentage of producers (84.4 %) consider that membership in an association contributes to better production (Kovačević, 2021). In organic production, the use of informative communication technology (ICT) is significant, and its presence is becoming more pronounced (Karipidis and Karypidou, 2021; Lekić et al., 2021; Vladisavljević et al., 2019). The reasons are as follows: organic producers have a high-school or college-level education, so they have acquired basic computer knowledge, use ICT and foreign languages (Lekić et al., 2020). The process of certification and obtaining required certificates of organic production requires keeping detailed records of production, which is done through a computer. The study shows that all participants in this research have a computer in their household. The question of whether they use a computer to keep records of their production on the estate was answered affirmatively by 84.3 % of participants. The largest number of producers keeps the records themselves (45.3 %), while a certain percentage keeps records together with someone else in the household or has someone else in the household do it.

Descriptive indicators of human capital variables of organic producers and sources of knowledge acquisition of organic milk producers have been presented in Figure 1. Learning and education - HC1 - results of the research on indicators learning and education within human capital show that it has been evaluated with an average grade of 3.54. The analysis of variables shows that the best-rated variable competencies of employees are in line with the requirements

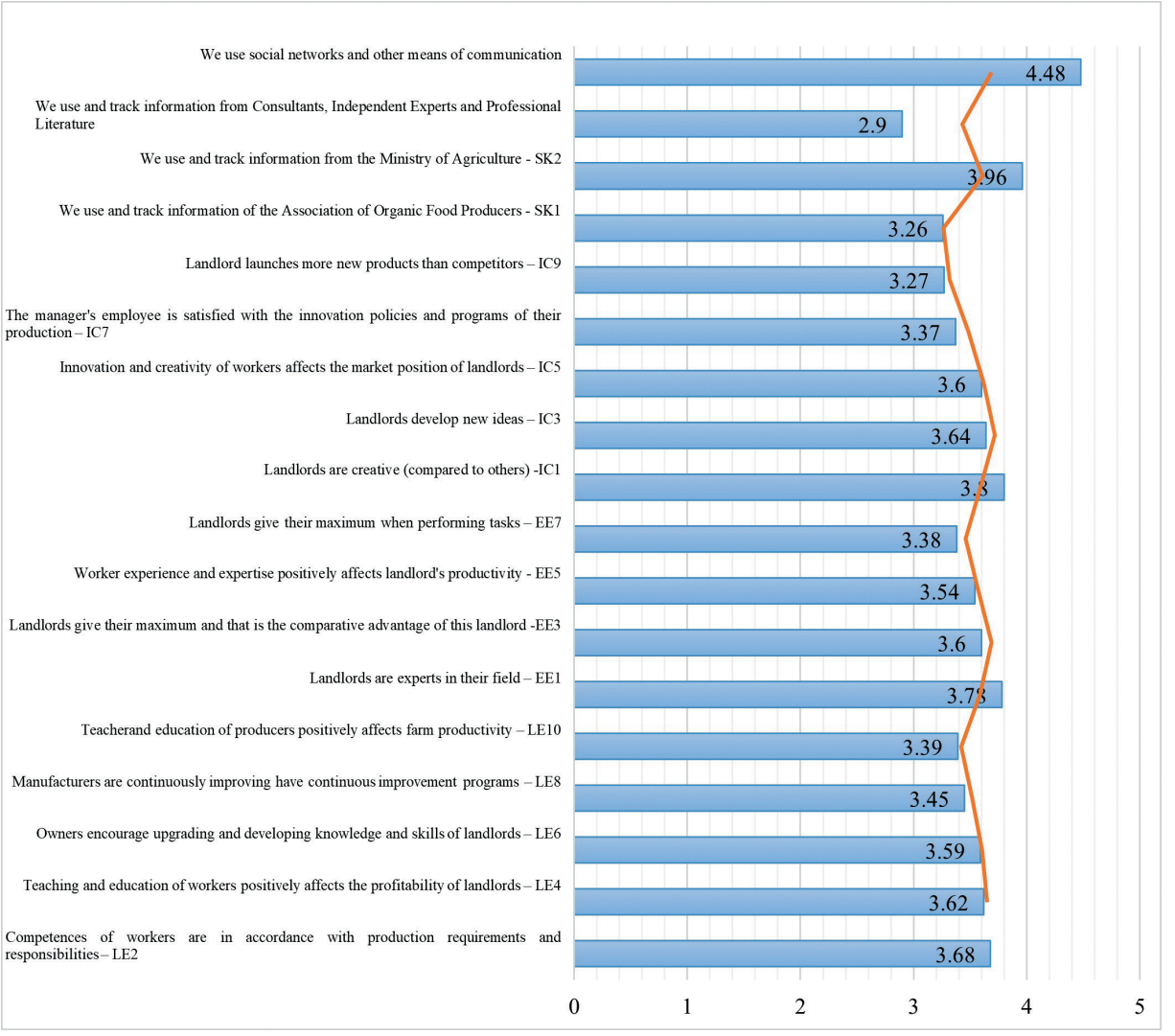

Figure 1. *Descriptive indicators of human capital variables of sources of knowledge acquisition of organic milk producers' variables*

and responsibilities of production (3.68), while the lowest-rated variable is learning, and education of producers have a positive impact on farm productivity (3.39). Experience and expertise - HC2 - the mean value of the group of variables that make up experience and expertise have a value of 3.53. Among the variables that make up experience and expertise, the best-rated variable is that farm producers are experts in their field (3.78), while the lowest-rated is that producers of the farm give their maximum and that is the comparative advantage of this farm (3.38). Innovation and creativity - HC3 - the mean value of the group of variables that make up innovation and creativity has a value of 3.52. Within the group innovation and creativity, the best-rated variables farm employees are creative (3.80), while the worst-rated variable is the farm is launching a larger number of new products compared to the competition (3.27).

Regarding the source of knowledge acquisition (SK), organic milk producers most often use social networks and the media (4.48). The findings have shown that the respondents use official publications, reports, and government information (3.96), while the publications of the Association of Producers-Organic Producers are less represented (3.26). The lowest rated used knowledge sources are consultants, independent experts, and professional literature (2.90).

Regarding the performances of organic milk producers (POP), following variables were the best rated: Leadership in the organic sector (3.89) and willingness to react quickly to competition (3.74), while the worst-rated were: Success in launching new products (3.29) and outlook for future business (3.33) (Figure 2).

After checking the normality of the distribution and the reliability of the data, further analysis was performed using the PLS SMART methodology. The external PLS-SEM model has the following structure: HC1 - 5 reflective variables; the second latent construct HC2 - 4 reflective variables; the third latent construct is HC3, and it consists of 5 reflective variables and the fourth latent construct is SK and it consists of 4 reflective variables. The internal model consists of four latent exogenous constructs (HC1, HC2, HC3, and SK) and one endogenous latent construct - POP. The external model consists of 18 reflective variables and 11 formative variables. The results of our research show that in the reflective measurement model out of a total of 35 variables (consists of HC for 30 variables and SK 5), 18 variables with a factor load > 0.7 were retained, while the rest were excluded from the model. The values of Cronbach's alpha coefficients are in the range of 0.752-0.841, and the values of composite reliability (CR) are in the range of 0.843-0.887, so we conclude that the model is highly reliable and selected variables represent latent constructs, what was in alignment with other recent investigations (Ignjatijević et al., 2022). Convergent validity (AVE) is satisfied (values are in the range 0.573-0.661, i.e.>0.5). The criteria for discriminant validity (Fornell Larcker criterion and HTMT values) are met. Further analysis of the structural model, using the bootstrapping procedure, (5 % significance level) has shown that the Outer VIF values are in the range of 1.316-1.993, and the Inner VIF values are in the range of 1.394-2.689. As the obtained values are less than 3, we conclude that there is no problem of collinearity in the model, which was in agreement with other researchers (Balenović et al., 2021; Ignjatijević et al., 2015).

The statistical significance of outer weights of formative measurement variables was analyzed using the bootstrapping procedure. The results show that the variables have outer weights ranging from –0.055 to 0.470, with no statistical significance (p>0.05) for POP3, POP4, and POP7. Other outer

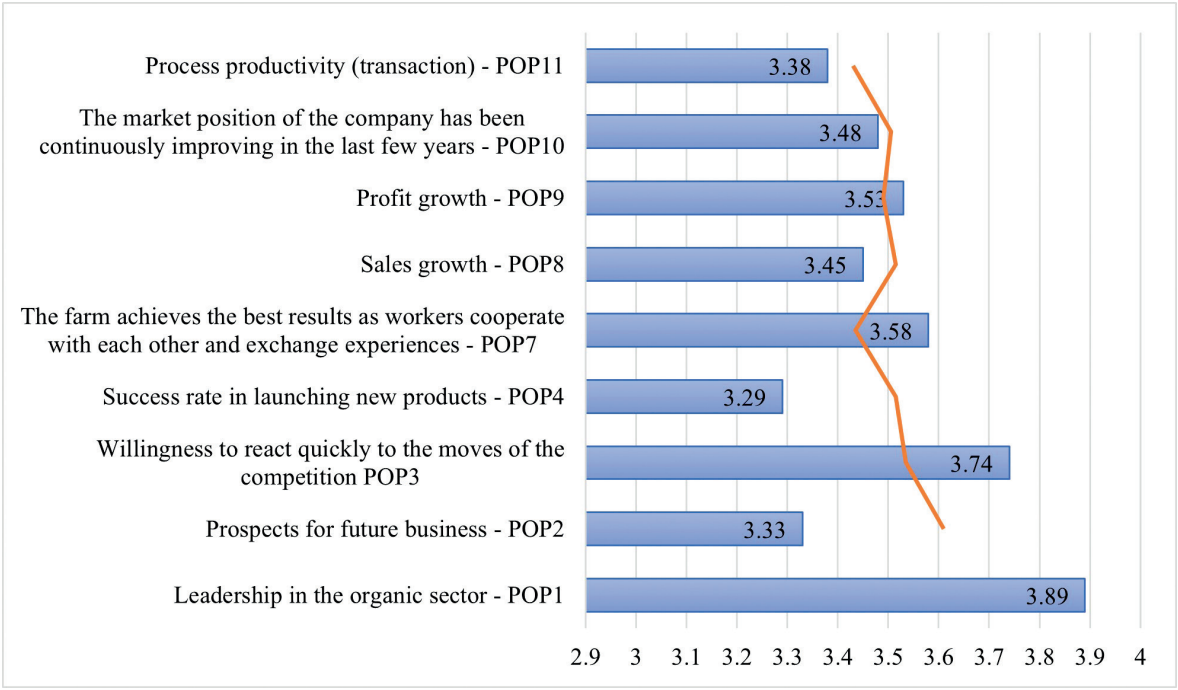

Figure 2. Descriptive indicators of performance variables of organic milk producers

weights in the formative measurement model are statistically significant (p<0.05). As the values of external loadings for the mentioned formative variables are statistically significant all variables can be kept as important.

Our findings indicate the existence of direct and indirect influence of latent constructs - factors that affect the performance of organic milk producers. We analyzed the direct impact of HC on POP, and the strongest direct link exists between HC2 (Experience and Expertise) and POP (0.432). When we talk about the direct impact of SK on HC, it is the strongest on learning - HC1 (0.596), which shows that organic milk producers use different sources of data, information, and knowledge to improve their competencies. The SK has a very strong influence on innovation and creativity - HC3 (0.576), while the weaker, but still very strong influence of SK on experience and expertise - HC2 (0.531). The total indirect impact of SK on the POP is 0.516, while the specific indirect impact via HC2 is 0.229, via HC3 is 0.202 and via HC1 is 0.087. The obtained value of the total indirect impact of SK on the POP is higher than the direct impact of HC, which shows the importance of acquiring knowledge and information from different sources (Table 3).

In this model, the value of R2 is adjusted to 0.659 and shows that latent variables with moderate-to-moderate action, with 65.9% explain the dependent endogenous variable - POP and that the whole model is representative. The value of cross-valid redundancy was calculated using Stone-Geisser Q2 indicators and the value of Q2 = 0.291 and indicates the medium predictive relevance of the PLS-path model. The coefficient of the size of the effect, the so-

Table 3. *Values of the direct and indirect impact of variables on the performance of organic milk producers*

	Total effects	Total indirect effects	Specific indirect effects
HC1 > POP	0.146**		
HC2 > POP	0.432***		
HC3 > POP	0.346***		
SK > HC1	0.596***		
SK > HC2	0.531***		
SK > HC3	0.576***		
SK > POP		0.516***	
SK > HC1 > POP			0.087**
SK > HC2 > POP			0.229***
SK > HC3 > POP			0.202***

*HC1 - Human capital 1; HC2 - Human capital 2; HC3 - Human capital 3; SK - Source of knowledge; POP - Performances of organic milk producers; Significance level: ** - p<0.05; *** - p<0.01.*

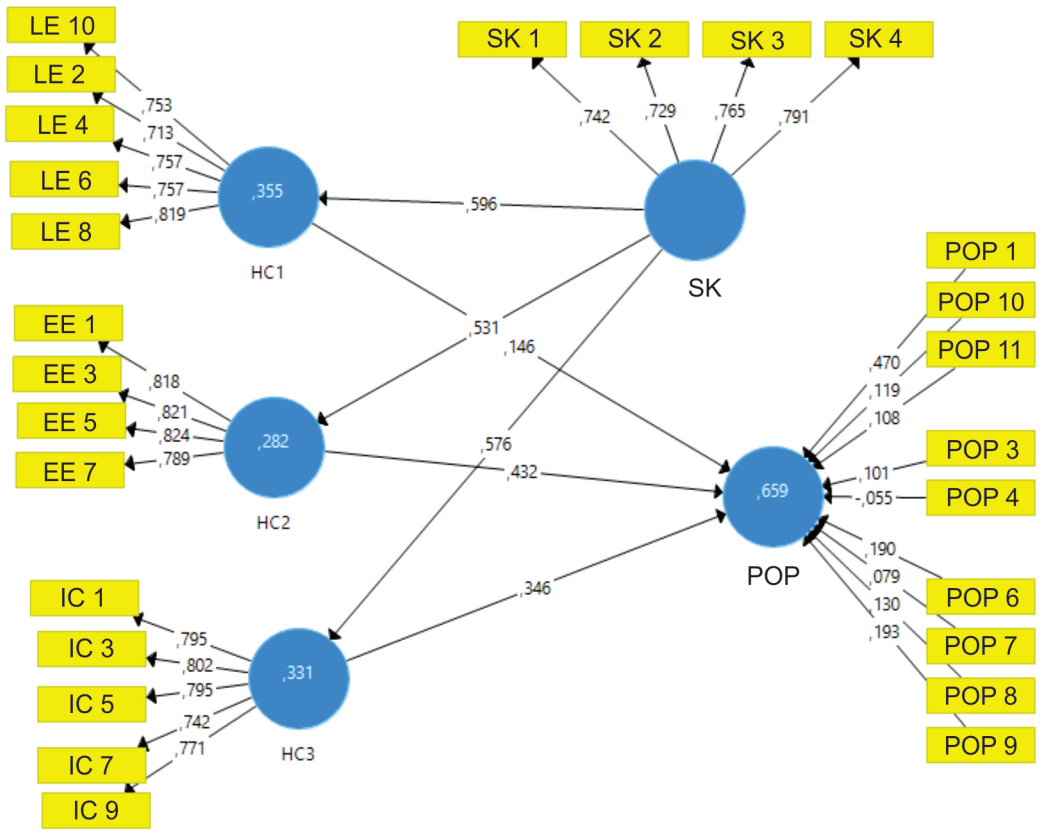

Figure 3. *Model of the influence of factors on the performance of organic milk producers*
HC1 - Human capital 1; HC2 - Human capital 2; HC3 - Human capital 3; SK - Source of knowledge; POP - Performances of organic milk producers; LE - Learning and education; EE - Experience and expertise; IC - Innovation and creativity

called f2 effect size has values of 0.068-0.228, indicating a small impact of exogenous human capital variables on the performance of organic milk producers.

The first hypothesis (H1), there is a statistically significant ($p<0.05$) and positive connection between HC1 and the performance of POP, has been confirmed due to the empirical relationship ($\beta = 0.146$; $t = 2.210$) which is statistically significant ($p<0.05$). The population is in the confidence interval from -0.004 to 0.258 with a 97.5 % probability. The second hypothesis (H2), there is a statistically significant ($p<0.05$) and positive connection between HC2 and the performance of POP, has been confirmed. The empirical relationship is statistically significant ($p<0.05$) and stable ($\beta = 0.432$; $t = 6.374$). The population has a 97.5 % probability in the range of 0.305 to 0.563. The third hypothesis (H3), there is a statistically significant ($p<0.05$) and positive connection between HC3 capital and POP, has been confirmed due to a stable empirical relationship ($\beta = 0.346$; $t = 4.492$) and statistical significance at the level of 97.55 % reliability and is in in the range of 0.194 to 0.489. The fourth hypothesis (H4), there is a statistically significant ($p<0.05$) and positive connection between SK and POP, has been confirmed due to a stable empirical relationship ($\beta = 0.516$; $t = 12.130$) and statistical significance at the level of 97.55 % reliability and is in the interval 0.431 to 0.600 (Figure 3).

Conclusion

Findings of this study have demonstrated that milk organic producers in Serbia somewhat resemble pioneers of this system in what is now developed countries and that they differ from conventional producers. An average milk organic producer owns a computer and uses it for keeping records of production. In terms of the level of education, producers have graduated from high school or university, most often unrelated to agriculture. They know at least one foreign language, and they use it to obtain information that is pertinent to their production. In addition to economic reasons, these producers have very often chosen milk organic farming for ideological reasons and motives, wanting to enrich their own lives and contribute to the improvement of the micro-region in which they started organic farming. The results have confirmed that human capital in organic milk production significantly differs from human capital in conventional production in terms of computer literacy. Organic milk producers are willing to join a professional association and most often as sources of knowledge use social networks and the media. The process of learning and education within the human capital show has been evaluated with the highest average grade. All four hypotheses, in terms of the positive relationship of the human capital (learning and education, experience and expertise, innovation and creativity, and sources of knowledge) with business performance have been confirmed. Accordingly, it can be concluded that human capital in organic milk production of the Republic of Serbia does not represent a limiting factor in the future development of this system on the farms where organic farming has already been introduced. Dairy and milk organic production especially endeavour to satisfy the needs of present-day humanity in a sustainable way, without jeopardizing the needs of future generations, which is in line with the concept of sustainable development.

Acknowledgments

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Utjecaj ljudskog kapitala na učinkovitost ekološke proizvodnje mlijeka

Sažetak

U posljednjem desetljeću raste interes potrošača za konzumaciju ekološki proizvedenog mlijeka, zbog njegovog pozitivnog učinka na zdravlje ljudi, ali i brojnih drugih pozitivnih učinaka. Glavni cilj ekološke proizvodnje mlijeka je uskladiti poljoprivrednu proizvodnju sa zahtjevima održivog sustava. Ljudski kapital u ekološkoj poljoprivredi važan je čimbenik jer značajno utječe na proizvodne i financijske rezultate. Kao važan čimbenik u proizvodnji, socio-ekonomske karakteristike proizvođača uvelike određuju mogućnosti budućeg razvoja ovog sustava proizvodnje u određenoj zemlji. Fokusirajući se na aspekt ljudskog kapitala, ovo istraživanje ispituje mogućnosti razvoja ekološke poljoprivredne proizvodnje u Republici Srbiji. Istraživanje je provedeno na području Republike Srbije na individualnim gospodarstvima koja su certificirana za ekološku poljoprivredu. Slijedom dobivenih rezultata, autori zaključuju da ljudski kapital u ekološkoj proizvodnji mlijeka Republike Srbije nije ograničavajući faktor u budućem razvoju ovog sustava, te da ljudski kapital u smislu učenja i obrazovanja, iskustva i stručnosti, inovativnosti i kreativnosti i izvorima znanja imaju pozitivan odnos s poslovnim učinkom.

Ključne riječi: organsko mlijeko; konvencionalno mlijeko; ljudski kapital; učinak; održivost

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