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Адреса уредништва / Editorial office
Београд, Волгина 15; тел/факс (+381)11/6972-848; E-mail: economicsofagriculture@ea.bg.ac.rs
Belgrade, Volgina 15; phone/fax (+381)11/6972-858; E-mail: epoljoprivrede@gmail.com

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THE IMPACT OF FOOD VISUAL AESTHETICS ON CONSUMER PERCEPTION OF A HEALTHY AND TASTY MEAL IN THE HOSPITALITY AND TOURISM INDUSTRY

Ljubica Janjić[1], Sonja Vujović[2], Ivica Zdravković[3], Dragana Ilić [4]

**Corresponding author E-mail: janjic.ljubica@vpsle.edu.rs*

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ABSTRACT

The visual appearance of food is an important attribute when people choose food. This paper aims to examine the impact of visual aesthetics on the consumer's perception of a healthy and tasty meal. The paper consists of two empirical researches, which includes survey and experimental research. The survey results indicate the connection between the visual appearance of meals and the consumer's perception of health and tasty meals. The experimental research compare consumer expectations about the meal taste based on its visual appearance, and actual consumer experience after tasting that meal. The results show that there are differences in consumer expectations, based on visual aesthetics and they should assist the hospitality and tourism business from acknowledging how the visual aesthetics of food can influence consumers' food choice decisions. This can be an effective technique for hospitality and tourism companies in attracting consumers and increasing their loyalty.

1 Ljubica Janjić, spec., Lecturer, Department of the Leskovac Business School, Academy of Vocational Studies Southern Serbia, Vlade Jovanović 8, 16000 Leskovac, Phone: +381643693831, E-mail: janjic.ljubica@vpsle.edu.rs, ORCID ID (https://orcid.org/0000-0003-4650-7862)

2 Sonja Vujović, Ph.D., Associate Professor, Faculty of Economics, University of Pristina, with temporary seat in Kosovska Mitrovica, Kolašinska 156, 38220 Kosovska Mitrovica, Phone: +38166140461, E-mail: sonja.vujovic@pr.ac.rs, ORCID ID (https://orcid.org/0000-0002-5462-1908)

3 Ivica Zdravković, M.Sc., Practical Skills Teacher, Department of the Leskovac Business School, Academy of Vocational Studies Southern Serbia, Vlade Jovanović 8, 16000 Leskovac, Phone: +381608742031, E-mail: zdravkovic.ivica@vpsle.edu.rs, ORCID ID (https://orcid.org/0000-0001-7219-9758)

4 Dragana Ilić, Ph.D., Higher Lecturer, Department of the Leskovac Business School, Academy of Vocational Studies Southern Serbia, Vlade Jovanović 8, 16000 Leskovac, Phone: +381638908971, E-mail: ilic.dragana@vpsle.edu.rs, ORCID ID (https://orcid.org/0000-0002-0879-4509)

Introduction

Food perception is connected with all five human senses experience. The development of sensory marketing indicates the beginning of a new era in the field of marketing, in which consumer's all five senses will be in the center of marketing strategies and techniques. In this paper, the focus will be on the sense of sight, as well as how this sense could be used to influence consumer decisions, especially in the field of gastronomy. Considering the fact that gastronomic experiences are increasingly becoming the main drivers of tourism development, the authors will try to analyze the impact of food visual aesthetics on consumer perception of a healthy and tasty meal in the hospitality industry.

In recent decades, we have witnessed the growing interest of people in a healthy lifestyle, which includes a healthy diet. Nutritionists recommend daily intake of a variety of food for a healthy life, and traditional Japanese cuisine recommends that each meal should contain five colors (red, yellow, green, black and white). People must rely on their perceptions of food when deciding what to eat, and if they choose a variety of colorful foods, they can meet the guidelines for a healthy diet.

This paper aims to examine the impact of visual aesthetics on the consumer's perception of a healthy and tasty meal. The subject of this paper is to determine the connection between the visual aesthetics and the consumer's perception of a healthy and tasty meal. The main research issue is to provide an assessment of whether the appearance and content of food, in a way inspired by aesthetics, have an impact on consumer expectations, and therefore on their perception of food as healthy and tasty. The paper consist of two different researches (survey and experimental research), which indicate the ways and effects of stimulating the sense of sight in the context of perceptions and choices of healthy food by consumers. First, the research includes the analysis of the aesthetic experience of food and differences in the interaction of colors and flavors of meals depending on the sociodemographic profile of consumers. In addition, an assessment of the influence of food design on the expectations that people have from the visual experience of food and their subsequent experience after tasting and consumption is given.

The main purpose of this paper is to broaden knowledge of gastronomy experiences in hospitality and tourism, which should be used in everyday business improvement. Results of the research indicate that stimulating the sense of sight can be an effective technique for hospitality companies in attracting consumers and increasing their loyalty. In that way, this paper should provide support for the significance of sensory marketing to enhance the satisfaction of customers in hospitality. This paper with an original thematic contributes to general knowledge by advancing previous research about similar topic, and especially contributes to the literature on food decision making, hospitality and tourism development and sensory marketing.

Literature review

In order to better understand the influence of sensory perception in hospitality and tourism, it is necessary to determine how consumers get an impression of a product

when they see it, hear it, touch it, feel its taste and smell. It is questionable if the color of the product's packaging, a pleasant feeling when touching it or perhaps adequate music that contributes to the general atmosphere stimulates the consumer to choose a product. "Through the human senses, sensory information is transmitted to the human mind and transformed into perceptions, feelings and sensory experiences" (Hulten, 2020, 19). Some authors emphasize the fact that, as people gain impressions of everything in their environment using their senses and this unconsciously influences their decisions, the importance of sensory marketing is exceptional (Krishna, Schwarz, 2014). It can be said that "sensory marketing offers consumers a sensory experience that adds value to their consumption" (Roggeveen et al., 2020, 7). In his book, Krishna (2011) explained that there is a need to understand the fact that "services and products have sensual nature, and the customer should experience all the senses - sight, taste, touch, sound and smell". When it comes to aesthetics, the question arises as to what is beautiful and how to define the sense of beauty in general. For centuries, people have dealt with this topic, but it can be said that aesthetics includes what makes an object beautiful and what people feel when they encounter that object (Horng, Hsu, 2020).

In accordance with the new marketing paradigm, the service industry and gastronomy are gradually applying the concept of holistic communication, which includes all five human senses (Lin, 2019). Research shows that hospitality and gastronomy businesses can influence consumer decisions and their overall experience by "providing the best designs for their products, such as comfortable furniture, unique designs and colors, music that evokes positive emotions and pleasant smells" (Shah, 2018). The creation of impressions has always been an important part of hospitality (Buharova, Vereshchagina, 2021). In recent times, the usage of the term gastronomy tourism for the appellation of food-related types of tourism has increased (Dixit, Prayag, 2022), as well as culinary tourism and food tourism (Ellis et al., 2018; Everett, 2019), which is an expanding field (Anderson et al., 2017). Henderson (Henderson, 2004) pointed out those experts in tourism use food as a promotional tool, so it is evident that food affects the overall customer's experience. Some authors explained that food represents one of the factors of the general tourism development (Stamenković, Đeri, 2016), so the hospitality and gastronomy are "a prerequisite for tourism development" (Ilić et al., 2016). Considering the fact that tourism sector is one of the most powerful drivers of economic growth (Rahmiati et al., 2019), it is obvious why the improvement of hospitality and tourist offer is important.

The authors Schifferstein et al. (2020) connect the visual aesthetics of food with concepts such as "sense pleasure" or "sensory enjoyment". Delwiche (2012) claims in his researh that "people eat with their eyes first". People evaluate food precisely on the basis of its visual aesthetics, and accordingly perceive that more visually appealing food is tastier. Research related to food aesthetics has shown that several important factors are involved in the visual presentation of food, which affects the consumer's evaluation of food and decision-making. Many of these factors came from "new culinary trends and guidelines, established by gastronomes around the world" (Rowley & Spence,

2018, 1). The importance of such research is related to the role that gastronomy and hospitality plays in the tourism industry, which has been increasingly highlighted in recent years in Serbia (Ćirić et al., 2022).

Visual properties of food, including color, are indeed important elements for food choice (Renner et al., 2016; Schulte - Mecklenbeck et al., 2013). It is necessary to take into account various factors that influence consumers' decisions about food choices and their perceptions of colors, such as consumer demographic factors (age, gender, culture, education), as well as their lifestyle (Sliburite, Skerite, 2014).

Color and gastronomy are closely related to each other, and the main reason is that the color of food represents "the most prominent visual sign, which determines the sensory properties of food such as taste" (Spence, 2015). In this way, "color affects consumers' expectations about the food they search for, buy, and consume" (Spence, 2016). When deciding what and how much to eat, people generally have to rely on their perception of food. An increasing number of authors point out that the taste experience is mostly determined by the expectations formed on the food color base, which means that the color of the food is decisive when choosing (Spence, Piqueras - Fiszman, 2016). Humans make decisions about food choices every day, and their food color preferences have been formed during evolution and depend on experience and inherited traits (Lieberman, 2006).

In addition to food color forming consumers' taste expectations, color intensity can be a sign of food quality (Valentin et al., 2016) as well as the nutritional value of food (Foroni et al., 2016). In his research, Spence (2015) points to the fact that "meeting or not meeting color expectations determines whether the consumer will like the food." Pereira (2021) points out that the color of the observed product affects the consumer's perception of the nutritional value of that product. When it comes to food coloring, "common natural colors are green, yellow, orange, red, pink and purple" (Hutchings, 1999). The blue color is rarely used in food products and it is often associated with the notions of "unnatural and artificial" (Spence, 2018).

It has been noticed that in recent decades, an increasing emphasis has been placed on the choice of healthy food, so an increasing number of people strive for a healthy diet. However, the average socio-economic and educational status of the population, the level of health awareness and the quality of food differ from country to country (Julia et. al, 2022). According to data available on the Statista website, consumers in the US have made certain changes in their diet (more fruits and vegetables) and lifestyle to improve their health. "In 2022, the global health food market was estimated at $841 billion and it is projected to grow up to $1 trillion by 2026" (Statista, 2022).

In a survey of Canadian consumers in which they were asked what they believe a healthy meal consists of, more than half said that more fruits and vegetables make a meal healthier (Statista, 2022). According to the "Food and Health study 2022", conducted by the International Food Information Council (IFIC, 2022), surveyed US consumers showed significant differences in the perception of healthy foods. On that

occasion, 37% of the respondents chose the attribute "fresh", which they associate with healthy food, then 32% chose the attribute "contains little sugar", 29% of the respondents chose the attribute "good source of protein", 28% the attribute "contains fruit or vegetables", 27% "a good source of nutrients" and 26% of respondents associate healthy food with the attribute "natural". In her research, Hagen (2020, 15) conducted a series of experiments and came to the conclusion that "people perceive the same food as more natural if it looks more beautiful, which implies that it is healthier, in terms of the content of positive elements (e.g. nutrients) and the absence of negative elements (e.g. calories)". Haws et al. (2017) found in their study that consumers believe that what is healthy is expensive, although this is unlikely to be true for all products.

Visual aesthetic research has shown that the food color affects consumer perceptions when it comes to a healthy meal. Thus, in his paper, Schuld comes to the conclusion that the color of the food label has an impact on the consumer's perception of healthy food, where respondents chose a product with a green label as healthier, in contrast to the same product with a red label (Schuldt, 2013). . When it comes to the perception of a healthy meal based on color, green is usually the color that symbolizes something natural and healthy (Michels et al., 2022). The green color has only positive implications and it is associated with organic food, health and nature (Schuldt, 2013). The red color has some positive associations (romance and passion), but it is predominantly associated with negative ones, such as danger and warning (Elliot et al., 2009).

Some researches show that the visual appearance of the food served on the plate has an influence on the formation of the consumer's opinion about that dish (Michel et al., 2015). Authors Piqueras - Fiszman et al. (2012) came to the result in their research that e.g. when strawberry mousse is served in white dessert plates (compared to serving in black dessert plates), consumers perceive it with a significantly more intense taste, because there is a greater contrast in regard to the plate. Then, Elliot & Maier (2014) conclude that red kitchenware has certain effects in the perception of the food and drinks taste. Roque et al. (2018) showed that differently placed food, in certain colors, can influence the consumer's perception, where centrally placed dishes on a plate, with colorful colors, are perceived as more creative and beautiful compared to monochromatic food that is not placed centrally. Perceptions of different food colors also depend on the context itself. Spence et al. (2010) state that as the fruit ripens and becomes sweeter, its color changes from green to red, and that's why some psychologists claim that people associate the red color with sweetness, and green with acidity.

Conceptual framework and the development of hypotheses

The research presented in the theoretical part of the work is the motive for an attempt to expand the framework related to the topic of food visual aesthetics. This research aims to examine the impact of visual aesthetics on the consumer's perception of a healthy and tasty meal. The specific objectives of the research are reflected in: 1) providing an assessment of whether the appearance and content of food, in a way inspired by aesthetics, have an impact on consumer expectations, and therefore on their perception

of food as healthy and tasty; 2) understanding how visual elements of food can influence consumer behavior. Based on an insight into the available literature related to the importance of the visual aspect and color contrast of the served food on consumer attitudes about a tasty and healthy meal, the initial hypotheses were set:

H1: The visual appeal of food is positively correlated with the taste of food.

H2: Differences in the age and level of education of consumers result in certain differences in terms of preferences in choosing healthy meals based on color as an element of the visual experience of food.

H3: Food that is aesthetically nicely arranged and contains intense colors is positively correlated with consumers' expectations regarding tasty and healthy food, as well as their intention to purchase (order) that dish.

Methodology

Starting from established hypotheses, in this paper it was used a combination of different methods, whereby the choice of methods was determined by the topic of the paper and research goals. The applied methodology is qualitative and quantitative, and exploratory and explanatory research was conducted. Considering the complex nature of sensory marketing, which includes sensory experiences, the combination of the mentioned types of research should lead to adequate and acceptable results.

In the first phase of research, which is exploratory, authors use methods of analysis and synthesis, as well as inductive and deductive methods. The method of data collection is firstly used, which is based on secondary sources from domestic and international journals and reports, and after that their analysis is performed. The combination of collected and analyzed data, together with theoretical implications, represents the starting point for further research development.

In the second phase, the phase of explanatory research, authors conducted experimental and survey research, where primary data was collected. In this phase, the observation method, comparison method, empirical method, analytical-interpretive method, statistical method, field research (systematic observation, examination: survey and experiment), inductive and deductive method were used. The purpose of this research is to provide empirical evidence that supports the importance of sensory marketing in improving consumer satisfaction in gastronomy, with a special emphasis on the sense of sight role. By defining the theoretical and empirical implications of an adequate approach to the sense of sight in sensory marketing, this research could help hospitality companies to adapt to consumer expectations and their healthy lifestyles.

Materials and methods

As part of the empirical research, survey and experimental research were conducted in order to examine the hypotheses set at the beginning.

Survey research procedure

It must be emphasized that the survey research was conducted in four phases. In the first phase, a study of the literature related to the definition of the concept of sensory marketing was carried out, especially from the aspect of the sense of sight and the perception of visually attractive food of different colors, which is considered and experienced as healthy and tasty. In this phase, the research instrument was formulated and an online questionnaire was created through Google Forms. The research was carefully prepared, with clear and precise instructions to the respondents and a questionnaire that was not standardized and which was created for the needs of this research. Using a detailed analysis of theoretical sources of data on the given topic, by consulting both domestic and foreign authors, key areas, factors and characteristics were determined, on the basis of which a questionnaire was formed with questions whose answers lead to the possibility of processing the desired data and obtaining the necessary results. In the second phase, the research was conducted by distributing the link for filling out the questionnaire through social networks (Facebook), as well as through Viber and Whatsapp groups. In the third phase, statistical processing (using the statistical software IBM SPSS 20.0 (Statistical Package for the Social Sciences)) and analysis of the results obtained from the research was performed, while in the fourth phase, positions were presented through discussion and drawing conclusions.

Survey research sample

The estimation of the sample size is based on the following criteria: a margin of error of 5%, a confidence level of 92% and a sample frame of N=125.876, which represents the total number of population in the city of Leskovac (according to the last census population). The sample size was checked using the Raosoft Calculator which showed that the recommended sample size at the 92% confidence level was 310 respodents. According to this, the sample size in this research was 310 respondents from the territory of Leskovac, who filled out an online questionnaire in the period from April to June 2022, and participation in this research was anonymous.

Measurement scales and data analysis in survey research

The questionnaire consists of three parts, where the first part is based on a nominal and ordinal scale, the second - on a five-point Likert scale, and the third - on an ordinal scale. The first part of the questionnaire represents the general part and refers to socio-demographic data. It contains eight questions that gain insight into the gender, age, education, amount of monthly income, as well as the status of the respondent. Then there are questions related to a special diet and the possible existence of a color recognition disorder, as well as the question of the frequency of going to a restaurant (ordering food). The second part of the questionnaire represents its main part and contains a list of attributes that can be used to evaluate the respondents' perceptions and attitudes about the impact of visual aesthetics and food color on the consumer's perception of a healthy and tasty meal. In this part, the respondents choose one answer on a scale from 1 to 5, with options ranging from 1 ("I totally disagree") to 5 ("I totally agree"). The third part of the questionnaire contains

a presentation of different types of meals (five types of salads and four types of pureed sauces), where each respondent chooses one answer (one salad and one pureed sauce), which best reflects his perception of whether it is a healthy and a delicious meal. A scale of 1 to 3 is given here, with options 1 ("Not a healthy meal"), 2 ("I have no opinion") and 3 ("Healthy meal"). In addition, in this part of the questionnaire, respondents choose one of five salads and one of four mashed sauces, which they consider the healthiest. The meals were prepared exclusively for the purposes of this research, after which each of them was photographed separately (from the same angle, with the same camera), on a white background and served on a white plate.

Survey research methods

Different methods were used during the statistical processing of the collected data. Descriptive statistics methods used percentage, frequency distribution, measures of central tendency (arithmetic mean) and measures of dispersion (standard deviation). Cross-tabulation analysis was performed in order to find the relationship between age and level of education according to the specific attribute. The exploratory factor analysis (EFA) was performed using the principal component method and Varimax rotation in order to associate each attribute to at most one factor. After that, a multiple regression analysis was conducted, in order to measure influence of visual aesthetics and food color on consumer's perception of healthy and tasty meal.

Considering the fact that an essential feature of any questionnaire is its reliability, the measuring instrument for checking the internal consistency of the scale used in this research is Cronbach's alpha (α) coefficient, which can have a value between 0 and 1. Tavakol and Dennick (2011) provided guidelines for interpretation values of the Cronbach alpha (α) coefficient, where values in the interval between 0.7 and 0.8 are marked as adequate. In this survey research, the Cronbach alpha coefficient is 0.715 (it refers to all attributes), which indicates acceptable reliability of the measuring instrument and leads to the conclusion that the variables in this research have good internal consistency.

Experimental research

Based on the literature review, it can be expected that the consumer perceives a meal as healthy and tasty not only based on the ingredients it contains, but also based on the visual appearance of that meal. For this reason, an experimental study was conducted, which was designed to compare consumer expectations regarding the taste of a meal based on the visual appearance of the meal, and the actual experience of the consumer after tasting that meal. In this research, which was conducted in April 2022, 20 respondents participated, who filled out questionnaires and performed tastings under identical conditions. Each participant, after taking his position at the set table, received a specially prepared meal, his cutlery, a napkin and a questionnaire. Before starting the meal tasting, each participant was asked to first fill out a first questionnaire about the visual appearance of the meal. The first questionnaire contained six questions on the basis of which the respondents' expectations of whether a meal is healthy and tasty

based on its visual appearance could be assessed. After tasting the meal, the subjects completed a second questionnaire, which tests the subjects' actual experience after tasting it and their experience through seven different questions. The meal contains food of different and intense colors (green, red, orange...), especially aesthetically arranged and positioned on a white plate.

Results

Survey research results

Descriptive statistical analysis

An overview of the socio-demographic characteristics of the respondents is given in the Table 1, with detailed data on their total number and percentage. According the total number of respondents (n=310), 73.9% are women and 26.1% are men. Due to this difference in gender structure, it was not observed if gender affects food preferences based on visual appearance, because the data would not be appropriate.

Table 1. Socio-demographic characteristics of the respondents

Variable	Frequency	Valid %
Gender		
Male	81	26,1
Female	229	73,9
Age		
18-24	88	28,4
25-34	61	19,7
35-44	80	25,8
45-54	60	19,4
55-64	19	6,1
65 and more	2	0,6
Employment status		
Employed	207	66,8
Unemployed, but looking for work	46	14,8
Unemployed, but not looking for work (student, housewife, pensioner)	57	18,4
Education level		
Primary school	1	0,3
Gymnasium/High School	95	30,6
Higher education	149	48,1
Master's degree	54	17,4
PhD	11	3,5
Monthly income		
up to 300 EUR	72	23,2
300-470 EUR	78	25,2
470-640 EUR	89	28,7
640-810 EUR	34	11,0
over 810 EUR	37	11,9

Variable	Frequency	Valid %
Do you have color blindness (color recognition disorder)?		
yes	3	1,0
no	305	99,0

Source: Author's calculations, based on data analysis in SPSS 20.0.

According to the age structure, the largest percentage of respondents are those between 18 and 24 years old (28.4%) and between 35 and 44 years old (25.8%) and then follow respondents between 25 and 34 years (19.7%), respondents between 45 and 54 years (19.4%) and those between 54 and 65 years old (6.1%). The largest number of respondents are employed (66.8%), have completed higher education (48.1%) and have a monthly income from 470 to 640 EUR (28.7%). Mostly of respondents (25.2%) go to a restaurant or order food once a month, 93.5% do not have any special diet and only 1% of respondents have color recognition disorder.

Using descriptive statistical analysis, the arithmetic mean and standard deviation for ten attributes were calculated, as shown in Table 2. The goal of this analysis is to determine the homogeneity of the respondents' attitudes. The highest value of the arithmetic mean is for the attitude: "I enjoy observing the beautiful things", which means that the largest number of respondents agree with this attribute. Respondents have the lowest degree of disagreement with this statement, given that it has the smallest standard deviation. The least accepted statement is "An aesthetically arranged meal is a tasty and healthy meal", where the value of the arithmetic mean is the lowest, and at the same time the value of the standard deviation is the highest, which indicates the greatest degree of disagreement among respondents with this attribute.

Table 2. Descriptive statistics results

	Attribute	Arithmetic Mean	Standard Deviation
1	I enjoy observing the beautiful things.	4,76	,516
2	I pay attention to the colors and design of the served dish.	4,38	,790
3	The appearance of the served food is very important to me.	4,09	,958
4	Colorfulness and high color contrast are associated with the freshness of the meal.	3,78	1,153
5	Colorful and food with intense colors is a healthy meal.	3,35	1,223
6	If I choose a healthy meal, I will choose colorful food.	3,23	1,200
7	If I choose a meal, I will decide for a healthier dish.	3,56	1,155
8	I am willing to pay more for a healthier meal.	3,82	1,159
9	A visually appealing meal whets my appetite and encourages a willingness to taste and consume the dish.	4,16	1,004
10	An aesthetically arranged meal is a tasty and healthy meal.	2,95	1,257

Source: Author's calculations, based on data analysis in SPSS 20.0.

The third part of the questionnaire contains photos of mixed salads of different colors, which were prepared to search the relationship between colors, color combinations, the visual appeal of the salad and the respondent's perception of whether it is a healthy meal. Salad 1 contains green color, salad 2 - red color, salad 3 - green, red and light brown colors, salad 4 - orange, green and red colors and salad 5 - red and green colors. The results of descriptive statistics shows that the highest value of the arithmetic mean and the smallest standard deviation is for salad 5, around which there is the greatest agreement among respondents. The lowest value of the arithmetic mean and at the same time the highest value of the standard deviation exists with salad 3, so this salad is the least accepted, with the greatest disagreements among respondents. Looking at the frequencies and percentages of responses, for each salad, the largest percentage of respondents perceive it as a healthy meal. Authors also calculated the frequencies and percentages of selected salad, which the respondents perceive as the healthiest. The largest number of respondents chose salad 4 as the healthiest (28.7%) and salad 5 (27.1%). Given that each of the observed salads contains components of intense colors, it can be said that the result indicates that the respondents perceive a meal with intense colors as a healthy meal.

In addition to salads, in this part of the questionnaire, various pureed sauces were presented (puree sauce 1 - orange color, puree sauce 2 – red color, puree sauce 3 – yellow color, puree sauce 4 – green color). In this case, a descriptive statistical analysis was applied again, and the results shows that the highest value of the arithmetic mean and the lowest standard deviation is for the sauce 4, where is the highest agreement among the respondents. The lowest value of the arithmetic mean and, at the same time, the highest value of the standard deviation exists for pureed sauce 2, which leads to the conclusion that this pureed sauce is the least accepted. By looking at the frequencies and percentages of responses, pureed sauce 1 and pureed sauce 4 are perceived by the largest number of respondents as a healthy meal, while with pureed sauce 2 and pureed sauce 3, the largest number of respondents do not have an opinion, which leads to the conclusion that food that is orange and green color is perceived by respondents as healthy. Authors calculated the frequencies and percentages of selected pureed sauce, which respondents perceive as the healthiest. The largest number of respondents chose pureed sauce 4 (51.3%), which is green color, and the smallest number chose pureed sauce 2 (9.4%), which is red color. If we analyze these results, we come to the conclusion that respondents perceive a meal that is green color as extremely healthy, in contrast to a meal with red color. These results partially confirm the third hypothesis.

Cross-tabulation analysis

Using the cross-tabulation method, the relationship between age and level of education was examined according to the attribute "If I choose a healthy meal, I will choose colorful food". The obtained results indicate that the largest percentage of respondents aged between 18 and 24 years (40.9%) and between 55 and 64 years (57.9%) do not have an opinion, while in other age groups the largest percentage expresses agreement with the attribute (Table 3). The assumption is that the population of young consumers

(between 18 and 24 years old) has limited financial resources, which they also need for other pleasures, so the visual appearance of the meal is not of great importance to them, but only that it tastes good.

Consumers between the ages of 25 and 55 are mostly employed, engaged in work and have a formed awareness of the importance of healthy nutrition, so they pay more attention to intensive colored dishes, which they perceive as healthy. However, members of the oldest category of respondents do not decide about the attribute, and the reason for this may be their potential lack of interest in the visual appearance of food. If we observe the level of education, there are evident differences in the responses of respondents with a high school (46.3%), as well as respondents with higher education (38.9%), where the highest percentage agrees with the attribute, unlike respondents with master's degree (42.6%) and doctorate (45.5%), who do not have an opinion.

Table 3. Cross-tabulation of sociodemographic characteristics by attribute

	If I choose a healthy meal, I will choose colorful food				
	I do not agree at all	I do not agree	I have no opinion	I agree	I completely agree
Age					
18-24	13,6%	14,8%	40,9%	19,3%	11,4%
25-34	6,6%	8,2%	29,5%	31,1%	24,6%
35-44	12,5%	13,8%	31,2%	25,0%	17,5%
45-54	10,0%	15,8%	36,7%	13,3%	25,0%
55-64	5,3%	15,8%	57,9%	15,8%	5,3%
65 and more	0,0%	0,0%	50,0%	50,0%	0,0%
Education level*					
PS	0,0%	0,0%	100,0%	0,0%	0,0%
G/HS	7,4%	7,4%	35,9%	22,1%	24,2%
HE	14,1%	15,4%	31,5%	22,1%	16,8%
MD	7,4%	14,8%	42,6%	24,1%	11,1%
PhD	9,1%	27,3%	45,5%	9,1%	9,1%

*Note: PS - Primary school; G/HS - Gymnasium/High School; HE - Higher education; MD - Master's degree

Source: Author's calculations, based on data analysis in SPSS 20.0.

The possible reason for the existence of these differences can be explained by the view that people with a higher level of education are more careful in giving answers, in the sense that they do not give an opinion without prior checking. In addition, it must be taken into account that there are probably other factors that influence the perception of a meal as healthy, which are not only related to intense and colorful colors, so that consumers cannot define their attitude only based on color as an element of visual healthy meal experience. By interpreting the results obtained through this analysis, the second hypothesis was proven.

Exploratory factor analysis

In order to perform exploratory factor analysis, it is necessary to determine the justification of its application, that is, the appropriateness of the data. An examination of the correlation matrix revealed many coefficients of values 0.3 and above. The Kaiser-Meyer-Olkin measure (KMO) was used to test the appropriateness of the data for all variables together. This indicator ranges from 0 to 1, with values less than 0.5 indicating the inappropriateness of the correlation matrix for factor analysis, i.e. a value of 0.6 is recommended as the minimum amount acceptable for good factor analysis (Tabachnick & Fidell, 2007). The value of this indicator is 0.740, as can be seen in Table 4. Bartlett's sphericity test showed us a statistically significant value (p=0.000), which means that there is a statistically significant correlation between the variables. In this way, the justification of the application of exploratory factor analysis was confirmed.

Table 4. KMO and Bartlett's test

The value of the Kaiser-Meyer-Olkin indicator	,740
Bartlett's test value	880,777
Df	45
Sig.	,000

Source: Author's calculations, based on data analysis in SPSS 20.0.

As a factor extraction method, the Principal component method (PCA) was used, in order to reduce the number of attributes into a smaller one. PCA is an approach that can be used to extract the number of underlying factors (Pallant, 2013).

As a criterion for choosing the number of factors, the Kaiser criterion was used, which retains only those factors whose characteristic value is greater than 1. In this case, PCA publicized the existence of three factors, because only the first three components have the characteristic value greater than one (Table 5). The total variance of 62.50% is achieved from these three factors, which is above the recommended value of 60% (Janković-Milić & Jovanović, 2019). The first characteristic value is equal to 3.380 and explained 33.80% of the variance in the original data. The second characteristic value is equal to 1.489 and explains 14.88% of the variance, and the third characteristic value is equal to 1.381 and explains 13.80% of the variance.

Table 5. Characteristic values, total explained variance in % and cumulative in %

	Initial characteristic value			**Extraction sums of squared loadings**			**Rotation sums of square loads**		
Components	**Total**	**Variance in %**	**Cumulative in %**	**Total**	**Variance in %**	**Cumulative in %**	**Total**	**Variance in %**	**Cumulative in %**
1	3,380	33,805	33,805	3,380	33,805	33,805	2,482	24,818	24,818
2	1,489	14,887	48,692	1,489	14,887	48,692	2,078	20,782	45,600
3	1,381	13,809	62,501	1,381	13,809	62,501	1,690	16,901	62,501

Components	Initial characteristic value			Extraction sums of squared loadings			Rotation sums of square loads		
	Total	Variance in %	Cumulative in %	Total	Variance in %	Cumulative in %	Total	Variance in %	Cumulative in %
4	,819	8,192	70,693						
5	,733	7,332	78,025						
6	,626	6,264	84,289						
7	,544	5,437	89,726						
8	,406	4,060	93,786						
9	,324	3,242	97,028						
10	,297	2,972	100,000						

Source: Author's calculations, based on data analysis in SPSS 20.0.

It is hard to name the components after extraction based on their factor loadings, so the factors were rotated in order to interpret them. To support in the understanding of these three factors, orthogonal Varimax rotation was conducted, which is the most common rotation method.

Table 6. Factor rotation using the Varimax method

		Components		
		1	2	3
4	Colorfulness and high color contrast are associated with the freshness of the meal.	,613		
5	Colorful and food with intense colors is a healthy meal.	,886		
6	If I choose a healthy meal, I will choose colorful food.	,825		
10	An aesthetically arranged meal is a tasty and healthy meal.	,686		
1	I enjoy observing the beautiful things.		,657	
2	I pay attention to the colors and design of the served dish.		,748	
3	The appearance of the served food is very important to me.		,798	
7	If I choose a meal, I will decide for a healthier dish.			,884
8	I am willing to pay more for a healthier meal.			,871
9	A visually appealing meal whets my appetite and encourages a willingness to taste and consume the dish.			

Source: Author's calculations, based on data analysis in SPSS 20.0.

By using the Varimax method, only those factor weights that are greater than 0.5 would be taken into account in the further analysis (Table 6). The main goal of Varimax rotation is to associate each variable to at most one factor. In order to make the interpretation of the meaning of every factor the variables that have the greatest loadings on a factor are analysed in terms of their similarity regarding the measured construct. After the mentioned rotation, a matrix was obtained on the basis of which it is possible to determine the factor weight value for each factor. Four attributes (4, 5, 6 and 10) are

attached to the first factor. Attributes from 1 to 3 are associated with the second factor, and statements 7 and 8 with the third factor. Attribute 9 is not associated with any of the three listed factors, as its factor weight is below the required level of 0.5.

Therefore, it was determined by exploratory factor analysis, using the PCA extraction method, that three factors can be distinguished from the 10 given attributes: Factor 1 - variety of colors; Factor 2 - visual aesthetics and Factor 3 - healthy meal.

Results of multiple regression analysis

In order to determine the influence of the observed three factors on consumer's perception of a healthy and tasty meal, a multiple regression analysis was conducted. As a dependent variable related to consumer perception, attribute 5 was chosen - "If I choose a healthy meal, I will choose colorful food." On the other hand, three factors were set as independent variables: variety of colors, visual aesthetics and healthy meal.

Regression model indicators are shown in the Table 7. Observed model is representative (Sig = 0.000), the coefficient of determination (R^2) is 0.623, which means that 62.3% of the variability of the dependent variable is explained by the three independents variables (factors). This means that consumer's perception is influenced by all three mentioned independent variables: variety of colors, visual aesthetics and healthy meal.

Results of the Analysis of Variance (ANOVA) shows that the independent variables statistically significantly predict the dependent variable, considering that F (3, 306) = 168.386, $p < 0.0005$. This indicate that the coefficient of determination differs from zero and that the regression of the influence of all three independent variables on consumer perception is statistically significant. The regression analysis results indicate that the factor that refers to the variety of colors individually the most contributes to consumer's perception of a healthy and tasty meal (ß = 0.762, p = 0.000). Also, visual aesthetics (ß = 0.086, p = 0.015) and healthy meal (ß = 0.146, p = 0.000) have a positive and statistically significant impact to consumer's perception. In this way, the third hypothesis was confirmed.

Table 7. Multiple regression analysis results

Variable	β	T	Sig.
Variety of colors	0.762	21.658	0.000
Visual aesthetics	0.086	2.453	0.015
Healthy meal	0.146	4.138	0.000

Source: Author's calculations, based on data analysis in SPSS 20.0.

Together with the results of the factor and multiple regression analysis, the results obtained by analyzing the respondents' answers regarding the given meals (various salads and puree sauces) and their selection in accordance with the perception of these meals as healthy, confirm the third hypothesis.

Experimental research results

Descriptive statistical analysis

After data collection in experimental research, analysis was performed, whereby the statistical software IBM SPSS 20.0 was used to process the views of respondents. Using descriptive statistical analysis, the arithmetic mean and standard deviation were calculated for all six attributes in the first questionnaire (which the respondents filled out before tasting the meal), as well as the response frequencies with percentages. The highest values of the arithmetic mean are for the questions "How artistically arranged is this dish?" and "How delicious does this dish look like?" with the lowest values of the standard deviation. The least accepted statement is "The preparation of this dish is simple", where the value of the arithmetic mean is by far the lowest, and at the same time the highest value of the standard deviation, which points to the highest degree of disagreement among the respondents with this attribute. After tasting this specially prepared meal, the plate with any leftover of food was removed and the respondents were given another questionnaire.

The data collected using the second questionnaire was processed using the same statistical software, and the results of the descriptive statistics were considered. Analyzing this data, it was determined that the largest percentage of respondents liked the taste of the meal extremely much, while the data from the first questionnaire must be taken into account, where 90% of them declared that they felt hungry after just seeing the meal. In addition to this, an attempt was made to determine which colors were remembered by the respondents, and if the meal contained those colors. The answers were relatively consistent, with most respondents claiming that the meal contained orange, red, green and white colors, while there was no blue color. If we compare these answers with the actual appearance of the meal, they completely match. By comparing the results of the first and second questionnaires, we can come to the conclusion that a large number of respondents (95%) liked the presentation and arrangement of the meal (first questionnaire), and after tasting the dish, 95% of the respondents declared that the dish was delicious. These experimental research results confirm the first hypothesis.

Discussions

In the present paper the relationship between food visual aesthetics with consumer perception of a healthy and tasty meal was investigated. By applying various statistical methods, which were used in empirical researches in this paper, all initial hypotheses have been confirmed (Table 8).

Table 8. Summary results

Hypotheses	Empirical research	Analysis	Results
H1: The visual appeal of food is positively correlated with the taste of food.	Experimental research	Descriptive statistical analysis	Confirmed
H2: Differences in the age and level of education of consumers result in certain differences in terms of preferences in choosing healthy meals based on color as an element of the visual experience of food.	Survey research	Descriptive statistical analysis Cross-tabulation analysis	Confirmed
H3: Food that is aesthetically nicely arranged and contains intense colors is positively correlated with consumers' expectations regarding tasty and healthy food, as well as their intention to purchase (order) that dish.	Survey research	Exploratory factor analysis Multiple regression analysis Descriptive statistical analysis	Confirmed

Source: Author's calculations

Perceived differences in terms of preferences in choosing healthy meals based on the visual experience of food, indicate variability of eating behavior within consumers of different sociodemographic profiles. Furthermore, the results revealed that increased perceived meal with intense colors, that was aesthetically arranged, was associated with the consumer's intention to order the meal. The results of experimental research, which show the positive correlation between visual appeal and the taste of food, provide the support to the fact that focusing on visual cues is a natural approach to making food choices (Renner et al., 2016; Schulte - Mecklenbeck et al., 2013).

It was shown in a survey, that the working women with a university degree are the most interested in the visual aesthetics of food. The respondents emphasized the importance of visual aesthetics and the presence of intense colors in food, as well as that this directly affects their perception of that food as healthy and tasty, but it is difficult to explain in detail the exact influence of visual aesthetics on food choice. Based on the obtained results, it is emphasized that people are interested in food visual aesthetics, vivid colors and a healthy meal. These results confirm assumptions from previous literature and can be used for future research in this field.

Conclusion

The conducted research is an attempt to determine the impact of the meal visual aesthetics on the consumer's perception of a healthy and tasty meal. Through an analysis of different literature sources, as well as empirical research conducted for the purposes of writing this paper, it was determined that the visual appearance of food affects its visual appeal, as it contributes to the identification of food ingredients and generates expectations about the taste, freshness and quality of the meal. The results of the empirical research provide evidence for the idea that there are differences in consumer expectations regarding healthy and tasty meals, based on visual aesthetics

and colors. These results are in accordance with the knowledge obtained in the papers of a significant number of authors, which refer to the fact that the visual appearance of food affects the expectations of consumers regarding the taste of food (Ab Karim, Chi, 2010; Fieldhouse, 2013; Carrillo et al., 2011; Spinelli et al., 2014).

One of the main conclusion is that sociodemographic differences among consumers result in significant differences in terms of preferences in choosing healthy meals based on the visual experience of food. Also, the same research suggests that food, which is aesthetically arranged and contains intense colors, is positively correlated with consumers' expectations regarding tasty and healthy food, as well as their intention to purchase (order) that dish. The results showed the importance of visual aesthetics and the presence of intense colored ingredients in food, as well as that it directly affects consumer perception of that food as healthy and tasty. It can be said that this research complements the existing knowledge about the visual attractiveness and aesthetic experience of food on consumers, especially in the context of the food colors. The paper identifies the connection between the visual and real experience of delicious and healthy food, after tasting, which leads to the conclusion that the visual appeal of food is one of the attributes that influence the consumer's decision-making about the choice of food, with the open question if it is the dominant factor.

Theoretical and practical implications

Theoretical implications will complement the existing knowledge on sensory marketing, especially on the influence of the sense of sight on food choice. In addition, the results of this research have numerous practical implications in the field of sensory marketing, gastronomy and hospitality in general. Managers of hospitality companies must not ignore the fact that the visual aspect and the first impression of the appearance of the food on the plate influence the expectations related to the taste of the food. The first sight of food stimulates the appetite and the intention to order an aesthetically arranged and visually appealing meal. Bearing in mind that the human senses, especially the sense of sight, play a key and determining role in consumer behavior, the task of the restaurateur becomes clear: to intrigue the guest and awaken his senses, even before the first bite, with an attractive and aesthetically appealing presentation of food on the plate. Starting from the well-known that "the eyes eat", it is not wrong to say that the visual aesthetics of the served food becomes a significant factor in attracting and motivating consumers to return again and again to the offer of hospitality facilities and to recommend it to others, inspired by their own positive experience. Frequent repeated visits of consumers (guests) depend from the quality of gastronomic offer and their satisfaction with tasty, but also attractively designed and served food. Hence, by increasing the level of satisfaction of their visitors and the visual aspect of a deliciously prepared meal, restaurants get the opportunity to improve their competitiveness in the market and increase the level of profitability.

Limiting circumstances

There are certain limitations that should be taken into account in future research. In some future research, the influence of consumers' personal characteristics and their lifestyle on their perception of the visual appearance of the meal should be studied. Also, the influence of other factors should be taken into account, such as the combination of colors, the balance between colors, the color and shape of the plate, the position, the color of the background, and also the general atmosphere during the tasting. In particular, the connection between different color combinations and food characteristics, such as healthy and fresh food, should be research in detail. It must be also emphasized that understandings and attitudes related to the perception of visual aesthetics are different not only within certain groups of people, but also in different cultures and countries, which can be the inspiration for some future research by the authors.

Conflict of interests

The authors declare no conflict of interest.

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CHARACTERISTICS OF AGRIPRENEURS IN SOUTHEAST EUROPE: GEM DATA ANALYSIS

Sunčica Milutinović[1], Milenko Matić[2], Željko Vojinović [3], Bojan Leković [4], Maja Đukić-Ivanović [5]

**Corresponding author E-mail: milenko.matic@ef.uns.ac.rs*

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ABSTRACT

This paper focuses on the factors that decisively influence the practice of agro-entrepreneurship in the early stages of the entrepreneur's development (demographic, motivational and internationalization factors). The results showed that people who have left their studies are more inclined to start entrepreneurial ventures in the agro-sector than those who are employed full-time or part-time and those who are currently unemployed. It has been proven that older people are more likely to start a venture in this sector. The size of the household proved to be a statistically significant determinant, in the sense that a larger number of household members increases the chances that a person will start a venture. Motives of necessity proved to be key motives for agro-entrepreneurs in the early stages of their development. It has been confirmed that entrepreneurs in the agro-sector in the early stages of development do their business predominantly within the borders of the national economy.

1 Sunčica Milutinović, PhD, Associate Professor, University of Novi Sad, Faculty of Economics in Subotica, Segedinski put 9-11, 24000 Subotica, Serbia, Phone: 021/485-2943, E-mail: suncica.milutinovic@ef.uns.ac.rs, ORCID ID (https://orcid.org/0000-0002-2155-602X)

2 Milenko Matić, MSc, Teaching Assistant, University of Novi Sad, Faculty of Economics in Subotica, Segedinski put 9-11, 24000 Subotica, Phone: 024/628-000, E-mail: milenko.matic@ef.uns.ac.rs, ORCID ID (https://orcid.org/0000-0002-6737-300X)

3 Željko Vojinović, associate professor, University of Novi Sad, Faculty of Economics Subotica, Phone: +381648832600, E-mail: zeljko.vojinovic@ef.uns.ac.rs, ORCID ID (https://orcid.org/0000-0002-2685-5504)

4 Bojan Leković, PhD, Associate Professor, University of Novi Sad, Faculty of Economics in Subotica, Segedinski put 9-11, 24000 Subotica, Serbia, Phone: 021/485-2903, E-mail: bojan.lekovic@ef.uns.ac.rs, ORCID ID (https://orcid.org/0000-0002-6329-8735)

5 Maja Đukić-Ivanović, PhD, Full Professor, University of Niš, Faculty of Economics, Trg kralja Aleksandra Ujedinitelja 11, 18105 Niš, Serbia, Phone: +381 18 528-659, E-mail: maja.djukic@eknfak.ni.ac.rs, ORCID ID (https://orcid.org/0000-0002-0547-7209)

Introduction

Common to most definitions of entrepreneurship is that it implies the process of creating new jobs and seeking new opportunities (Kirzner, 1979; Garther, 1985; Reynolds et al, 2004). A better understanding of entrepreneurship and the entrepreneurial process requires a review of a specific sector (Arafat & Saleem, 2017). The agro-industrial sector consists of a series of activities through which agriculture is connected to other sectors on both sides of the supply chain (Rossi et al 2014). Agro-processing refers to a set of technological and economic activities, which are undertaken on an agricultural product with the aim of turning it into a usable thing, such as food, fiber, fuel or industrial material (Thindisa, 2014). Agripreneurs are not only critical to the economy for the provision of food, but are agents of economic development and the dynamic nature of the agro-economy. Based on previous researches we accepted term "agripreneurs" as they are identified as an entrepreneurial people in agriculture and allied sector who either create or run either formal or informal agriventures (Yoganandan *et al.,* 2022). Farmers and those who perform agri-related activities are entrepreneurs in that they run businesses (McElwee, 2008).

Thompson (2009) talks about the fact that agro-entrepreneurial activity is determined by cognitive abilities and exogenous factors available to small farmers. Cognitive abilities include the origin of the farmer, level of education, previous experience, while exogenous factors are institutional support and socio-economic dynamics. Understanding the involvement of small entrepreneurs in agricultural activity implies understanding the factors that decisively influence their choice. Based on the analyzed literature, the authors arrive at three groups of determinants that influence the career choice of agro-entrepreneurs: demographic factors (Arenius & Minniti, 2005; Savić, 2022; Arafat et al, 2017; Ilić et al., 2022; Daviddson & Hoing, 2003), motivational factors (Ionescu et al., 2018; Florea et al., 2019; Pantić et al., 2022; Thephavanh et al., 2022) and internationalization factors (Leković & Petrović, 2020).

The paper aims to identify determinants that characterize agripreneurs in Southeast Europe. Early entrepreneurial activity in the agricultural sector was put in the center of attention. The methodology of the work is based on the Global Entrepreneurship Monitor (GEM) database and theoretical analysis of the available literature. The task included determining the common characteristics of agro-entrepreneurs from Greece, Bulgaria, Croatia, Slovenia and Bosnia and Herzegovina. In accordance with related research and theory in this field, it is based on demographic factors (work status, gender, age and household size), motivational factors, and internationalization. The research sample includes a group of nascent and entrepreneurial enterprises whose ventures is in the incubation period (up to 42 months old), which according to the GEM methodology represent Total Entrepreneurial Activity (TEA).

The work is organized as follows. As part of the theoretical background, the relevant literature in this field was consulted. The influence of demographic factors on the career choice of agro-entrepreneurs was analyzed. After that, the importance of motivational

factors was considered, within which two groups of motives and their influence on the agro-entrepreneurial activity of the individual are considered. Finally, the impact of internationalization as an entrepreneurial aspiration on agripreneurial activity was also discussed. Also, the methodology and results of statistical research using the logistic regression method are presented. This is followed by a discussion of the results, concluding remarks of the work with a list of contributions and limitations, and recommendations for further research.

Theoretical background

The success of entrepreneurs in performing entrepreneurial activities is largely determined by their demographic characteristics. Arafat et al. (2017) claim that entrepreneurial intention can be explained by demographic variables. Demographic characteristics of entrepreneurs include age, gender, education, work status, household size. Demographic characteristics are often responsible for the entrepreneur's orientation and ability to search for new opportunities (Javalgi & Grossman, 2016). Their influence can be both positive and negative on the creation of new entrepreneurs (Startiene & Remeikiene, 2009). Younger people are more energetic, they are familiar with available technologies, they have an adventurous spirit and what is most important, and they have not yet realized their limits and ultimate ranges.

The assumption is that older people have more knowledge and skills, better access to information, developed business networks and other resources necessary for starting an entrepreneurial venture. Older people, unlike younger people, can have a greater dose of responsibility. Age is generally observed in a negative correlation with the initiation of entrepreneurial ventures, which means that the intention to initiate entrepreneurial ventures decreases with age (Brixy & Hessels, 2010). However, when looking at starting new ventures in the agro-sector, the agripreneur is more likely to be an older person (Pindado Tapia & Sánchez García, 2017; Zagata & Sutherland, 2015; Yilmaz, 2018). Just as there is an ingrained imagination of an entrepreneur as a person who does everything by himself, the very mention of the word entrepreneur awakens in us the dominant perception that it is primarily a male person. For any national economy, inclusiveness in entrepreneurship is a necessary condition. If one group of people does not initiate business ventures at the level of another group or if there is a large discrepancy between the observed groups, it can in some way lead to restrictions on the creation of new jobs, new products and services, the development of innovations, economic growth and development.

According to the mentioned study, in most national economies there is also a higher probability of men starting ventures. Observed from the aspect of gender, women entrepreneurs are mostly in the minority. The literature says that men prefer to start new ventures (Arenius & Minniti, 2005; Markussen & Røed, 2017; Vossenberg, 2013). Pindado Tapia & Sánchez García (2017) come to the conclusion that more educated and entrepreneurs with previous work experience prefer to choose another sector that is more profitable than the agro-sector. Arafat et al (2020) come to a different

conclusion. According to their research, a higher level of education means a greater chance of starting a venture in the agro-sector. The same authors also talk about work status as a factor influencing agro-entrepreneurs. The category of the unemployed is the most inclined to start new ventures in the agricultural sector. Other authors agree with this (Startiene & Remeikiene, 2009; Yilmaz, 2018). Household size is often cited as important for entrepreneurial aspirations. A larger number of household members increases the probability of starting entrepreneurial ventures (Raijman, 2001). Based on the analysis, the first hypothesis was set:

H1: Demographic characteristics (age, gender, number of household members, work status) influence on agripreneurial activity in the Southeast European countries.

Motives as determinants of human behavior or motivational factors as determinants of individual behavior are the basic reasons why someone is ready to change and direct their attitudes, actions and activities, which in any case also applies when it comes to entrepreneurs. Every social behavior of an individual as an individual is basically motivated by certain motives. Motivation, as a result of the action of internal or external factors affecting the individual, results in the investment of effort and energy to undertake activities and actions aimed at achieving set goals. It represents the behavior of individuals based on their abilities, environmental support and the attractiveness of rewards for satisfying perceived needs. Man's needs, such as recognition, achieving success, monetary rewards and the like, create certain unrest and disharmony in man's personality in the form of tensions, the action of which results in the motivation to undertake a certain type of behavior in order to satisfy certain needs. Encouraging people to use the opportunities of agro-entrepreneurship requires an understanding of the phenomena that can motivate them to enter the waters of agro-entrepreneurship in relation to other careers (Thephavanh et al, 2022). The explanation of entrepreneurial intentions is often seen through looking at the motives for starting entrepreneurial ventures. Taking into account the motive for starting an entrepreneurial venture, we distinguish between two basic types of entrepreneurs, "necessity and opportunity", i.e., forced and chance-driven entrepreneurs. This concept was supported by numerous researchers in the field of entrepreneurship (Gurtoo and Williams, 2009, Issa et al., 2022; Hessels et al., 2008).

It is necessary to distinguish between entrepreneurs who are dissatisfied with their current position or have no other option, and are therefore pushed into entrepreneurial activity, from those who want to take advantage of an opportunity that attracts them to engage in this business (Minniti et al. 2006). The decision of people who were employed before starting an entrepreneurial venture is explained in the literature through the opportunity motive (Caliendo & Kririkos. 2019). Kirkwood (2009) includes autonomy, profit and wealth, challenge, recognition and status as opportunity motives. In developed countries, these motives are dominant for starting entrepreneurial ventures (Hessels et al. 2008). Persons who started an entrepreneurial venture from the status of unemployed are characterized as necessary entrepreneurs (Caliendo & Kririkos, 2019). Kirkwood (2009) cites unemployment, job dissatisfaction, lack of support at

work, changing working conditions, family existence as the main motives of necessity. This type of entrepreneur has much less growth intentions (Reynolds et al, 2002). For agripreneurs in the literature, it is generally considered that their entrepreneurial activity is based on motives of necessity (Nikolaev et al, 2018). Thephavanh et al (2022) come to the conclusion that the need for independence, escape from poverty and financial pressures fit better into the concept of motives that drive agro-entrepreneurs. Based on the previously analyzed views, the authors propose the following hypothesis:

H2: Entrepreneurial motivation based on necessity (necessity-driven) has a direct positive impact on agripreneurial activity in the Southeast European countries.

Entrepreneurs as an initiators of the entrepreneurial process, based on the observation and profitable exploitation of identified opportunities, often find opportunities for the growth of their enterprise outside the borders of their country. Entrepreneurs see their chance for success in appearing on other markets. Expanding business beyond the borders of the national economy is one of the steps that a large number of entrepreneurs decide on. Looking for opportunities to expand business in a foreign market, can make significant benefits to entrepreneurs. Innovative products/services and new technologies are responsible for entrepreneurs being able to internationalize their business. The company's internal strengths, which include: accumulated knowledge, organizational capabilities, financial, human and material resources, are the basis for realizing the internationalization of business. The personal characteristics of entrepreneurs are used to explain the intentions of entrepreneurs to do business abroad. Foreign education, foreign work experience, travel experience, knowledge of languages, knowledge of business practices abroad, laws and regulations are responsible for the development of personal characteristics that support the process of internationalization (Zucchella et al, 2007). Agripreneurs are not expected to internationalize their business (Bertolini & Giovannetti, 2006). Leković & Petrović (2020) say that the absence of international orientation is a characteristic of agro-sector entrepreneurs. Most agripreneurs show difficulties when operating in a competitive environment, and that a better position can only be achieved by joining forces (Rossi et al 2014). Carraresi (2012) reveals that small and medium-sized agro-enterprises benefit from sales at the national level or within the territory of one region. In accordance with the analyzed literature, the authors propose the following hypothesis:

H3: The internationalization of business has a direct negative impact on entrepreneurial intentions in the agricultural sector in the countries of the Southeast Europe.

Methodology

The aim of the work is to identify the determinants that influence people in Southeast Europe to make a decision to engage in agropreneurship. For research purposes, the Global Entrepreneurship Monitor (GEM) database from 2017 was used. The main source of data for the analyzed factors (variables) in this study are the results of the GEM survey (Global Entrepreneurship Monitor) from 2017. GEM represents the

world's leading research consortium dedicated to understanding the relationship and impact of entrepreneurship on national economic development. The research conducted in 2017 covered 54 countries, which accounted for 64.7% of the world's population and 86% of the world's GDP. GEM represents the most relevant database when it comes to the academic discipline of entrepreneurship. Answers from Greece, Bulgaria, Croatia, Slovenia and Bosnia and Herzegovina were filtered from the database, which makes a total of 10,047 entrepreneurs, of which 69 are agro-entrepreneurs. GEM represents one of two available international comparative datasets related to entrepreneurship (Estrin etal., 2013). The second is the "Entrepreneurship Survey" of the World Bank focused on registered companies, while the GEM covers all entrepreneurial activities at the national level (Acs et al., 2008). The authors decided to use global data at the national level from 2017, because the GEM research methodology, from the aspect of conceptuality and comprehensiveness, leads to research results that in this intensity do not lose their significance with the passage of time, since it is a matter of national research.

Table 1. Variable description

Description	Variable	Answers
Demographic	GEMWORK3. GEM harmonized work status: 3 categories	Work (1), Not working (2), Retired students
	What is your gender?	Male (1), Female (2)
	What is your current age (in years)?	Continuous variable
	How many members make up your permanent household, including you?	Continuous variable
Motivation	Motive for people involved in TEA	Purely opportunity motive (1), Partly opportunity motive (2), Necessity motive (3)
Internationalization	TEA: strong international orientation (more than 25% of revenue from outside country)	No (0). Yes (1)

Source: Author`s analysis

For the purposes of statistical data analysis, the software package SPSS 18 was used. TEA: Industry ISIC version 4, 1-digit code, which reflects the industrial sector of the entrepreneurial venture, was chosen as the dependent variable. The research sample includes entrepreneurs who are in the early stages of entrepreneurial activity (TEA). The payment of wages in a period of three months (to the workers or the owner himself) is considered a key event for determining the date of "birth" of a business venture. Entrepreneurs who have invested significant resources (human, financial, material) but have not reached the stage of salary payment within a time interval of three months are considered entrepreneurs in the process of establishment or nascent entrepreneurs. Entrepreneurs who have paid salaries for more than 3 months and less than 42 months are considered owners - managers of new companies. Together these two groups of entrepreneurs. For the purposes of the research, the variable was recoded with the

intention of creating a categorical type variable. Respondents engaged in agribusiness are separated into one group, while respondents from all other activities are in the second group. Independent variables are grouped into three categories of factors: Demographic factors: Work status, Gender, Age, Number of household members; Motivational factors: Type of motive (opportunity/necessity); International factors: Strong international orientation (more than 25% of revenue is generated from abroad). An overview of the variables used in the research can be found in Table 1.

Results and discussion

Binary logistic regression was used to examine the influence of determinants on the decision to engage in agribusiness. Omnibus Tests of Model Coefficients takes into account the independent variables and based on the data (Sig.=0.000), ($p<0.0005$) better predicts the results, than in a situation where it is predicted that all students seriously considered the option of starting an entrepreneurial venture. The chi-square indicator is 39,306 with 8 degrees of freedom. According to the Hosmer-Lemesh test, the chi-square is 11.668 with a significance of 0.167, which shows that the model is supported. Nagelkerke R Sguare is a modification of Cox & Snell R Square, so in this research we report on Nagelkerke R Sguare. Therefore, the model explained 15.7% of the variance in students' intentions to start entrepreneurial ventures, and correctly classified 89.0% of cases. The conclusion is that the sensitivity of the model is 99.8%, which means that the model correctly recognized this percentage of entrepreneurs who do not engage in agribusiness. The certainty of the model is 5.6%, which means that the model recognized exactly this percentage of agro-entrepreneurs.

Table 2. Variables in the Equation

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	**Demographic Factors**								
	GEMWORK3. GEM harmonized work status: 3 categories			10.3	2	0.006			
	GEMWORK3. GEM harmonized work status: 3 categories (1)	0.91	0.44	4.29	1	0.038	2.484	1.05	5.88
	GEMWORK3. GEM harmonized work status: 3 categories (2)	1.56	0.59	7.01	1	0.008	4.765	1.5	15.1
	A. What is your gender?	-0.4	0.34	1.46	1	0.226	0.665	0.344	1.29

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	B. What is your current age (in years)?	0.03	0.01	7.31	1	0.007	1.034	1.009	1.06
	E. How many members make up your permanent household, including you?	0.3	0.09	11.9	1	0.001	1.351	1.139	1.6
	Motivation Factors								
	Motive for people involved in TEA			8.03	2	0.018			
	Motive for people involved in TEA (1)	0.17	0.43	0.15	1	0.695	1.182	0.512	2.73
	Motive for people involved in TEA (2)	0.97	0.37	7.07	1	0.008	2.644	1.291	5.42
	International Factors								
	TEA: strong international orientation (more than 25% of revenue from outside country) (1)	-0.9	0.37	5.8	1	0.016	0.408	0.196	0.85
	Constant	-4.3	0.87	24.6	1	0.000	0.01		
a Variable(s) entered on step 1: GEMWORK3. GEM harmonized work status: 3 categories, A. What is your gender? B. What is your current age (in years)? E. How many members make up your permanent household, including you? Motive for people involved in TEA, TEA: strong international orientation (more than 25% of revenue from outside country).									

Source: Author`s analysis

The contribution and importance of each independent variable was analyzed. Primarily, the variables that are statistically significant for the model are considered. These are the factors that decisively influence whether a person will engage in agribusiness. In the case of demographic factors, these are: work status, age and number of household members, while gender is not significant and does not influence the decision to engage in agribusiness. The observed motivational and international factors are statistically significant for the decision to engage in agribusiness.

The probability that a person engages in agribusiness is 2,484 times higher for entrepreneurs who are unemployed compared to those who are employed full-time or part-time, when all other factors are equal. It was confirmed that the category of

unemployed has the greatest chances for an agro-entrepreneurial career, which is in line with previous research (Startiene & Remeikiene, 2009; Yilmaz, 2018). The probability that a person engages in agribusiness is 4,675 times higher for entrepreneurs who left their studies compared to those who are employed full-time or part-time, when all other factors are equal. More educated and experienced people from the business world will direct their knowledge to some other more profitable sector. The students' decision to engage in agropreneurship was encouraged by an external aspect. The role of family, friends, teachers, the state is critical for attracting and motivating a career in the agricultural sector (Che Nawi et al, 2022). The result itself can be partially explained by the fact that the countries of the Southeast Europe are predominantly rural, which means that dropping out of studies mostly means returning home to the countryside, and therefore engaging in agriculture as the most represented activity. The probability that a person engages in agribusiness is 1,034 times higher for entrepreneurs who are older, when all other factors are equal. The age of the entrepreneur increases the chances that the entrepreneurial venture he starts will be within the agro-sector. Brixy & Hessels, (2010), Leković & Petrović, (2020) reach identical conclusions, which is mainly explained through risk. Old age increases risk aversion, and investments in agriculture do not involve large infrastructure investments and unknown circumstances, so they are therefore less uncertain. In the regions of the Southeast Europe suitable for farming, the elderly population predominately lives, so in accordance with this, the chances of entrepreneurial ventures in this sector being started by the elderly are much higher. The probability that a person engages in agribusiness is 1,351 times higher for entrepreneurs who have a larger number of household members, when all other factors are equal. This also means that if the number of household members increases by one unit, the probability that they will engage in agribusiness increases by 1,351. The result proves that a larger number of members of the entrepreneur's household increases his chances of starting an agro-entrepreneurial venture, which is in agreement with other literature (Raijman, 2001). A larger number of household members, on the one hand, can mean more sources of family financing, and with that, greater freedom for individual members to engage in entrepreneurship. On the other hand, it can also mean more hands that will be employed, contribute and help the family agricultural business. Since in the countries of the Southeast Europe, in its rural areas, the coexistence of several generations within the same household is represented, they influence the fact that a larger number of household members represents one of the statistically significant variables and their positive impact on agro-entrepreneurial activity. H1 hypothesis was partially confirmed, since there was no statistical significance in the case of the gender variable.

The probability that a person engages in agribusiness is 1,182 times higher for entrepreneurs who are motivated partially by opportunistic motives compared to those who are driven by opportunistic motives in full, when all other factors are equal. The probability that a person engages in agribusiness is 2,644 times higher for entrepreneurs who are motivated by motives of necessity compared to those who are motivated entirely by opportunistic motives, when all other factors are equal. For entrepreneurs

who are motivated by necessity motives, it has been shown that they have the highest probability of starting business in the agro-sector. Financial pressures and escape from poverty push people into this sector. The existence of a certain infrastructure, such as family property, inheritance, gives the possibility that farming is the first choice. In this way, it is not necessary to have large investments at the start, which brings with it a lower risk, so the decision is fully justified. We find confirmation of this in the work of Thephavanh et al (2022). Based on the results, it can be concluded that hypothesis H2 is fully confirmed.

The probability that a person will engage in agribusiness is 2,451 times lower for entrepreneurs who generate more than 25% of their income from abroad, when all other factors are equal. The third hypothesis was fully confirmed, which means that the characteristic of agro-entrepreneurial firms is business within the national economy. If a company generates more than 25% of its revenue from the foreign market, it is unlikely that it comes from the agro-sector. The theoretical basis that can support these results can be found in the works written by Bertolini & Giovannetti (2006). Agricultural entrepreneurs market their products within the borders of the national economy and it is unlikely that they will launch their ventures in order to expand to foreign markets. Entrepreneurs in the agro-sector are mostly small producers, who enter the market through family farms, which means they also enter within the borders of one country. The export of agricultural products implies simultaneous quality and quantity, in terms of satisfying the refined demands of foreign customers on the one hand, while on the other hand it implies continuous deliveries. These specific requirements can hardly be fulfilled by all agripreneurs. Since the analyzed sample is aimed at entrepreneurs in the early stages of the life cycle, ventures that are in the incubation period, since they do not have a high-growth rate, they are expected to be focused on the development of the venture within the limits in the initial stages national economies.

Conclusion

Agropreneurship plays an important role when it comes to the development of a country. This study was carried out in order to determine the current situation and draw attention to entrepreneurship in this sector. The goal of the research was to determine the determinants that decisively influence the intentions of early agro-entrepreneurs. The Global Entrepreneurship Monitor (GEM) database was used for the research, within which 10,047 entrepreneurs from the countries of the Southeast Europe were singled out, of which 69 are agro-entrepreneurs.

The analysis highlighted three groups of factors. The first group includes demographic factors in which work status, gender, age and number of household members were considered. Differences in gender did not prove to be statistically significant for agro-entrepreneurial intentions, while other demographic factors were significant. The result showed that unemployed people most often start these ventures. In addition, it has been proven that older people are more likely to make a decision to engage in agro-entrepreneurship. A larger number of members of the entrepreneur's household

increases the chances that his entrepreneurial venture is within the agro-sector. The second group consists of motivational factors. It has been shown that necessity motives drive agro-entrepreneurs, which means that they are pushed into this activity for certain reasons. As for the internationalization of business, the results lead to the fact that entrepreneurs in the agro-sector mainly conduct their business within the borders of the national economy.

The contribution of the work is reflected in the increase of literature in the field of agro-entrepreneurship in this area. It should serve researchers as a guideline for further research in this area. It provides an overview of the factors that are key to engaging in this activity. In addition, it shows the situation and attitude towards this sector of entrepreneurship in the Southeast Europe. The research results should serve as a sign to policy makers that it is necessary to work on making agro-entrepreneurship a more attractive occupation.

The work includes several limitations. Within the limitations of the research, it is emphasized that it does not include all the countries of the Southeast Europe. The sample includes only Greece, Bulgaria, Croatia, Slovenia and Bosnia and Herzegovina. These are the countries that participated in the 2017 GEM survey. As the next limitation, the authors state that the research did not include the creation of a questionnaire and directing the research directly to entrepreneurs in the agricultural sector. The GEM database was used for the research, from which responses of agro-entrepreneurs were filtered. If the research had been purposefully created and focused onF agro-entrepreneurs, some other determinants might have been identified. In addition, the determinants were observed on the basis of a database that includes the results for 2017, which may reflect the current situation specific to that time instance. Creating a time series and covering a time period of several years, creating longitudinal data, creating panel data and increasing the number of observations, would lead to more reliable results for interpretation.

Future research could be focused on the creation of a questionnaire that is fully adapted to examining the determinants of agro-entrepreneurs and that is conducted only on them. Furthermore, subsequent research could include a review of the results for several years, in order to see whether the significance of the determinants that influence the choice of an agro-entrepreneurial career changes over time. It would be good to do comparative analyzes and review the determinants of developing countries and developed countries. New technologies, the development of mechanization, government subsidies, access to the market, certainly make a difference in the attractiveness of agro-entrepreneurship in developed and developing countries. Looking for specific recommendations from agro-entrepreneurs, which can contribute to increasing the attractiveness of this career, could also be the direction of future research.

Conflict of Interests

The author declares no conflict of interest.

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ANALYSIS OF ATTITUDES TOWARDS SOCIAL-ECONOMIC AND MARKETING FACTORS ON THE GROWTH OF ORGANIC PRODUCTION

Boris Latinović[1], Bojana Ostojić[2], Marina Bugarčić[3]

**Corresponding author E-mail: boris.latinovic1984@gmail.com*

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ABSTRACT

The aim of this paper was to examine the differences in attitudes towards the influential economic, social and marketing factors on the growth of organic agricultural production. In addition to the above, the scientific goals of the work are to determine the persistence, nature of the connection and predictability of the above strategies for dealing with health problems. The subject of this research is the examination of the attitudes of the population of agricultural producers who own farms and students of the Faculty of Agriculture in Novi Sad according to the representation of influential sociological, economic and marketing factors on the growth of organic agricultural production. The instruments used in this research include a sociodemographic questionnaire constructed for the purposes of this research, methods of analysis, synthesis, induction and comparative methods. The results show that students have a moderately positive attitude towards the use of organic agricultural products, with income, employment and economic growth being significant predictors.

Introduction

The main problem of the attitude towards the growth of organic agricultural production is the factors that significantly affect them. Socio-economic factors and the implementation of a marketing strategy that will raise consumer awareness of health care stand out as significant influencing factors (Proshchalykina, 2019). However, it

1 Boris B. Latinović, Assistant professor, University "Union - Nikola Tesla", Cara Dušana 62-64, 11000 Belgrade, Serbia, Phone: +381616558961, E-mail: borislatinovic1984@gmail.com, ORCID ID (https://orcid.org/0000-0002-0651-1720)

2 Bojana M. Ostojić, Assistant professor, Faculty of Project and Innovation Management, Bože Jankovića 14, Belgrade, Serbia, +381693370334, E-mail: bojanaostojic2002@yahoo.com, ORCID ID (https://orcid.org/0000-0001-6731-431X)

3 Marina D. Bugarčić, Associate professor, University "Union - Nikola Tesla", Cara Dušana 62-64, 11000 Belgrade, Serbia, +381695113399, E-mail: bugarcic.vbps@gmail.com, ORCID ID (https://orcid.org/0000-0003-0762-0192)

could be said that the consequences of impaired health are increasing express the need for health care, and the dynamics of modernist frameworks, especially if to this are added the processes of globalization, the weight of the achievements of modern society and the progressive shortage individual's time to satisfy their own needs, make it difficult to maintain health individual (Subić et al, 2010; Mie et al, 2017; Reeve et al, 2016; Elmaz et al, 2004). Plant production from the point of view of the use of an increasing degree of mechanical means, as well as the use of different types of pesticides, leads to serious problems with human health, as well as the population that we will deal with in this paper (Kovačević et al, 2007; Lunch, 2009; Costa et al, 2014). Intensive agriculture of the conventional type pollutes the environment, and as a result, pollution of agricultural and food products occurs (Salai et al, 2015). Therefore, consumers are increasingly concerned about their nutrition, health and environmental impact, and demand products that are produced in accordance with their beliefs and lifestyle (Vehapi, 2015). What agricultural development is based on is based on the mutual connection of economic and sociological factors (Mihailović, 2007). Also, it stands out here as an important development factor in terms of the application of marketing activities. Marketing is seen as an important development driver in the production of organic products (Vehapi, 2015;Vehapi, 2016). The application of the marketing model with a certain degree of attention is considered one of the basic prerequisites for the success of organic agricultural production (Babović, 2013). Modern marketing contains all the benefits that can represent a basic prerequisite in the development of any segment of the economy (Tomić, 2016). What is of essential importance refers to the emphasis on the basic benefits, as well as on the effective management of the basic factors that affect the organic production itself (Lazić et al, 2015). As a specification of the mentioned domains and problems, it is made up of the student population and that in the major knowledge, availability of information, and monitoring of population concepts that concern almost everyone aspects of life (Mutiara, 2017). The problem itself establishes the importance of the question and the study of influencing factors on health, nature and dimensions of attitudes towards increasing their use (Willer et al, 2010). One of the common entities of most of the research concerning this issue could be said to refer to the issue of stigma, both perceived and self-stigma, was determined in one such research that the biggest problem is the stigma towards health problems (Tananeva, 2010), which is followed by the attitude towards looking for and treating the cause of the problem, not the consequences, and when these two aspects are considered together, the unequivocal conclusion is that health is evaluated more negatively than the possession of specific complaints as a consequence of impaired health (Allen, 2000). The subject of this research is the examination of the attitudes of the population of agricultural producers who own farms and students of the Faculty of Agriculture in Novi Sad towards the prevalence of influential sociological, economic and marketing factors on the growth of organic agricultural production.

The scientific goal of this research concerns the determination of the attitudes of the student population towards the increase in the use of organic agricultural products,

and it is based on the prediction of the contribution to the scientific community, but also to the practical implementation. (Lazić et al, 2003; Lotter, 2003; De Lind, 2000). In addition to the above, the research also includes question, that is, the initial assumption about the existence of a different position of the examined sample groups in the given construct, and predictions about the connection of the constructed test, the scale for examining the overcoming of negative effects of influential factors. The social justification of this research refers to its uniqueness and first conducting research on this topic in the Republic of Serbia. Apart from the specificity of the sample population (farmers and students), there is also a comparison of agricultural producers and students of the Faculty of Agriculture in Novi Sad. The results of this research would be useful in terms of understanding needs, promotion importance of health care in general, health difficulties, and can also serve as support efforts to highlight the importance of health hygiene and literacy.

Considering the subject, problem and goal of the research, the following hypotheses are taken as a starting point:

H1: It is assumed that there is a difference between agricultural producers and students of the Faculty of Agriculture in Novi Sad regarding the attitude towards the influential socio-economic and marketing factors on the growth of organic agricultural production. It is expected that the questionnaire that is intended to assess the attitude towards the growth of the purchase of organic agricultural products, and ultimately in the growth of organic agricultural products to discriminate well the differences that concern ability to recognize and express the need for health care.

H1a: Taking into account the findings that support the fact that the level of information and the importance of health care and a positive attitude towards the consumption of organic agricultural products are positively correlated (Jorm, 2000) it is assumed that agricultural producers will be more open and have a more positive attitude attitude towards organic agricultural production in relation to students of the Faculty of Agriculture.

Materials and methods

The practical part of the work includes research conducted in January and February 2023. The methodology of this research includes empirical knowledge and mathematical - statistical processing, and will be relevant test material and statistical analysis of the obtained data are shown. Methods used in this research are: socio-demographic questionnaire constructed for needs of this research, method of analysis, synthesis, induction, comparative method.

The data for this scientific research work was collected online, using Google Form questionnaires, predominantly through social networks. They are emphasized at the very beginning of the questionnaire the aim and purpose of the research, and the respondents were informed about the anonymity of the answers received. Time required to fill it varied from 10 to 20 minutes. What the research will be based on is a questionnaire about socio- demographic data, a questionnaire on the respondents' attitude towards

the influence of socio-economic factors on the improvement of agricultural production, as well as the influence of marketing activities on the growth of organic agricultural production. Except for the question that initiated a descriptive answer, all 215 respondents answered to the questions, while the aforementioned question (which asked for a description of a significant problem) was answered 172 respondents.

Socio-economic factors analyzed in the paper include consumer awareness, environmental awareness, subsidies, incentives and regulation, while marketing factors include branding, distribution and marketing campaigns.

Results

215 students living and studying in Serbia participated in this research. The age range in this sample is between 19 and 53, while the average age of respondents in this sample is 23.6. The questionnaire was available to respondents for 30 days, as long as the collection lasted data or answers. Socio-demographic questionnaire. The socio-demographic questionnaire was filled out by 215 respondents, ranging from 19 to 53 years old, while average age of respondents 23.64 years, with a standard error of measurement SD=4.72. The largest number of respondents is in the age range of 20 to 24 years, ie 63.7% of respondents. A range of the age of the respondent group of farmers is from 19 to 53 years, with the standard with measurement error SD=5.98. The largest number of respondents (74.1%) are in the age range from 20 to

26. When it comes to the group of students, the age range of the respondents is from 19 to 29 years, with a standard error of measurement SD= 2.22. The average age of the respondents is 22.22, while the largest number of respondents, more precisely 74.9% of students in the age range from 20 to 23. As for demographic variable gender, 130 female persons participated in this research, that is 60.5% of the sample, while 84, i.e. 39.1%, were male, while one respondent did not stated on this dyadic scale of choice, and makes up 0.4% of the sample. In the group of farmers, 79.6% of the sample is female, 19.4% male and one respondent who did not express himself precisely on this item. The group of students consists of 41.1% of people female and 58.9% of male respondents. The surveyed population in this research are students of the Faculty of Agriculture and farmers who own farms from Vojvodina.

The target group of this research consists of students of the Faculty of Agriculture, who make up 50.2% of the sample, while the second group of respondents consists of farmers who own farms and who make up 49.8% of the total sample. Students are in at the time of conducting the questionnaire studied at 3 levels of study, namely: basic studies 68.4% of respondents, in specialist studies, 7.4% of respondents, while in master's studies, 24.3% of respondents. The last variable of the socio-demographic questionnaire referred to the completed level of studies, whereby the largest percentage of the surveyed population, more precisely 52.6% of students did not complete their basic studies, 38.6% of students have completed basic studies, students who have completed specialist studies make up 6% of the examined sample, while 2.8% of

students completed master's studies. In order to check the normality of the distribution and further application of parametric procedures, used is the Kolmogrov–Smirnov test, skewness index, and measure of asymmetry of the distribution for a sample group of students of the Faculty of Agriculture in Novi Sad and farmers. Values normality test, skewness index and measure of asymmetry are presented in Table 1.

Table 1. Values normality test, skewness index and measure of asymmetry

	Kolmogrov – Smirnov test	Skewness index	Measure of asymmetry
Students and farmers	0,341	-2,02	0,01

The Kolmogrov-Smirnov test shows that the group samples are normally distributed in the population with a significance level of 0.05. Furthermore, the value of the curvature index indicates that the distribution of this sample is platykurtic that is, that the grouping of the sample around the mean value is more pronounced, which initiates less dispersion of the sample, while the curvature index coefficient indicates a distinctly slightly asymmetric distribution sample.

Attitude towards the influence of socio-economic factors on organic agricultural production

The questionnaire that measures the attitude towards the influence of socio-economic factors on organic agricultural production was filled out by 215 respondents, aged from 19 to 53 years. Since this instrument is not standardized on the population of students and farmers, the reliability of the scale was calculated to be 0.84, while the sample adequacy measure for this test (KMO) is 0.82. Since the test measures existence negative or positive attitude towards the growth of organic agricultural production, the results obtained the average response for the entire sample is 21.68, which indicates the existence of a moderately positive put in this sample, given that the theoretical values range from 10 to 40. A measure of standard deviation ie of variability is 6.68, while the overall distribution of response frequency is unimodal (26), a the distribution of responses in the sample is negatively skewed (-.831).

Within the sample group of farmers, the average rating of the attitude towards the influence of socio-economic factors on the growth of organic production of agricultural products is 23.79, while the average rating of the attitude for students of the Faculty of Agriculture in Novi Sad is 19.55.

Table 2 shows the values of statistical measures for the attitude inventory towards the influence of socio-economic factors on the growth of organic agricultural production separately for sample groups (students and farmers).

Table 2. Values of descriptive statistics for two sample groups in relation to the attitude towards the influence of socio-economic factors on the growth of organic agricultural production

	Agricultural producers	Students of the Faculty of Agriculture
Average grade of attitude towards increasing the use of organic agricultural products	23,79	19,55
Standard deviation	6,1	6,68
Minimum response value	10	2
Maximum response value	30	30
Central tendency value	28	27

The difference between the two groups is 4.24, which is a deviation from the overall average answers for farmers 2.11 and for students -2.13. Students declare that in the situation of various socio-economic factors, there would not be a significant increase in organic agricultural production, while farmers express a higher disagreement rather than agreement with the given description of the situation, and the given relationship of both groups have according to the statement "If there was an improvement in socio-economic factors, I am sure that the impact on the growth of organic agricultural production would be significantly improved".

Farmers, on average, have the highest agreement with the statement "The application of marketing activities would have a significant impact on the growth of organic agricultural production." When it comes to the group of students, the highest average degree of compliance is with with the statement "Marketing activities increase consumer awareness of the importance of buying organic agricultural products and their positive impact on health." The lowest degree of compliance with the statement "There is no significant impact of marketing activities on the growth of organic agricultural production" is expressed by both groups of respondents.

When it comes to the demographic variable gender, researches that dealt with gender determination the difference in attitude towards the significant impact of socio-economic factors on the growth of organic agricultural production suggests that women occupy more positive attitude compared to men. Namely, the results indicate that persons females have a 6.41 more positive attitude towards seeking psychological help (M=31.13) in compared to men (M=24.72). In the group of farmers, the average value attitude towards seeking psychological help in women is 28, while in men this value is 20. Regarding the demographic variable gender in the group of students, average knowledge for female students it is 26, while for male students the average value is 13.5. When it comes to the need to buy organic products and the influence of income on the purchase of organic agricultural products, 46.9% of respondents and 16.7% of male respondents give an affirmative answer. 26.9% of respondents and 8.3% of respondents intend to increase their purchase of organic agricultural products in the next three months. in the whole sample. As for female farmers, 39.5% of them state that they have the need to buy organic agricultural products, with which many female

students agree that is, 61.4%. When it comes to men, 19% of male respondents agree with the same statement who are farmers, and 15.9% are students. I intend to in the next three 24.4% of farmers and 31.8% of students increase their purchase of organic agricultural products.

With the aim of determining cause-and-effect relationships between tests and subtests within the inventory, a correlation analysis procedure was carried out. Data analysis and determination of the existence, degree and value of correlations was carried out for the inventory of the attitude towards the influence of socio-economic factors on the growth of organic agricultural production and the attitude towards the influence of marketing activities on the growth of organic agricultural production. Although the level of correlation for each subscale is at a lower level, the obtained data indicate that the connection or the existence of low correlations with a significance level of 0.01% and 0.05%. The highest degree of correlation is seen with the leadership as a social resource subtest, and reliable connections and social integration. By comparing 6 subtests, i.e. (income, occupation, education, awareness, promotion, advertisement), it can be seen that the lowest degree of correlation of the attitude inventory towards seeking psychological help with the social need is nurturing, which is also the least represented strategy in the sample, while the highest degrees of correlation are precisely on the most represented resources of social support for the attitude towards seeking psychological help, namely guidance and reliable relationships. Correlation analysis can determine that social support, nurturing and attachment are not correlated with the attitude towards seeking psychological help.

Table 3. Correlation of factors according to the growth of organic agricultural production

Scale of attitudes towards the influence of socio-economic and marketing factors on the growth of organic agricultural production	**Income**	**Occupation**	**Education**	**Conscience**	**Promotion**	**Commercials**
	0,24**	0,13	0,20**	0,23**	0,1	0,17*

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 4. Correlations of strategies for overcoming the negative effects of factors and attitudes towards the growth of organic agricultural production

	Employment	Economic growth	Avoidance
Attitude towards influential factors on the growth of organic agricultural production	-,075	-,284 **	,054

**Correlation is significant at the 0.01 level (2-tailed)

The highest degree of significance of the correlation at the level of 0.01% is recorded on the subtest which is moderately low and negative, which implies that the use of social support resources as a dominant strategy has a low and negative effect on the attitude towards impact on the growth of organic agricultural production. More precisely, the obtained values indicate that a higher degree of presence of socio-economic and marketing factors has a moderately low influence on taking a more negative attitude towards increasing organic agricultural production.

The level of association between the test that examines the attitude towards influencing factors and the growth of organic agricultural production at for the whole sample it is negative, moderately low (-.293) with a significance level of 0.01%. Correlation attitude to attitude in in the sample of farmers, it is negative, moderately low and amounts to -.233, while it is the same the value in the sample of students is slightly higher and amounts to -.238. Level of significance correlation for both samples is at the level of 0.05%

Examining multiple linear regression analysis of attitude towards socio-economic factors of marketing factors on the growth of organic agricultural production was performed for 3 subtests whose values are at the highest level correlations, and at the same time 3 coping strategies that respondents use most often.

Table 5. Regression analysis of attitude towards seeking psychological help and coping strategies

	R	R^2	B	P
Employment	0,22	0,50	-0,14	0,01
Economic growth	0,01	0,00	0,00	0,93
Avoidance	0,22	0,50	-0,14	0,01

Using multiple linear regression, it was determined that avoidance is a significant determining factor attitude towards the purchase of organic agricultural products by 5%, while the Beta regression indicates that for each unit of change in the avoidance

strategy, there is a change in attitude towards the growth of organic agricultural production by -0.14. More precisely, it was determined that the attitude towards seeking psychological help will decrease by 0.14 if there is an increase of one unit in the case of using avoidance as a dominant stress coping strategy

Conclusions

The ultimate goal of this work was to examine the attitude towards socio-economic and marketing factors on the growth of organic agricultural production. In this connection, the role of the strategy of overcoming the negative effects of factors on the growth of organic agricultural production was investigated. Statistical analysis indicates high levels of reliability and adequacy of the batteries used of tests for the research topic and the examined population sample. The analysis of the obtained data indicates to the existence of a moderately positive attitude towards the significant influence of socio-economic factors on the growth of organic agricultural production, which is something more pronounced in the group of agricultural producers, thus confirming the first hypothesis. Obtained the findings are somewhat expected as less than a third of respondents increased their purchase of organic agricultural products. Furthermore, the expectation of representation more positive attitude of farmers in relation to students of the Faculty of Agriculture is reflected through better information, i.e. a greater degree of knowledge about the importance of healthier nutrition through organic agricultural products.

Apart from the above, in the group of farmers, respondents asked for more professional assistance in improving organic agricultural production in relation to students of the Faculty of Agriculture. Regarding the examined socio-demographic variable education, the obtained findings are partially in agreement with previous researches that speak in favor of it'd at the level of the whole sample, the most positive position taken by farmers.

The obtained correlations, although moderately low, are suggestive on the existence of a connection between the two examined constructs, whereby the social resource is guidance to the greatest extent reciprocally connected with the attitude towards seeking psychological help, especially in to a group of farmers. The result indicates that seeking information and advice from other persons, as well as the media campaign, i.e. the source of information of persons associated with representing a more positive attitude towards organic agricultural products.

The assumption that strategies to overcome the negative effects of factors can be a good predictor of the growth of organic agricultural production, more precisely that a higher score in to the aspect of overcoming negative factors with a method focused on avoidance, determines a lower tendency to increasing the consumption of organic agricultural products. The results indicate that using the effect of increased employment as dominant strategies for overcoming the negative effects of the factor have a moderately low influence on the attitude towards the growth of consumption of organic agricultural products. The obtained results show that avoidance strategy is a significant predictor of attitude towards seeking psychological help, which initiates it that it supports and

promotes a more negative attitude towards seeking psychological help avoidance as a dominant coping strategy. The obtained correlation and regression values analyzes are low, largely due to the complexity of both examined variables. Furthermore, it can be to assume that a superficial, incomplete attitude towards health and rejection of dealing with problem indicates that people underestimate health care, although qualitative analysis suggests that the respondents have a solid insight into everyday issues, because the events they mentioned they mostly represent critical situations and significant challenges. What can be concluded based on the qualitative analysis of descriptive data about the subjective significant problems is that important factors that influence the increase in the use of organic agricultural products are awareness, lack of funds, lack of knowledge about health benefits.

Conflict of interests

The authors declare no conflict of interest.

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IMPACT OF REALIZED INVESTMENTS IN NEW FIXED ASSETS ON GROSS DOMESTIC PRODUCT IN SERBIA

Biljana Grujić Vučkovski[1], Vesna Paraušić[2], Nataša Kljajić[3]

**Corresponding author E-mail: biljana_g@iep.bg.ac.rs*

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ABSTRACT

The research subject is the analysis of the impact of the value of realized investments in new fixed assets on the gross domestic product (GDP) of Serbia in the period from 2012 to 2021. The research was conducted with the aim of determining which economic activity, according to the value of realized investments, contributes the most to the creation of the value of Serbia's GDP. The defined goal was realized by applying the multiple regression method, and the starting model contained the value of realized investments in four activities, which are: manufacturing; electricity, gas, steam and air conditioning supply; transportation and storage; agriculture, forestry and fishing. The occurrence of multicollinearity between independent variables was checked by the tolerance coefficient, VIF coefficients and Eigen values, and their values indicate the presence of weak multicollinearity, which is a consequence of the impact of realized investments in agriculture, forestry and fishing. The result of the set regression model shows that the greatest contribution to the creation of Serbia's GDP is made by the realized investment value in the electricity, gas, steam and air conditioning supply (Standardized Beta Coefficients 0.687, Sig. = 0.012).

Introduction

Gross Domestic Product (abbr. GDP) shows the value of final products and services that the country produces during one calendar year. The economic strength of a country is most often measured by the total GDP and GDP per capita. GDP is an indicator of economic growth and living standards of a country and is most often used to compare

1 Biljana Grujić Vučkovski, Research Associate, Institute of agricultural economics, Volgina 15, 11060 Belgrade, Serbia, Phone: +381116972848, E-mail: biljana_g@iep.bg.ac.rs, ORCID ID (https://orcid.org/0000-0003-2588-4888)

2 Vesna Paraušić, Senior research associate, Institute of agricultural economics, Volgina 15, 11060 Belgrade, Serbia, Phone: +381116972848, E-mail: vesna_pa@iep.bg.ac.rs, ORCID ID (https://orcid.org/0000-0001-6193-5297)

3 Nataša Kljajić, Senior research associate, Institute of agricultural economics, Volgina 15, 11060 Belgrade, Serbia, Phone: +381116972848, E-mail: natasa_k@iep.bg.ac.rs, ORCID ID (https://orcid.org/0000-0003-2245-8285)

economic development between countries (Abbas et al., 2011; Chamberlin, 2011). According to Chamberlin (2011), GDP, as a measure of economic activity, it is a useful indicator of production and suitable for use in productivity assessments. However, as a measure of economic well-being, it has several limitations. This measure of real income differs from real (money) GDP by taking into account capital consumption, net income and transfers from abroad, and uses a consumption deflator rather than a general GDP deflator, so that output is valued in terms of consumption units (Chamberlin, 2011).

The contribution of certain activities to the creation of GDP varies by country. For example, Isidro (2022) using data from the World Bank, she observed, for example, that the participation of agriculture in the creation of GDP in the countries of the world ranges from 4% to even 25%. Also, GDP is affected by numerous factors, and which factors, in what strength and combination will affect the GDP of each country, differs from country to country.In the scientific and professional literature, many examples dealing with the analysis of the impact of various factors on the creation and change of the country's GDP can be found.

Iordache et al. (2011), by using multiple linear regression, analyzed the influence of three different factors on the realized GDP in Romania (unemployment rate, annual inflation rate and exchange rate), indicating by the correlation method that the exchange rate has a positive and strong influence on the country's GDP. According to Milutinović (2022), economic differences between countries, viewed through GDP per capita, can arise due to unequal human capital between countries.

Important factor that affects the value of GDP is FDI. Using a panel dataset of bilateral flows of FDI, Bevan and Estrin (2004) study the determinants of FDI in western European countries (mainly in the European Union), and in the Central and Eastern European ones, and they find following the most important determinants of FDI: *"unit labor costs, gravity factors, market size, and proximity"* (Bevan, Estrin, 2004, p. 775). *The mentioned authors also pointed out that "host country risk proves not to be a significant determinant"* (Bevan, Estrin, 2004, p. 775). FDI are key initiator of long-run economic growth in all developing country (Dinh et al., 2019; Nosheen, 2013; Pantić et al., 2022; Dumitraşcu et al., 2013; Rahaman, Chakraborty, 2015; Stanciu et al., 2019; Sarker, Khan, 2020). However, other macroeconomic factors also play an important role in explaining economic growth in these countries. Thus, according to Dinh et al. (2019) long-term economic growth in developing countries is driven by money supply, human capital, total domestic investment and domestic credit to the private sector.

Izuchukwu (2011) analyzed the impact of the agricultural sector on the economic development of Nigeria. He formed a multiple linear regression model, where the achieved GDP was a parameter for economic development (dependent variable), and for agricultural indicators (dependent variables) he took the following values: domestic savings, state expenditures in agriculture and FDI in the agricultural sector. Through research, he came to the result that all three predictors have an impact on GDP, but that the biggest impact is achieved by state savings.

In this paper, the authors analyzed the impact of the value of realized investments in new fixed assets on the realized value of GDP in Serbia in period 2012-2021 in four activities: (1) Manufacturing; (2) Electricity, gas, steam and air conditioning supply; (3) Transportation and storage; and (4) Agriculture, forestry and fishing. The choice of the first three economic activities was conditioned by the high average annual participation of the investments made in these activities in the total investments of Serbia in the period 2012-2021. The choice of the fourth economic activity (Agriculture, forestry and fishing) conditioned the high contribution of this sector to numerous performances of the national economy. Namely, agriculture in Serbia significantly contributes to the employment of the working-age population, contributes positively to the foreign trade balance, provides food to the population and the livestock sector, provides industry with raw materials, and still significantly encourages the development of rural areas (Grujić Vučkovski et al., 2022).

With the application of multiple regression, the aim of the paper is to determine which economic activity, according to the value of realized investments in new fixed assets, contributes the most to the creation of the total value of GDP.

Literature review

According to the World Bank classification (World Bank, 2022), Serbia belongs to the group of upper middle income countries (for 2021, the group of countries where the range of gross national income per capita ranges from 4,256 to 13,205 USD). When it comes to GDP per capita, compared to EU countries, Serbia still lags far behind. Namely, in 2019, GDP per capita in European Union 28 was EUR 32,150, while in Serbia it is only EUR 6,620 (EUROSTAT Database, Economy and finance, National accounts, Main GDP agregates, GDP at market prices). It is concluded that GDP per capita in 2019 is five times lower in Serbia compared to the European Union 28. The same ratio of realized GDP per capita in the territory of the European Union 28 and Serbia has been achieved during 2018, and this ratio has also been noticed by authors Grujić et al. (2021).

According to Statistical Office of the Republic of Serbia (SORS), Municipalities and regions of the Republic of Serbia, in the period 2012-2021, the highest average annual share of investments by activities in the total realized investments was recorded by Manufacturing (25.3%). At the same time, in the analyzed period (2012-2021), investments in Agriculture, forestry and fishing grew on average annually at a higher rate than in the manufacturing (2.1%, versus 0.8%, respectively).

Unfortunately, Serbia has economic activities that in the ten-year period (2012-2021) recorded average annual decreases in investments, which are: financial and insurance activities -3.9%, real estate activities -1.8%, accommodation and food service activities -0.5%, other service activities -2.2% (SORS, Municipalities and regions of the Republic of Serbia). Aso, agriculture plays a vital role in the national economies of Serbia and all Western Balkan Countries (WBC), but this sector shows lower technical efficiency

compared to EU countries. This is primarily result of lower productivity, dominance small scale family farms, high land fragmentation, small and unstable support for rural development and difficult access to finance (Erjavec et al., 2021; Horvat et al, 2020; Savić, 2022; Kotevska et al., 2015; Nikolić et al. 2017; Sanfey, Milatovic, 2018; Volk et al., 2019).

Macroeconomic stability has been established in Serbia in the last few years, primarily due to the successfully implemented fiscal consolidation (Randjelovic, 2020). In the group of Southeastern European countries (Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Romania, Serbia and Slovenia), Serbia shows good macroeconomic indicators (Marjanović, Zubović, 2020). The country managed to transform itself into a growing economy with low inflation, fiscal surpluses, reduced public debt, reduced external imbalances and recovery in the labor market (Marjanović, Zubović, 2020). According to the multiplicative and seasonal aspects of the trend analysis, the projections for Serbia show a gradual increase in GDP, FDI, national competitiveness and a decrease in the unemployment rate in the next 5 years (Vukmirović et al., 2021).

GDP growth in Serbia shows a strong correlation with the growth of industrial production, but also with the inflow and outflow of FDI (Vasa, Angeloska, 2020; Vukmirović et al., 2021). Capital investments have a statistically significant positive effect on the long-term performance of domestic companies (Grozdić et al., 2020), and consequently on GDP. At the same time, the tax treatment of investment projects (which differ by the type of funds, activity and source of financing) in Serbia has a uniform burden, which indicates the absence of discrimination and distortionary effects of taxation and can be considered as a confirmation of tax neutrality (Luković et al., 2021).

Beke-Trivunac et al. (2021) proved the effect of investments in fixed assets on the growth of employment in Serbia. Analyzing the period 2013-2020, these authors point to a high correlation between annual investments in fixed assets and employment growth, emphasizing that these investments are the most significant generator of new job openings, i.e. employment growth. Despite all of the above, Serbia's economic growth is insufficient for faster convergence with European countries, and one of the causes of slow growth is found in low domestic private and public investments over a longer period (Randjelovic, 2020). As for public investments, although they have seen growth in recent years, Serbia still lags behind the countries of Central and Eastern Europe and the Western Balkans in terms of their size and participation in GDP (Randjelovic, 2020).

In addition, investments are still low in fixed assets. On the example of sector A (Agriculture, Forestry and Fishing) in the Republic of Serbia, in the period 2013-2018, the fixed assets financing indicators indicate a lack of capital for financing new investments, which is mostly compensated by long-term borrowing at the level of enterprises and short-term borrowed sources at the level of entrepreneurs in the analyzed sector (Bogićević et al., 2021).

Materials and methods

The analysis of the indicators began with an overview of the interannual rates of changes in GDP and GDP per capita in the area of the European Union 28 and Serbia in the period from 2012 to 2019. After that, an overview of the average annual participation and PGSP (in %) of the value of realized investments by activity in the total value of investments in Serbia from 2012 to 2021 was given. The average annual rate of change (*equation 1*) was calculated according to the following formula (Fay et. al., 2006):

$$\gamma = \left(\left[\frac{\delta_n}{\delta_1} \right]^{\frac{1}{n-1}} - 1 \right) * 100 , \qquad (1)$$

where γ - the average annual rate of change, δ_n – the absolute value of the last member of the time series, δ_1 – is the absolute value of the first member of the time series, n – the number of members in the series (ie, the number of years).

In the follow-on of the paper, research was conducted on the analysis of the impact of realized investment values according to activities on the total GDP of Serbia. Our research is based on determining the value of investments made in nineteen groups of activities monitored by the Statistical Office of the Republic of Serbia (abbr. SORS). The exact values of realized investments according to activities are given by SORS's publication Municipalities and Regions in the Republic of Serbia. This publication publishes data on municipalities, cities and regions of Serbia from various areas of social and economic development. The data taken from this document represent the basic source of data for the application of statistical methods in the period from 2012 to 2021.

In the paper, first of all, an analysis of the descriptive statistics of investments in Serbia by activity was carried out. After an insight into the structure, as well as due to the complexity of the data, the values of realized investments in certain activities, due to their low values, were shown collectively and marked as *"other activities"*. These activities include: accommodation services; financial activities; real estate activities; professional, scientific and technical activities; administrative activities; education; human health and social work activities; arts; other service activities. If we look at the average annual share of the total realized investments, we see that *other activities* make up only 14.5%.

In aim to set up a valid regression model, the authors include in the analysis the first three economic activities that achieve the largest average annual participation in the total investments of Serbia from 2012 to 2021, that are: *manufacturing; electricity, gas, steam and air conditioning supply; transportation and storage*. Also, the authors include the activity of *agriculture, forestry and fishing* because it employs a high percentage of the working age population in Serbia. According to the data published in the Labor Force Survey in the Republic of Serbia (SORS, 2022) during 2021 15% of the population aged 15-89 of the total population is employed in this activity, which is why this branch is right behind the manufacturing, which employs 19.8% of the population in this age group.

The regression model set in this research has the following form (*equation 2)*:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n + \varepsilon_n, \quad (2)$$

where: Y – value of dependent variable, X_1, X_2, …, X_n – value of independent variables, β_0, β_1, β_2, …, β_n – regression parameters, ε_n – random error.

The multiple regression model is set so that GDP represents the dependent variable, while the independent variables are represented by the realized values of investments of the mentioned activities. Regression model get the new form (*equation 3)*:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon, \quad (3)$$

in our case it is: Y – GDP of Serbia (current prices), X_1 – the value of realized investments in the manufacturing (current prices), X_2 - the value of realized investments in electricity, gas, steam and air conditioning supply (current prices), X_3 - the value of realized investments in transporting and storage, X_4 - the value of realized investments in agriculture, forestry and fishing, β_0, β_1, β_2, β_3, β_4 – regression parameters, ε - random error.

In the established model, the *initial hypothesis* has the following form:

H_0: β_0, β_1, β_2, β_3, $\beta_4 = 0$ (the observed coefficient is not statistically significant).

In the same model, *alternative hypothesis* has the following form: H_1: β_0, β_1, β_2, β_3, $\beta_4 \neq 0$ (the coefficient is statistically significant).

The evaluation of the hypotheses was given after analyzing the values of the obtained coefficients.

The SORS database and the publication *Municipalities and Regions in the Republic of Serbia* recorded, only in domestic currency (RSD), the investments values by economic activities and for easier understanding of the obtained values, using the average annual exchange rate[4], the values in the domestic currency were converted to EUR.

Firstly, the established model was evaluated by interpreting the results of descriptive statistics of the realized GDP of Serbia in the observed period.

After these analyses, the correlation between the independent variables in the set model will determine the fulfillment of the initial assumption in terms of whether there is a certain degree of linkage between the predictors (independent variables), as well as whether the presence of multicollinearity affects the achieved regression results.

4 The average official middle exchange rate of the dinar against foreign currency in the year is calculated as the arithmetic mean of the official middle exchange rates that were applied on working days of the year (https://nbs.rs/en/finansijsko_trziste/medjubankarsko-devizno-trziste/kursna-lista/prosecni-kursevi/index.html).

The presence of multicollinearity between independent variables will be done in three ways, and the mathematical formulas are best presented by the authors Adeboye et. al. (2014). Therefore, the presence of multicollinearity on the regression standard error coefficient will be confirmed using the following indicators: *tolerance level, VIF (Variance Inflation Factors) coefficient, Eigen values.*

The tolerance level is calculated according to the following formula $1 - R^2$, where R^2 is coefficient of determination and represents the result of regression analysis. The tolerance level can also be explained as the influence of one independent variable on another independent variable in the established regression model. Lower values of the tolerance coefficient are considered to indicate a high level of multicollinearity. If the value of this coefficient is around 0.4, it can be said that there is weak multicollinearity.

VIF represents the reciprocal valu $\frac{1}{}$ the tolerance coefficient and is calculated according to the following formula $\frac{1}{1-R^2}$. The VIF value indicates the size of inflation in the standard errors. If the VIF value is greater than 2.50, it means that there is a relatively high level of multicollinearity between the predictors.

Using *Eigen values* we can determine the closeness between variables. When the value for Eigen value is close to zero then it indicates linear dependence in the analysis and more closely determines the properties of independence.

The previously mentioned analyzes contributed to determine that the activity of electricity, gas, steam and air conditioning supply had the greatest influence on the creation of the GDP of Serbia in the analyzed period, and a linear trend model was shown for this branch of the economy. The graphic representation of this result indicates how the change in realized investments in the most dominant activity will affect Serbia's GDP in the next three years. The initial equation has the following form (*equation 4)*:

$$y = bx+a, \qquad (4)$$

where: y – value of dependent variable, x – value of independent variable, a *i* b - parametric values.

All the above-mentioned analyzes were carried out in aim to determine the accuracy of the obtained data and the correctness of the conclusions reached.

Statistical data processing was carried out using the SPSS 25 software package.

Results and discussion

Table 1. shows the indicators of the descriptive statistics of the realized values of the GDP of Serbia from 2012 to 2021 (SORS, eletronic database, national accounts, annual national accounts, Gross domestic product, total and per capita).

Table 1. Descriptive statistics of GDP of Serbia from 2012 to 2021 (in EUR, mln)

Variable	Mean	Std. Deviation	Minimum	Maximum	Coefficient of variation (in %)
GDP	40,637.0	6,384.5	33,679.3	53,329.3	15.7

Source: Author's calculation based on SORS databases.

The average realized value of Serbia's GDP in the ten-year period was EUR 40,637.0 mln, with the maximum value recorded in 2021 and the minimum in 2012 (*Table 1.)*. The standard deviation value shows us the average deviation from the average value, and in our case it is EUR 6,384.5 mln. The value of the coefficient of variation shows the slight variability of Serbia's GDP (15.7%).

The results shown in *Table 2.* indicate the following:

- The manufacturing has the highest average annual realized value of investments of EUR 1,443 mln, and the lowest water supply; sewerage, waste management and remediation activities with only EUR 111.4 mln;
- The highest average deviation from the average value of investments was observed in the activities of public administration and defense; compulsory social security, and the lowest in the area of the water supply; sewerage, waste management and remediation activities;
- The least investments were recorded in the water supply; sewerage, waste management and remediation activities, and the most in the manufacturing;
- Wholesale and retail trade as well as agriculture, forestry and fishing have the lowest variability of realized investments in Serbia.

Table 2. Descriptive statistics of realized investments according to activities in time 2012-2021 (in EUR, mln)

Variable	Mean	Std. Deviation	Minimum	Maximum	Coefficient of variation (in %)
Agriculture, forestry and fishing	144.6	25.6	101.0	183.3	17.7
Mining and quarrying	256.4	154.3	113.7	531.6	60.2
Manufacturing	1,443.0	323.8	1,098.1	1,943.7	22.4
Electricity, gas, steam and air conditioning supply	571.2	169.6	330.5	909.6	29.7
Water supply; sewerage, waste management and remediation activities	111.4	20.7	74.5	149.1	18.6
Construction	454.5	183.4	205.0	811.7	40.4
Wholesale and retail trade; repair of motor vehicles and motorcycles	440.6	70.7	321.0	553.3	16.1
Transportation and storage	549.6	382.6	259.4	1,294.9	69.6
Information and communication	462.4	137.4	302.3	710.3	29.7
Public administration and defence; compulsory social security	627.1	640.1	137.0	1,910.9	102.1
Other activities*	829.3	180	481.6	1,073.1	21.7

Source: SORS, Municipalities and Regions in the Republic of Serbia for analized years.

*Other activities include: accommodation services; financial activities; real estate activities; professional, scientific and technical activities; administrative activities; education; human health and social work activities; arts; other service activities.

Table 3. shows the variability of the regression model of the dependent variable *Y* (GDP, current prices) and independent variables X_1, X_2, X_3 and X_4 , where X_1 – the value of

realized investments in the activities of manufacturing (current prices), X_2 - the value of realized investments in the activities of electricity, gas, steam and air conditioning supply (current prices), X_3 - the value of realized investments in transportation and storage activities (current prices), X_4 - the value of realized investments in activities of agriculture, forestry and fishing (current prices).

Table 3. Coefficient of correlation, coefficient of determination, standard error of the regression model of realized investments values of selected economic activities on Serbia's GDP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.964	.929	.872	22804.6800

Source: Author's calculation based on SORS databases.

The correlation coefficient shows us that there is a strong positive link between the variables (0.964). The coefficient of determination shows us that 92.9% of the variation in the GDP of Serbia can be explained by the strong influence of the realized investment values of the analyzed activities, while the corrected coefficient of determination shows that 87.2% of the variability of the GDP of Serbia depends on the value of the investments realized in the observed economic activities. The remaining 12.8% is the influence of other factors (eg, other economic activities that are excluded from further analysis due to their low participation in the total realized investment value, as well as other influences that are not the subject of the analysis). The standard error of the regression shows that there is a deviation from the regression line of the sample in the amount of EUR 22,804.6800 mln.

The results of testing the assumed regression model in *Table 4.* show us that the set model is statistically significant, as indicated by the value in the last column (0.004).

Table 4. Evaluation of the significance of the set regression model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	34085405239.255	4	8521351309.814	16.386	.004
	Residual	2600267141.245	5	520053428.249		
	Total	36685672380.500	9			

Source: Author's calculation based on SORS databases.

In the next table *(Table 5.)*, we see positive values for β_0, β_2, β_3, β_4, while value for β_1 is negative. The set regression model has the following form (*equation 5)*:

$$Y = 252988.002 - 3.894\ X_1 + 25.862\ X_2 + 8.583\ X_3 + 10.148\ X_4 + \varepsilon \quad (5)$$

Table 5. The results of the set regression model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	252988.002	55228.206		4.581	.006		
	Manufacturing	-3.894	4.364	-.197	-.892	.413	.289	3.455
	Electricity, gas, steam and air conditioning supply	25.862	6.666	.687	3.880	.012	.452	2.213
	Transportation and storage	8.583	3.157	.514	2.719	.042	.396	2.525
	Agriculture, forestry and fishing	10.148	58.187	.041	.174	.868	.259	3.855

Source: Author's calculation based on SORS databases.

The data presented in *Table 5.* show us that the realized value of investments in the activities of *electricity, gas, steam and air conditioning supply* has the greatest influence on the realized value of Serbia's GDP, because the standardized beta coefficient is the highest (0.687). This conclusion also confirms the value for Sig. (0.012), which means that this activity is statistically more significant and contributes more to the creation of Serbia's GDP compared to the remaining three.

Analyzing the value of the non-standardized beta coefficient for the activities of *electricity, gas, steam and air conditioning supply*, we observe that if the value of investments increases by EUR mln., then the GDP of the country increases by EUR 25.862 mln. In other words, if we want to increase Serbia's GDP, then we must intensify investments in this activity.

Agriculture, forestry and fishing make the smallest contribution to the creation of Serbia's GDP, as the standardized beta coefficient is the smallest (0.041).

Regarding the negative value of the unstandardized beta coefficient was observed in the manufacturing, we conclude that if the value of investments in the manufacturing increases by EUR mln, the realized value of Serbia's GDP decreases by EUR 3.894 mln. Therefore, the increase in investments in the manufacturing industry affects the reduction of the country's GDP. Therefore, it is recommended that more investment funds direct to the remaining three activities.

In the continuing of the paper, the regression model and the parameters used will be tested. In order to assess if the parameters $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ are correct, and they are not affected by errors, we must conduct another testing.

For testing β_0 parameter, we consider the following hypotheses (*equation 6)*:

$$H_0: \beta_0 = 0 \text{ and } H_1: \beta_0 \neq 0 \qquad (6)$$

The standard error of β_0 variable is β_0 = 55228.206. The value of the statistic test is *t* = 4.581. Because t = 4.581, with a Sig. = 0.006, we confirm that the null hypothesis is rejected because the parameter is significant with a possibility of risk of 5%.

For β_1 parameter, we considered the hypotheses (*equation 7)*:

$$H_0: \beta_1 = 0 \text{ and } H_1: \beta_1 \neq 0 \quad (7)$$

The standard error of β_1 is β_1 = 4.364. The value of the statistic test is t = - 0.892. Because the variable t is equal with -0.892, with a Sig. = 0.413, we accept the null hypothesis, at a significance limit level of 5%, which means that the manufacturing has not a good influence on the model.

For testing β_2 parameter, we consider the following hypotheses (*equation 8)*:

$$H_0: \beta_2 = 0 \text{ and } H_1: \beta_2 \neq 0 \quad (8)$$

The standard error of β_2 variable is β_2 = 6.666. The value of the statistic test is t = 3.880. Because t = 3.880, with a Sig. of 0.012, we consider the null hypothesis false, and that the parameter is significant from a statistical point of view, which means that electricity, gas, steam and air conditioning supply is the valid parameter at a significance limit level of 5%.

For testing β_3 parameter, we consider the following hypotheses (*equation 9)*:

$$H_0: \beta_3 = 0 \text{ and } H_1: \beta_3 \neq 0 \quad (9)$$

The standard error of β_3 variable is β_3 = 3.157. The value of the statistic test is t = 2.719. Because t = 2.719, with a Sig. = 0.042, we consider the null hypothesis false, and that the parameter is significant from a statistical point of view. This means that transportation and storage is the valid parameter at a significance limit level of 5%.

For testing β_4 parameter, we consider the following hypotheses (*equation 10)*:

$$H_0: \beta_4 = 0 \text{ and } H_1: \beta_4 \neq 0 \quad (10)$$

The standard error of β_4 variable is β_4 = 58.187. The value of the statistic test is t=0.174. Because t = 0.174, with a Sig. = 0.868, we accept the null hypothesis, at a significance limit level of 5%, which means that the agriculture, forestry and fishing has not a good influence on the model.

The conclusion of these five testes is that only the intercept parameter (β_0), and parameters of electricity, gas, steam and air conditioning supply as well as transportation and storage were accepted as highly influencing on the GDP.

The correlation between the independent variables in the set model will determine whether there is a certain degree of connection between the predictors, as well as whether their connection affects the achieved regression results. The degree of connection between the predictors was determined using the tolerance level, VIF and eigen value (*Table 5. and Table 6.*).

The obtained values in the *Tolerance* column are around 0.4, so we conclude that the values of realized investments are weakly collinear according to the analyzed economic activities in the observed period. The presence of weak multicollinearity between the value of realized investments according to activities is also indicated by the VIF coefficient, which ranges up to 3.8. We conclude that the set regression model is valid, and there is weak multicollinearity between the predictors.

Table 6. Diagnosing the influence of independent variables on the presence of multicollinearity

Model	Dimension	Eigen value	Condition Index	Variance Proportions				
				(Constant)	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage	Agriculture, forestry and fishing
1	1	4.762	1.000	.00	.00	.00	.00	.00
	2	.190	5.001	.02	.00	.00	.48	.00
	3	.030	12.550	.12	.00	.78	.13	.01
	4	.012	20.064	.36	.69	.21	.19	.00
	5	.005	30.370	.50	.31	.00	.19	.98

Source: Author's calculation based on SORS databases.

The Eigen value of 4.762, 0.190, 0.030, 0.012 and 0.005 for $\beta_0, \beta_1, \beta_2, \beta_3$ and β_4 give low values for variables. However, Eigen values are closest to zero when the Condition Index achieves a very high value. In our case, the highest value of the Condition Index is 30.370 for β_5. This result indicates that the current multicollinearity is largely due to the influence of the independent variable X_4 (realized value of investments in agriculture, forestry and fishing).

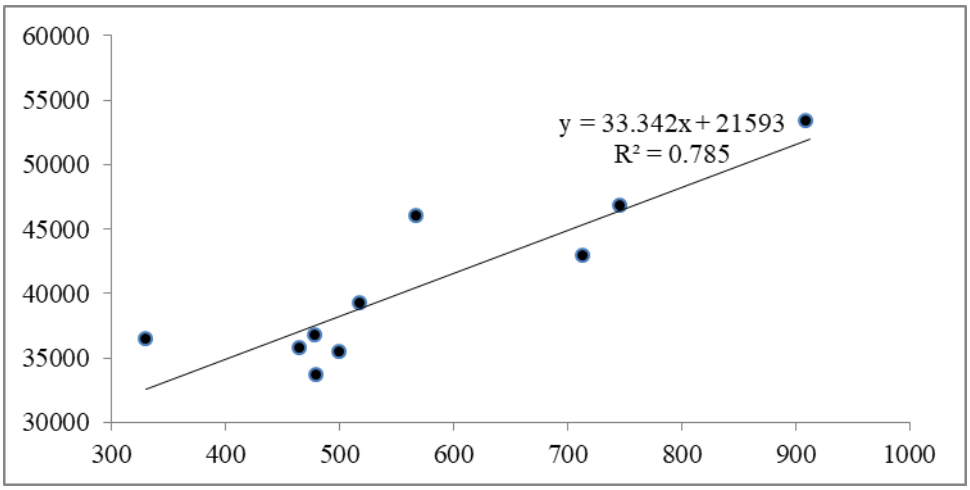
Based on the obtained results of the set regression model, we concluded that the greatest influence on the creation of Serbia's GDP has the realized value of investments in the electricity, gas, steam and air conditioning supply, while the presence of multicollinearity between the predictors comes from the realized value of investments in the activity of agriculture, forestry and fishing.

Considering that the set regression model showed that the biggest influence on Serbia's GDP is the value of realized investments in the electricity, gas, steam and air conditioning supply, in the following text a simple linear regression model with a trend line is given. This model should show how the change in the value of realized investments in the above mentioned activity will affect Serbia's GDP in the next three years. Accordingly, the initial equation of the linear regression model is of the following form (*equation 11)*:

$$y = bx+a, \qquad (11)$$

which is in our case: y – GDP of Serbia (dependent variable), x – value of investments realized in the activity of electricity, gas, steam and air conditioning supply (independent variable), a and b - parametric values. The graph below (*Figure 1.)* shows the trend of the linear regression model with the analyzed variables.

Figure 1. Linear regression model of Serbian GDP movement in the period 2022-2024



Source: Author's calculation based on SORS databases.

Based on the graphic above, we conclude that if the value of investments in the electricity, gas, steam and air conditioning supply were to increase EUR 1 mln in the next three years, we could expect an increase in Serbia's GDP by EUR 33.342 mln.

Golusin and Ivanovic (2011) point to low energy efficiency in the Serbian economy, which is based on "*outdated and dirty technologies*", as well as the need for greater application of the Kyoto Protocol and pulling on foreign investments to raise energy efficiency, and all with the aim of strengthening competitiveness of Serbia on global term. The mentioned authors indicate that "*application of different mechanisms aiming to increase energy efficiency in Serbia, could contribute to the increase of GDP annual growth rate from 5% to 7%, which cannot be achieved by any other economic instrument*".

Renewable energy sources are especially important and increasingly significant in the energy systems of all countries. Sabic et al. (2017) and Karakosta et al. (2012) indicate that Serbia has adapted the institutional environment and incentive measures in order to attract FDI in the field of renewable energy sources. At the same time, Sabić et al. (2017), by applying Inward FDI Performance Index, they conclude that Serbia is appealing to investors in the field of renewable energy sources, also that inflows of FDI in this field have positive impact on Serbian's economic growth.

Conclusion

With the application of a multiple regression model, the research showed that, compared to other activities, the GDP of Serbia is influenced to the greatest extent by investments in new fixed assets in the activity of electricity, gas, steam and air conditioning supply. Although this activity does not achieve a high average annual participation in the value of GDP and AARC, the conclusion was made in accordance with the value parameters of descriptive statistics, the value of the standardized beta coefficient and the evaluation

of the parameters used. The graphic presentation with a trend line showed that if the value of investments in the electricity, gas, steam and air conditioning supply were to increase by 1 million EUR in the next three years, we can expect an increase in Serbia's GDP by EUR 33.342 mln.

The set regression model showed that the impact of the transportation and storage activities on the value of GDP cannot be ignored either, although the statistical significance is lower compared to the previously mentioned branch of the economy. Realized investments in agriculture, forestry and fishing contribute to the creation of GDP, but do not have a statistically significant impact. Certainly, this activity records an average annual participation in total investments and average annual growth rates, which are higher than in other branches of the economy. Realized investments in the manufacturing affect the value of Serbia's GDP, but the impact is not statistically significant. For this activity, we can say that it has the highest value of the average annual participation in the total investments in the country, while the value of PGSP is lower than the value achieved by the activity of agriculture, forestry and fishing, and wholesale and retail trade.

The obtained results can help economic decision makers, indicating the contribution of past and future investments by individual activities to the growth of Serbia's GDP. The results can also provide support to public policy creators in order to adapt the institutional framework and support policy to domestic and foreign investors, in all activities, given the established positive contribution of investments in most activities to GDP growth.

The conducted research also has its limitations, because the results of the research and the realized values of the country's GDP are influenced by other factors that were not analyzed in this paper, and should be mentioned: FDI, industrialization level, prices, exchange rate, value of public debt, employment , etc. The directions of future research could include the indicators just mentioned, because each of them affects the creation of GDP to a certain extent.

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Conflict of interests

The authors declare no conflict of interest.

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APPLICATION OF THE PPM MODEL IN ASSESSING THE IMPACT OF ECONOMIC FACTORS ON THE SELECTION OF AN AGRO-TOURISM DESTINATION AFTER COVID-19

Tamara Gajić[1], Dragan Vukolić[2], Filip Đoković[3], Marija Jakovljević [4], Jovan Bugarčić [5], Ivana Jošanov Vrgović [6], Slobodan Glišić [7]

**Corresponding author E-mail: vukolicd@yahoo.com*

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ABSTRACT

The tourism industry is one of the industries most affected by the Covid-19 pandemic. Understanding the motivation for travel is essential for the tourism development of the destination and long-term business. This study used the push-pull-mooring model (PPM model) to explain the factors that influence the decision of tourists to visit agritourism destinations in Serbia after the Covid-19 pandemic, with an emphasis on the economic factors of travel. The results obtained by multiple regression analysis indicate a significant effect of economic, as well as other factors within the model, on the decision of tourists. The significance of the research is reflected in the creation of a realistic picture of the influence of factors on tourists' decisions, and therefore on the creation of future management steps in the management of an agro-tourism destination.

1 Tamara Gajić, PhD, Geographical Institute "Jovan Cvijić" SASA, Belgrade 11000, Serbia. South Ural State University, Institute of Sports, Tourism and Service, Chelyabinsk, Russia. Faculty of Hotel Management and Tourism University of Kragujevac, Vojvođanska 5a, 36210 Vrnjačka Banja, Serbia. E-mail: tamara.gajic.1977@gmail.com, ORCID ID (https://orcid.org/0000-0003-3016-8368)

2 Dragan Vukolić, MSc, Faculty of Hotel Management and Tourism University of Kragujevac, Vojvođanska 5a, 36210, Vrnjačka Banja, Serbia. University of Business Studies, Faculty of Tourism and Hotel Management, Banja Luka, Bosnia and Herzegovina. E-mail: vukolicd@yahoo.com, ORCID ID (https://orcid.org/0000-0002-6364-9849)

3 Filip Đoković, PhD, College of Organizationl Studies - EDUKA, 11000 Belgrade, Serbia, Phone: + 381 64 648 32 03. E-mail: fdokovic@vos.edu.rs, ORCID ID (https://orcid.org/0000-0002-2342-9358)

4 Marija Jakovljević, PhD, Belgrade Academy of Business and Art Vocational Studies, department of business and IT studies, department of Legal and Sociological Sciences, Kraljice Marije 73, 11000 Beograd. E-mail: marija.jakovljevic@bpa.edu.rs

5 Jovan Bugarčić, MSc, Faculty of Hotel Management and Tourism University of Kragujevac, Vojvođanska 5a, 36210, Vrnjačka Banja, Serbia. E-mail: bugarcicjovan@gmail.com, ORCID ID (https://orcid.org/0000-0002-6104-2939)

6 Ivana Jošanov Vrgović, PhD, College of Organizational Studies - EDUKA, 11000 Belgrade, Serbia, Phone: + 381 64 648 32 03. E-mail: josanov.vrgovic@gmail.com, ORCID ID (https://orcid.org/0000-0003-3010-3206)

7 Slobodan Glišić, PhD, Academy of Professional Studies South Serbia, Partizanska 7, 16 000Leksovac. E-mail: glisictfl@gmail.com, ORCID ID (https://orcid.org/0000-0002-0772-0831)

Introduction

Due to the Covid-19 virus pandemic, the tourism industry has lost more than 4 trillion dollars (UNWTO, 2023). The number of tourists on the world level decreased by about 70% in 2021 (Gajić et al., 2023). In countries that are developing, the situation is even more drastic, so it is estimated that the number of tourists moving to other destinations has decreased by 80% (UNWTO, 2023). In order for the tourism industry to recover as soon as possible after the end of the pandemic, it is necessary to investigate in detail the motivation of tourists for travel, during and after the pandemic. In addition, research on factors that influence travel motivation, travel mode preferences directly contributes to the development of strategies for the tourism industry and other stakeholders (Arbulú et al., 2021). Every time international media reports on a destination, tourists often change their travel plans, postpone or cancel their pre-scheduled travel plans (Zheng et al., 2020). If the pandemic continues longer, it negatively affects tourism, reduces significant revenues and causes liquidity problems (Gössling et al., 2020). Small and medium-sized tourism enterprises, tourism workers and destinations have shown their vulnerability during crisis situations such as the Covid - 19 pandemic (Basnyat & Sharma, 2021). Unhindered movement of tourists is necessary even in crises such as this pandemic in order to maintain the destinations. Due to the coronavirus alone, as of May 18, 2020, 100% of destinations worldwide still have some travel restrictions in place, and 75% have closed their borders entirely (UNWTO, 2023). As of July 5, 2021, the restrictions report mentions that one-third of travel destinations are partially closed (Twining Ward and McComb, 2020).

In this study, a research PPM model was used to determine the influence of factors on the decision of tourists to visit agritourism destinations in Serbia after the pandemic. The significance of the research is reflected in the addition of existing literature that deals with the development of agritourism in Serbia, before and after the pandemic. Also, the importance of the study is reflected in the application of the obtained results as a starting information base for the development of strategic measures for the future management of agritourism destinations in Serbia.

Literature review

The influence of various factors on the choice of destination with a focus on economic factors

When tourists choose a destination, they are influenced by the destination's images and attributes as well as infrastructure (Baloglu and McCleary, 1999; Ewing and Haider, 1999; Huybers, 2003). When choosing a tourist destination, tourists choose the most optimal destinations taking into account many factors (Hamilton and Lau, 2006). Tourists have the need to choose the least risky destination as their tourist destination (George and Booyens, 2014; Gajić et al., 2022). A tourist destination can become an undesirable destination if the tourist perceives a certain risk and therefore chooses another destination (Crompton, 1992).

For many people, tourism is a way to satisfy their psychological needs such as travel, pursuit of leisure activities, exploration of novelties and opportunities, self-expression and confidence, creativity, competition, need for relaxation and belonging. Intrinsic motivations refer to ensuring one's abilities on various emotional fronts (Gajić et al., 2023). Intrinsic motivation drives tourists to choose tourism for intangible rewards such as entertainment, safety and other emotional needs. Other essential factors of motivation are: attitudes of tourists, tourist's perception, values or beliefs, tourist's personality. In tourism, there are external motives that can influence tourists and pull them towards a certain motivation and subsequent decision: extrinsic motivation, place of origin, family, age, culture, market (Gajić et al., 2023a). Economic factors are one of the main factors that most affect travel. In most studies, a clear link between increased travel and increased income can be seen. The price is a significant, perhaps the deciding factor for choosing a certain destination. Serbia belongs to destinations that are considered cheaper compared to others in Europe and the region (Zheng et al., 2020). A clear example of this in recent years is the increase in international travel by Chinese, which correlates with the growing middle class in China over the past 20 years as a result of the liberalization of the economy (Ha & Jang, 2013).

However, foreign tourists also seek vacations in rural areas, especially those that are poorly explored and have different natural beauties than those already seen in Europe and the world (Bugarčić et al., 2023). Agritourism, which is considered a subcategory of rural tourism, is practiced in rural areas with agritourism activities. It is mostly attended by middle-income families, far from their place of residence, and the aim of the movement is the accumulation of information and experiences, which will satisfy the needs of visitors to these rural locations (Vukolić et al., 2023). Consumers in agritourism feel good in the countryside, more precisely in an agritourism household, because they have the opportunity to experience local products, healthy food, authentic culture, the joy of spending free time in nature in a less polluted environment and the like (Popescu & Andrei, 2011; Пасько et al., 2019; Stanciu et al., 2019; Stoica et al., 2022; Vukolić et al., 2023). The classification of consumer types in agrotourism is based on demographic, social, behavioral and other criteria.

Explanation of the PPM model in the existing literature

The PPM model originates from migration theories, which explain the factors that cause people to move from one area to another, and is currently used in various fields such as tourism (Hou et al., 2011; Hsieh et al., 2012; Xu et al. , 2014). The best explanation of the PPM model can be seen from Heberle's research where the factors of migration are highlighted as push and pull where the push was the factor that led or "forced" people to go to another place in a negative sense while the pull was the factor which led people to go elsewhere in a positive sense (Bansal et al., 2005).

More specifically, research points out (Lee, 1966) that there are intermediate factors that are not positive or negative, and in addition to these factors, personal preferences can also act as obstructive factors against movement. After that, a factor called mooring

was added (Moon, 1995), and the existing push-pull model was extended to the push-pull-mooring model (hereinafter PPM).

The PPM model comprehensively explains and provides a useful and appropriate perspective for identifying changes in consumer behavior and intentions (Hou et al., 2011). The PPM model is derived from the push-pull paradigm and it is recognized as a theory that helps to understand changes in consumer behavior (Xu et al., 2014; Hou and Shiau, 2020). In tourism, very few studies have been conducted on this topic, in Serbia there are almost none.

In the field of hotel industry, in order to investigate the intentions of hotel users to change their goal, Sun (2014) composed factors with hotel characteristics and perceived risks and then composed mooring factors with individual characteristics to conduct the study. In hospitality studies (Ha and Jang, 2013; Jung and Yoon, 2012; Park and Jang, 2014), perceived quality, satisfaction, satiety and loyalty were used as push - pull factors, while personality, variety seeking and participation in purchase decision used as mooring factors. Although PPM is derived from the push-pull concept, which is often used to explain travel motives, most applications of the PPM model in the field of tourism have been conducted with a focus on the behavior of specific consumers. Since post-Covid-19 tourists require replacement or changes in various tourism-related behaviors, such as continuing travel or changing destinations, the application of the PPM model is considered valid to achieve the purpose of this study. The PPM model is a tool for understanding changes in consumer behavior or changes in behavioral intentions and enables complex studies of consumer behavior that include not only motive factors but also obstructive factors. Therefore, in this study, it is estimated that the PPM model can be applied as an internal factor that promotes the continuation and intention of trips that have been stopped due to Covid - 19.

In tourism, push can be seen as a characteristic of an emotional part that occurs within the traveler, such as an individual's urge to escape from the repetitive daily life (Baloglu and Uysal, 1996; Klenosky, 2002; Kim et al., 2003; Yoon and Uysal, 2005). Push factors include emotional characteristics that arise from the psychological causes of travelers, such as the desire to vacation, and they are the internal motives of individuals, including behavioral elements that lead potential tourists to travel for reasons such as vacation, escape from daily routine, health care and similar (Chon, 1989; MacCannell, 2013). Despite the fact that safety has been an important motivator for travel (Pyo et al., 1989), and that concerns about safety and hygiene have increased due to prolonged Covid-19, there are reasons for the increase in the desire of potential tourists to travel. It can be expected that these changes in the environment have affected the pressure factors that cause tourism consumer travel behavior after Covid - 19, so they should be significantly different from those before Covid - 19. That is, it can be said that there are limitations in considering the changed tourist motives of consumers by applying the existing measurement units as they are, as well as that there is a need to introduce new measurement units. Therefore, in this study, internal motives for the promotion of travel participation are defined as push factors.

Pull factors are motivators related to the characteristics or attractive attributes of a tourist destination, and include factors that influence the choice of destination (Bansal et al., 2005; Kim et al., 2003). Motivators in this sense are those motivators that attract travelers to a tourist destination, such as the natural environment, historical events, facilities, infrastructure and others (Baloglu and Uysal, 1996; Klenosky, 2002; Yoon and Uysal, 2005). Tourists' expectations and perceptions of tourist destinations, benefits that can be realized at tourist destinations and images of tourist destinations are also seen as pull factors (Prayag et al., 2020). Meanwhile, studies on the role of social media in the decision-making process by applying pull factors explain that social media change the decision-making process (Neuhofer et al., 2012; Kibby, 2020) and that they especially influence the production of related information, marketing, management, and decision-making processes more so in the case of experiential products such as tourism (Leung et al., 2013).

Tourism marketing activities, which have slowed down for some time due to Covid-19, continue, and the repeated exposure of travel information via social networks increases the interest of potential tourists in travel (Vukolić et al., 2022; Gajić et al., 2022). Furthermore, the preference for small group individual tours has increased over large package tours, and consumer views on travel behavior decisions are changing, such as the desire to minimize contact at travel destinations. However, most of the items traditionally used as pull factors (e.g., availability, attractiveness, price, etc.) are items that are adapted from a physical point of view and have measurement limitations to be used as appropriate pull factors in situations where the choice between continuation and withdrawal from traveling abroad should be done before planning a trip abroad with a specific fixed destination because of the emergence of Covid-19. Due to the limitation of push and pull factors to comprehensively explain the intentions of consumers who change their intentions and behavior, mooring factors emphasize or can even influence the decision-making itself (Zhang et al., 2014; Venkatesh and Brown, 2001). That is, in situations where external risk factors such as Covid-19 have appeared, in addition to social influences, personal dispositions such as the tendency to avoid uncertainty, mooring factors can influence decision-making.

Kim et al. (2003) analyzed correlations between push and pull factors, with the aim of examining the relationship in settings involving more common domestic travel decisions. They found significant correlations between various push and pull factors and that age, occupation, gender, and income influence these correlations. Although understanding the relationship between push and pull motivation is important, there are not many studies that address this topic except Kim et al. (2003).

Covid - 19 has increased the concern of tourist consumers about safety and hygiene. The level of recognition of safety and hygiene problems may vary according to personal moods and social situations, and may act as a factor that interferes with travel behavior. Even if an individual's desire to travel is strong, the burden of social norms and views can act as an obstructive factor in determining travel behavior (Cheng and Huang, 2013; Seo et al., 2018; So et al., 2021), and infectious diseases such as Covid – 19 are

becoming factors that disrupt travel behaviour. Decisions in the case of persons with a strong disposition to avoid risks (Kim and Kim, 2010). As such, there are various obstructive factors in the process through which a potential tourist determines his tourist behavior, so it can be predicted that the sensitivity of that person will be very high, especially at a time when the world is exposed to travel risks due to Covid - 19.

Therefore, it can be said that uncovering decision-making factors in the process through which potential tourists' travel motives lead to travel behavior and the extent to which these factors influence actual travel behavior is very important for future research on consumer behavior in tourism.

This study will add mooring factors that are not verified in the existing push and pull model in order to attempt a complex study of consumer behavior in tourism. The Republic of Serbia, undoubtedly, has an excellent basis for the development of tourism (Pantić, 2016; Pantić and Milojević, 2019).

Based on the review of available literature, initial hypotheses were set:

H1: Pull factors have a significant effect on tourists' decision to visit agritourism destinations in Serbia after the pandemic.

H2: Push factors have a significant effect on tourists' decision to visit agritourism destinations in Serbia after the pandemic

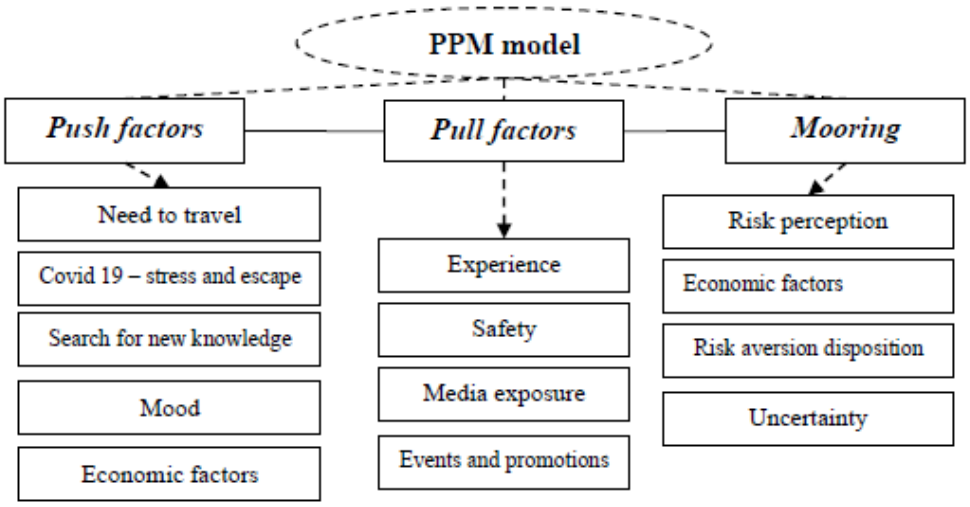
H3: Mooring factors have a significant effect on tourists' decision to visit agritourism destinations in Serbia after the pandemic.

H4: Economic factors have the strongest influence on tourists' decision to visit agritourism destinations in Serbia after the pandemic.

Methodology

In order to achieve the stated goal of the research, the authors used the PPM (push-pull-mooring) model by the authors Jeong-Joon Kim, Byeong-Cheol Lee and Hyo-Jeong Byun (2022), whose factors are given in Model 1. The authors added another question with the possibility of answering yes or no, and the question was, would you visit an agro-tourism destination? A total of 67.3% answered yes and 32.7% no. To analyze the obtained results SPSS version 23.00 software was used. Exploratory factor analysis determined the percentage of saturation for each factor, as well as the separation of all items into 15 factors (50 indicators) whose characteristic values exceed the acceptable value of 1. The number of factors was confirmed by a parallel model. The procedure of maximum variance rotation from the measurement process eliminated all options that had values below 0.3, while the results showed that the requirements of load and internal consistency as reliability requirements were met. Kaiser-Meyer-Olkin and Bartlett's test of sphericity. Also, a Cronbach reliability analysis was determined for each item, in order to establish the degree of reliability for each of the dimensions. Finally, a regression analysis was performed to determine the influence of the dimensions of the PPM model on the decision of tourists to visit rural destinations in Serbia.

Model 1. Research model



Source: Authors

Participants and procedure

The research was conducted in the period from January 2023 to March 2023, on a total sample of 380 tourists who visited a total of 45 rural households in Vojvodina (145 questionnaires), Central Serbia (112 questionnaires) and Western Serbia (123 questionnaires). The research is of a volunteer character and was done with the help of students of the Faculty of Hotel Management and Tourism in Vrnjačka Banja. It was explained to the tourists in advance that the research is anonymous and that it will be used exclusively for the needs of scientific work. The authors set the age of 18 as the lower limit of the respondents. Table 1 shows data on the sociodemographic characteristics of the respondents.

Table 1. Sociodemographic characteristics of the respondents

Gender	Male 42.5%
	Female 57.5%
Education	High school 36 %
	Faculty 60 %
	MSc, PhD 4 %
Age	18-30 - 18 %
	31-55 - 58 %
	>56 - 24 %
Earning	Low (≤300*) 1.8 %
	Average (300-600*) 66.9 %
	High (>600*) 31.3 %

Frequency of traveling	I have traveled abroad several times 45.3%
	I travel abroad once a year 26.9 %
	I travel abroad several times a year 27.8%
Country of residence	Austria 9.5%
	Bosnia and Herzegovina 42,5 %
	Slovenia 12.3%
	Montenegro 5.7 %
	Hungary 3.4%
	Russia 26.6%

Source: Authors

Results and discussion

The results of factor analysis, with promax rotation, indicated the existence of five factors within the push dimension. The first factor gathers indicators of the need for travel (23.8% of variance explained), the second factor has a total of five indicators with a percentage of explained variance of 12.4%. The third factor within the push dimension gathers indicators of the search for something new (9.37% of variance explained), the fourth factor with indicators that describe the respondents' mood explains a total of 7.56 % of the variance, and finally the fifth factor with a total of three questions explains the largest percentage of the variance out of 6.84 %. The reliability analysis confirmed that all measures used in the study are reliable, as Cronbach's alpha (α) for each construct is greater than 0.7 (Kaiser, 1974). The Kaiser–Meyer–Olkin (KMO) overall measure of sampling adequacy were above 0.60 (Kaiser, 1974) indicating that the data were appropriate for the principal component model. The Bartlett's test (Bartlett, 1954) of sphericity was significant (p = 0.000)

Table 2. Analysis of push factors

Factors	Indicators	Factor loadings	Variance explained	α
Need to travel	After Covid-19, I wanted to travel to agritourism destinations	0.818	23.871	0.712
	After Covid-19, my desire to travel to agritourism destinations grew.	0.719		
	I'm sorry I can't travel to agritourism destinations after Covid-19.	0.795		
	I would like to have new experiences through trips to agritourism destinations.	0.650		
	I often remember previous trips to agritourism destinations (before Covid – 19)	0.613		
Covid 19 - stress and escape	I feel depressed because of Covid-19	0.700	12.489	0.823
	I am not motivated for anything after Covid-19	0.607		
	I lack vitality in my life because of Covid-19.	0.702		
	My stress has increased due to Covid-19.	0.899		
	I'm sorry I can't have free activities due to Covid-19.	0.754		

Factors	Indicators	Factor loadings	Variance explained	α
Search for new knowledge	When I return from a trip, I organize information about the places I visited.	0.731	9.376	0.789
	I am looking for new knowledge through travel.	0.738		
	I satisfy my curiosity about tourist destinations through travel.	0.825		
	I often see photos of my travels before Covid – 19.	0.822		
	I often talk to my acquaintances about my travel experiences before Covid-19.	0.636		
	I love new experiences through travel.	0.619		
Mood	Even if I travel to agro-tourism destinations, I will not easily catch the virus.	0.889	7.563	0.803
	I am not very afraid of contracting the corona virus.	0.759		
	The level of quarantine in agritourism destinations is reliable.	0.840		
	If I follow the rules well, I won't get infected.	0.728		
Economic factors	Travel costs have been reduced since Covid-19.	0.725	6.846	0.877
	My budget for tourism activities after Covid - 19 is ready.	0.839		
	Overall consumer spending has generally decreased since Covid-19.	0.737		
KMO = 0.823 Bartlett's test: 3071.640; df = 57; p = 0.00				

Table 3 shows the reliability results for each factor indicator belonging to the pull dimension from the PPM model. It is observed that the reliability values for all indicators are within acceptable limits. The experience factor gathers a total of 4 indicators and explains 24.7% of the variance. The second factor gathers questions related to efforts to improve hygiene and explains 13.25% of the questionnaire. The third factor explains 9.29% of the variance and contains a total of four indicators. The fifth factor Event and promotions explains the largest percentage of variance (8.36%).

Table 3. Analysis of pull factors

Factors	Indicators	Factor loadings	Variance explained	α
Experience	I would like to experience local culture (festival, event, etc.) in agritourism destinations.	0.721	24.718	0.842
	I would like to do shopping in agritourism destinations, to buy local specialties, etc.	0.702		
	I would like to eat food in agritourism destinations	0.648		
	I would like to do unique (recreational) activities for experience in agritourism destinations	0.636		

Factors	Indicators	Factor loadings	Variance explained	α
Safety	Agritourism destinations have a good quarantine policy	0.667	13.258	0.717
	Agritourism destinations have well-established tourism safety guidelines	0.650		
	Agritourism destinations invest enough effort in quarantine activities	0.820		
Media exposure	I am fascinated when I see online/offline promotions (for agritourism travel destinations)	0.676	9.299	0.752
	Online/offline promotions (for agritourism travel destinations) catch my attention	0.668		
	When I see agritourism travel destinations shown on TV, I follow the content with great attention	0.653		
	When I watch videos from agritourism destinations, I want to go there	0.693		
Events and promotions	Advance purchase discounts for some trips to agritourism destinations are attractive.	0.691	8.362	0.864
	Flexible product policies related to travel products in agritourism destinations are attractive.	0.696		
	My interest grows when I see various promotions related to travel to agritourism destinations (discounts on transportation, tourist products, etc.)	0.673		
KMO = 0,812 Bartlett's test: 3920,543; df = 57; p= 0,00				

Table 4 shows the results of factor loadings, variance explained and Cronbach's reliability analysis. It can be seen that a total of 4 factors and 19 indicators were selected within the mooring dimension of the PPM model. The first factor Risk perception brings together 4 indicators with high reliability and explains a total of 30.38% of the variance. The second factor called Economic factors explains a total of 17.06% of the variance with its 4 indicators. The risk aversion disposition factor explains 11.38% of the variance, while the fourth factor called Uncertainty explains 8.53% of the variance.

Table 4. Analysis of mooring factors

Factors	Indicators	Factor loadings	Variance explained	α
Risk perception	I know that personal hygiene is important in the prevention of infectious diseases.	0.844	30.380	0.769
	I know that my infection is dangerous for others.	0.838		
	The risks of viral infection are clear to me.	0.845		
	I often check information about infectious diseases.	0.804		

Economic factors	The infrastructure to agritourism destinations may be damaged if I travel to those destinations	0.805	17.607	0.773
	Prices in agortourism destinations can increase if the number of tourists in them increases	0.804		
	The tourist offer of agro-tourism destinations will be better if there are more tourists	0.808		
	If I travel to agritourism destinations, I can help the development of local residents	0.805		
Risk aversion disposition	I prefer travel destinations that have been verified by others.	0.817	11.380	0.872
	I prefer to plan my trip in advance so that it goes perfectly.	0.823		
	I prefer travel destinations with strict hygiene.	0.817		
	I prefer travel destinations where safety (physical, bodily) is ensured.	0.828		
	Even if I want to go, I don't go to restricted travel areas.	0.826		
	Even if I want to go, I don't go to high travel warning areas.	0.812		
Uncertainty	If I travel to agritourism destinations, the locals will not like me.	0.819	8.538	0.818
	If I travel to agritourism destinations, I will be exposed to the risk of infectious disease.	0.833		
	Now it would be too expensive to travel to agritourism destinations.	0.832		
	If I travel to agritourism destinations now, I won't be able to enjoy it enough.	0.844		
	New strains of Covid-19 (eg Omicron) can spread.	0.838		
KMO = 0,804 Bartlett's test: 3207.087; df = 70; p = 0,00				

Multiple regression analysis determined the influence of PPM model factors on the decision of tourists to visit agritourism destinations in Serbia after the COVID-19 pandemic. Table 5 shows the results of the analysis.

Table 5. Results of determining the effect of PPM model factors

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Economic factors	0.891	0.179	0.118	2.189	0.03
Push	0.091	0.028	0.191	3.214	0.00
Pull	0.135	0.036	0.241	3.743	0.00
Mooring	0.124	0.037	0.207	3.327	0.00
R^2= 34.5%	H1 ✓ ; H2 ✓ ; H3 ✓ ; H4 **X**				

*criterion variable: tourist decision to visit agro destinations

The results of the multiple regression analysis indicated a statistically significant effect of all factors on the decision of tourists to visit agritourism destinations in Serbia after the pandemic (F=12.045, p=0.00). The push factor is low and positively related to the tourist's decision (β=0.191, p=0.01, t=3.214). Then, the Pull factor also shows a low, but statistically significant effect on tourists' decision to visit agro destinations in Serbia after the pandemic (β=0.241, p=0.00, t=3.743). The mooring factor within the PPM model also shows a positive significant effect on the decision of tourists (β=0.207, p=0.01, t=3.327). All hypotheses are confirmed, except for hypothesis H4, because the strength of all factors is approximately the same.

Conclusion with limitations and future implications

The COVID-19 pandemic has brought great changes in the tourist movement itself, and the influence on tourists to change their decisions. Rural areas reached their peak in the number of overnight stays. Serbia recorded a record number of visits by domestic and foreign tourists during the pandemic. However, even after the declaration of the end of the pandemic, the trend of increasing tourist visits to rural and agricultural destinations continues in Serbia. Many factors have an influence on making travel decisions, among which economic factors have always been key to important directions of tourist movements. After the pandemic, the situation changed a little. Now, to a large extent, safety and healthy living dictate movement trends.

The authors conducted a survey in agro-tourism households in Vojvodina, Central and Western Serbia, on a total sample of 380 respondents, who stayed in those households. The aim was to determine the influence of the PPM model factors on the decision of tourists to visit agritourism destinations, after the pandemic. The PPM model by Jeong-Joon Kim, Byeong-Cheol Lee and Hyo-Jeong Byun (2022) was used. There are various factors that influence the choice of a tourist destination. The goal of the research was to determine the extent to which each of the factors has an impact, with an emphasis on economic factors. It is important to clarify the definition of the motive of the trip, especially in relation to the purpose of the trip. Motive is not the same as purpose. Motives are the basic psychological reasons why we travel and are often not considered openly, unlike the purpose of travel. They reflect the needs of the individual and are often difficult to describe in words.The results obtained by multiple regression analysis indicated a significant effect of all factors of the PPM model on the decision of tourists. The impacts are positive, but quite low. The initial hypotheses that speak about the given impact have been confirmed. It turns out that economic factors have an equal influence on the decisions of tourists to visit agro destinations and households after the pandemic. Among the three determinants assumed by the PPM model in behavioral changes, the push factor is a factor that forces users to switch to a new service due to the negative elements of the existing service, while the pull factor is a factor that attracts users based on the attractiveness of the new service. Finally, the mooring factor plays a role in the push and pull effects given the situational and social circumstances related to the individual's motives (Socoliuc et al., 2018).

The obtained results can serve to expand the existing literature on the topic of the influence of environmental risks on the behavior of tourist consumers. This would strengthen information in many segments of the tourism industry in the domain of theoretical studies. By observing such results, it is possible to predict the reactions of tourists in advance and propose an offer based on their demand. The findings can be used as methodological support and practical recommendations for tourism and other industries when developing business strategies, taking into account the influence of economic and other research factors on the tourist's decision to choose a destination. These impacts can have long-lasting effects on communities and economies and can be challenging for tourism and the economy to recover from the pandemic.

Conflict of interests

The authors declare no conflict of interest.

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ARMED CONFLICT IN UKRAINE: FOOD SECURITY AND ENVIRONMENTAL IMPLICATIONS

Tatjana Brankov[1], Anton Puškarić[2]

**Corresponding author E-mail: tatjana.brankov@ef.uns.ac.rs*

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ABSTRACT

The ongoing conflict has far-reaching consequences, not only for the citizens of Ukraine and Russia but for societies and economies worldwide. This paper examines specific geopolitical, economic, and environmental impacts of the war – both direct and indirect consequences on food security, including rising prices, as well as short-term and long-term implications on the environment, including the impact on agricultural land and loss of biodiversity. It is concluded that the conflict is likely to have a greater impact on the environment than on the economy.

Introduction

The conflict in Ukraine has had a dramatic impact on the global economy, geopolitics, and food security. The dynamic and unpredictable situation has reduced revenues and caused disruptions in the food system, eroding all dimensions of food security, particularly food availability and access. The conflict has resulted in population displacement, damages to civil and agricultural infrastructure, restrictions on the movement of people and goods, increased disruptions in public services (transportation, banking, water, and energy supply), and the formation of bottlenecks in input supplies (especially fertilizers). Furthermore, the armed conflict emerged at a time when food prices were already high due to drought, poor harvests in South America, and the impact of the COVID-19 pandemic (Rice et al., 2022).

It is realistic to expect that the current conflict will also cause an ecological disaster (Pereira et al., 2022). There is already evidence of severe air pollution and greenhouse gas emissions released during intense fighting. The war will have a negative impact on soil degradation and landscape morphology. Considering that Ukraine possesses some of the most fertile soil in

1 Tatjana Brankov, Associate profesor, Faculty of Economics Subotica, University of Novi Sad, Segedinski put 9-11, Subotica, Phone: +38124628049, E-mail: tatjana.brankov@ef.uns.ac.rs, ORCID ID (https://orcid.org/0000-0002-3675-6788)

2 Anton Puškarić, Research associate, Institute of Agricultural Economics, Volgina 15, Belgrade, Serbia, Phone: +381116972858, E-mail: anton.puskaric@gmail.com, ORCID ID (https://orcid.org/0000-0003-1538-4337)

the world (chernozem), soil degradation will affect food production. Intensive deforestation and habitat destruction will seriously disrupt biodiversity, with significant implications for wildlife. Due to the destruction of infrastructure and the transportation of pollutants into water reservoirs, the availability and quality of water will be jeopardized. Finally, the war activities near Europe's largest nuclear power plant, the Zaporizhzhia Power Plant, and Chernobyl have the potential for unforeseen consequences such as radiation leaks.

The very nature of the problem addressed in this paper gives rise to the basic hypothesis of the research itself: the conflict causes numerous economic and environmental consequences. The research conducted in this paper is based on the application of desk research methodology, including analysis and synthesis, deduction and induction, as well as descriptive analysis. Relevant sources, such as publications from international organizations primarily from the United Nations (UN) system and referenced scientific papers, were utilized in the study. The significance of this research lies in providing theoretical and analytical insights into the consequences related to food security, agricultural trade, and the environment, which are triggered by the ongoing conflict.

Impact on food security and agricultural trade

Seismic hunger is raging through the world - 828 million people are experiencing hunger, with a significant increase since 2019 in the number facing acute food shortages, rising from 135 million to 345 million. In 45 countries, 50 million people are on the brink of famine, while the gap between the need and the possibility (desire) for funding has never been greater (WFP, 2022). There are numerous causes contributing to this catastrophic situation, including climate shocks, the economic consequences of the COVID-19 pandemic, the cost of living, and conflicts. Conflicts are the primary drivers of hunger, with 60% of the hungry living in war-affected areas of violence. In this regard, in May 2018, the UN Security Council adopted Resolution 2417, which addresses the link between armed conflict and violence, as well as conflict-induced food insecurity and the threat of famine (UN, 2018). Resolution 2417 calls upon all parties to armed conflict to fully comply with international humanitarian law and to protect the civilian infrastructure essential for the proper functioning of food systems.

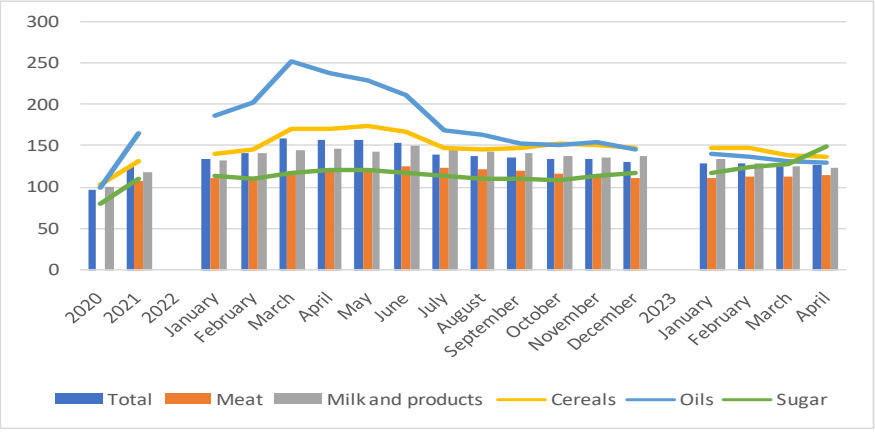
The Ukrainian conflict serves as an additional example of how conflicts fuel hunger, displace people from their homes, and destroy sources of income. The ongoing conflict has resulted in the fastest-growing refugee crisis in Europe since World War II, with approximately 7.7 million registered Ukrainian refugees across Europe (UNHCR, 2022). The war has prevented farmers from cultivating the land, with 20-30% of winter crops remaining unharvested, and spring crop areas reduced by around 20% compared to the previous year. Access to inputs such as seeds, fertilizers, fuel, and pesticides is limited, resulting in a significant overall decline in yields and a decrease in cereal production of approximately 40% compared to expected results (FAO, 2022). Additionally, Ukraine is facing a shortage of storage capacity as existing facilities cannot absorb all the produce from the above-average harvests in 2021 and 2022, which was halted due to the sudden closure of maritime export channels.

According to the recent FAO report (2023), which includes agricultural enterprises, it is evident that those cultivating up to 250 hectares of land are responsible for producing more than 70% of the crop output. However, the report also reveals that 90% of crop producers are experiencing a decline in revenue, 40% are making changes in their farm operations, and 93% are facing increases in production costs compared with the same period of the previous year. The situation is somewhat better in the livestock sector, with 60% experiencing a decline in revenue. The overall assessment is that the total losses in agriculture amount to 3.8 billion dollars, with approximately 70% attributed to crop production.

Overall, the conflict in Ukraine has immediate and indirect consequences on food security (Ben Hassen & El Bilali, 2022). The most significant immediate consequences include logistical blockades, export restrictions, price increases (energy, gas, fertilizers, food), inflation, reduced production, and damage to storage facilities. The indirect consequences of the war include panic buying, delayed sowing, reduced yields, economic recession, decreased purchasing power of the population, political instability and protests, increased hunger and malnutrition, and consumption of lower-quality food (Ben Hassen & El Bilali, 2022).

The Ukrainian conflict, in the first months after its beginning, posed a threat to food security by reducing economic access to food through price increases. The FAO Food Price Index, which monitors monthly fluctuations in the prices of globally traded food commodities, reached 136.3 in September 2022, indicating a 5.5% increase compared to the same month the previous year (Figure 1). However, it is important to note that the conflict, which commenced on February 24, 2022, cannot be solely attributed as the exclusive cause for high food prices. As shown in Figure 1, the price of total food in April 2023 is actually lower by 6.19% compared to January 2022, before the war. During the same period, grain prices have decreased by 3.2%, dairy product prices by 6.04%, and vegetable oils prices by as much as 30.07% (World Bank, 2023).

Figure 1. FAO food price index (2020-2022)



Source: Authors' composition based on FAO (2023)

Despite the food price index consecutive monthly decrease, domestic food price inflation remained high in almost all countries, regardless of their income levels, during the period of April 2022 to March 2023. For instance, in the low-income country of Burundi, food price inflation increased from 19.3% to 48.9%. In lower-middle-income countries like Egypt, it rose from 26% to 63%, and in Tanzania, it increased from 6.6% to 9.7%. In upper-middle-income countries, Serbia saw an increase from 16.1% to 27.0%, and Albania from 10.4% to 11.5%. Even in high-income Germany, food price inflation went up from 8.6% to 22.3%. However, during the same period, domestic food price inflation in Russia decreased from 20.5% to 2.6%, and in the United States, it decreased from 9.4% to 8.5% (World Bank, 2023).

Bombing and shelling result in the creation of craters in the soil, erosion, and pollution, forcing to exclude such lands from agricultural production. Damage to irrigation systems negatively affects soil fertility and the biocapacity of arable land (Pathak, 2020). Ukraine is one of the most significant grain producers in Europe, and according to available data, large agricultural areas have been affected. In July 2022, fires covered approximately 70,000 hectares of agricultural land, resulting in the equivalent loss of 317,000 tons of grain (Forbes, 2022).A study based on the FAO model has shown that the damage (until June 2022) to physical assets, land, and machinery used in the production of wheat, corn, barley, and vegetable oils amounts to around $4.3 billion (AgPulse, 2022; KSE, 2022) (Table 1). Soil damage has occurred due to mining pollution and direct physical damage (mines). Physical damage to fertile soil has been caused by craters from shelling and rocket attacks, as well as damage inflicted by tank tracks and other military vehicles. It is estimated that due to restricted access to farms and thus a lack of care, 42,000 sheep, 92,000 cattle, 258,000 pigs, and over 5.7 million poultry have died. More than 7,800 hectares of perennial crops located in affected areas have been partially or completely destroyed.

Table 1. Damage in agriculture by categories

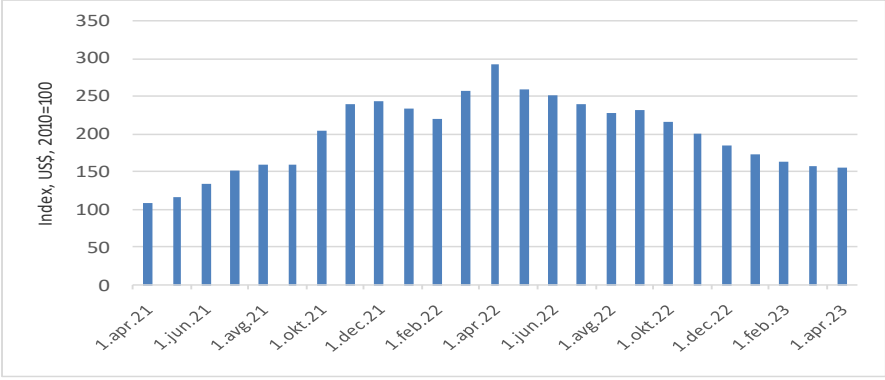
Category	Total value (milion US$)
Soil&non-harvest winter crops	2.135
Agricultural machinery and equipment	926,1
Storage capacity	272,4
Livestock inventory	136,4
Perennial crops	89,1
Inputs (fertilizers, fuel...)	119,6
Stored products	613,0
TOTAL	4292.3

Source: KSE, 2022

Russia and Ukraine are net exporters of agricultural products and leading suppliers to the global food and fertilizer markets. One-third of the world's grains originate from these two countries. They are ranked among the top three global exporters of wheat, barley, corn, rapeseed and oil, as well as sunflower and oil. Russia is the largest global exporter of nitrogen fertilizers, the second-largest exporter of potassium fertilizers, and the third-largest exporter of phosphate fertilizers (FAO, 2022a).

Of particular concern is the increase in the prices of essential inputs, such as fertilizers. For example, in the Eastern Africa region, fertilizer prices have more than doubled in just two months since the start of the conflict in Ukraine compared to the previous year, which will reduce cereal production by at least 16% (Reliefweb, 2022). The price of natural gas, a raw material in the production of nitrogen fertilizers, has risen in Europe by 127.6% six months after the start of the conflict, following sanctions imposed on Russia (Anadoly Agency, 2022). The sharp increase of fertilizers prices can be caused by Russia's temporary export restrictions (Glauben et al., 2022). Nevertheless, similar to food prices, fertilizer prices were already high before the conflict began(Figure 2).The fertilizers price index was at 240.01 points in November 2021, rose by 22.4% in April 2022, reaching 293.73 points. However, it has continuously declined for the following 12 months, reaching 155.97 points in April 2023. (World Bank, 2023a).

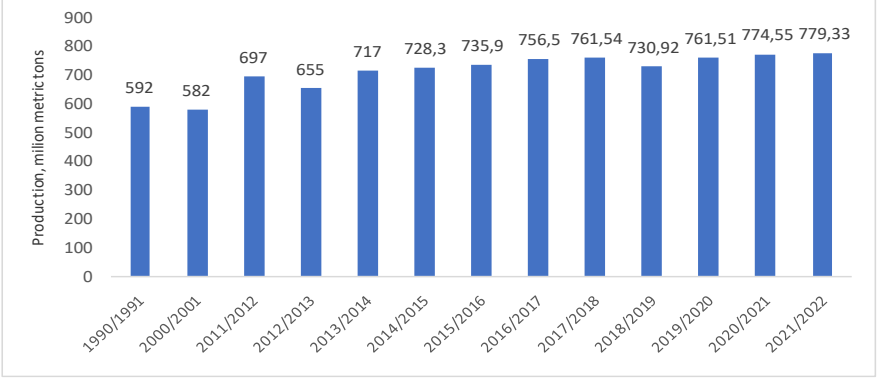
Figure 2. Fertilizers Price Index



Source: World Bank (2023a)

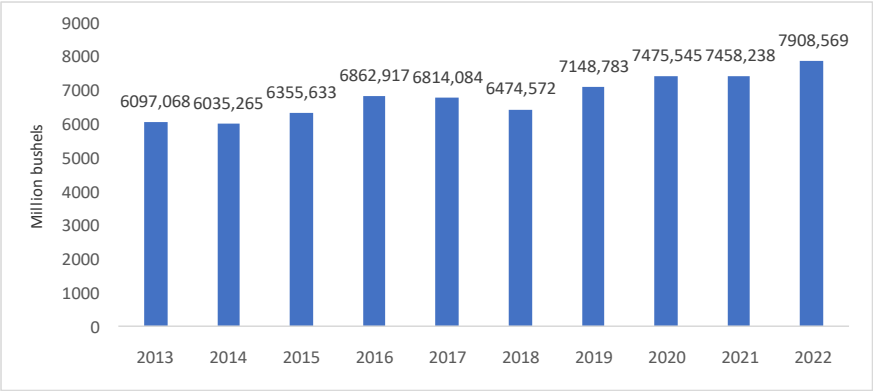
Despite tensions in the world wheat market, there was no shortage either on the supply side (Figure 3) or in terms of exports (Figure 4).

Figure 3. Global wheat production volume, million metric tons



Source: Authors' composition based on USDA (2023)

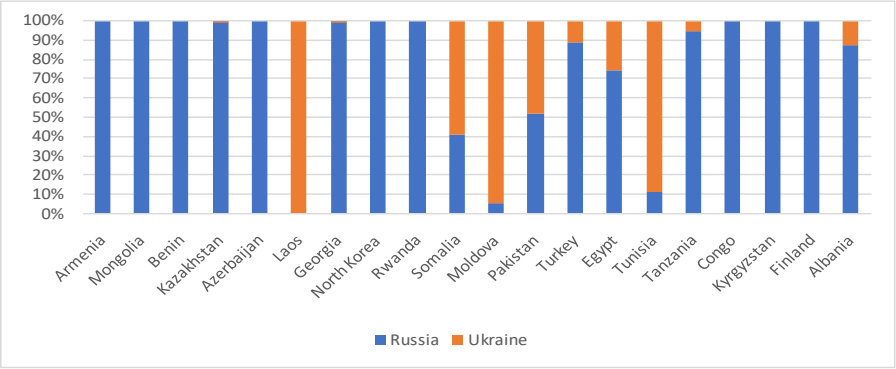
Figure 4. World wheat export, 2013-2022



Source: Authors' composition based on USDA (2023)

Nevertheless, the situation remains precarious for economically disadvantaged regions heavily reliant on imports, particularly in Africa and Southeast Asia, which adopt a relatively neutral stance towards the conflict(Glauben et al., 2022) (Figure 5). Under the current circumstances, significant benefits are expected for major wheat suppliers in the EU and North America. Consequently, it appears highly unlikely that Russia would enforce extensive export restrictions with the intention of provoking food insecurity in import-dependent regions.

Figure 5. Wheat import depe.ndence on Russia and Ukraine 2022, by country (%)



Source: Authors' composition based on OECD (2022)

Environmental consequences

Military activities have caused serious consequences for the environment that future generations will also experience. It will take decades to restore the landscapes and natural resources of Ukraine (Fernandez-Lopez et al., 2022; Sikorsky et al., 2022; Jacobo, 2022). The potential short-term and long-term negative effects of war on the environment are presented in Table 2.

Table 2. Short-term and long-term impacts of the conflict in Ukraine

Short-term	Long-term
Water pollution and contamination of water resources	Chronic respiratory diseases and shortened lifespan
Acute water scarcity	Contamination of cities (remediation is a lengthy process)
Deterioration of air quality causing respiratory issues	Permanent changes in soil profiles and land use leading to decreased agricultural production
Increased greenhouse gas emissions	Lower quality of life due to pollution effects
Soil pollution through toxic substance leaching	Loss of biodiversity
Changes in soil profiles and land use, soil erosion	Reduction in ecosystem services
Acute impact of radiation	Impact on efforts to achieve climate change goals and sustainable development objectives
Deforestation and forest fires	Collapse of environmental management systems
Death of wildlife	
Habitat destruction and temporary species migration	

Source: Rawtani et al. (2022)

Damage to infrastructure, particularly in eastern Ukraine, which is heavily industrialized, can lead to the release of toxins into natural water sources. Toxins from closed mines without adequate drainage systems can contaminate groundwater, and worsening water supply and sanitation conditions can lead to an increase in food and waterborne diseases (Anthes, 2022; Jacobo, 2022; Rawtani et al., 2022). It has already been proven that after damage to fertilizer reservoirs, the concentration of ammonia increased 163 times, and the concentration of nitrates increased 50 times in river water samples east of Lviv (Subbaraman, 2022). The consequences of air pollution will be dramatic, especially since air quality in Ukraine was below European standards even before the war (Pehchevski, 2020). Research in Ukraine has shown that concentrations of NO2 and PM2.5 are most strongly correlated with wartime activities (Zalakeviciute et al., 2022).

Ukraine is one of the most significant European centers of biodiversity, with 35% of the species inhabiting the continent found within its borders (WWF, 2022). Among the 70,000 plant and animal species, many are rare and endemic. These include European bison, brown bears, lynx, wolves, and sturgeons—the most endangered species in the world. Ukraine, which encompasses part of the Danube Delta, belongs to the "Green Heart of Europe" and is home to rare steppe ecosystems (in the central-eastern part of the country), coastal wetlands, alpine meadows, ancient beech forests, and vast peat lands. In the Polissya region in the north, immense pine, oak, and birch forests can be found, while the Carpathian Mountains in the west host ancient beech forests and alpine meadows. Many habitats within and outside protected areas have been endangered by previous military interventions, and forest management certificates in war zones have been suspended. According to preliminary data, 30% of Ukraine's protected areas have been threatened by shelling, bombing, oil pollution, and military maneuvers. At

least 14 zones (in the Dnieper Delta, Black Sea lagoons and islands, Karkinitski and Dzharylgatsky bays, areas along the Desna River in the Sumy region) recognized under the Ramsar Convention on wetlands are at risk of complete destruction (WWF, 2022). There have been 254 cases of environmental crimes and 1,500 cases of ecosystem destruction recorded, while forest fires have affected over 250,000 hectares (Rawtani et al., 2022).

Disscusion and conclusions

Currently, there are six active armed conflicts taking place globally, namely in Afghanistan, Ethiopia, South Sudan, Syria, Yemen, and Ukraine. According to data from the World Food Programme (WFP, 2022), over half of Afghanistan's population is experiencing acute food insecurity, with 5.5 million people facing severe hunger in Northern Ethiopia. In South Sudan, approximately 60% of the entire population lives under constant risk of hunger, while 60% or 12.4 million Syrians are suffering from hunger. Additionally, a staggering 16.2 million Yemenis are grappling with food insecurity.

Similar to other conflicts worldwide, the armed conflict in Ukraine has the potential to directly and indirectly affect food security. As of 16 May 2023, approximately 20% of the Ukrainian population, totaling 8,240,289individuals, have become refugees dispersed across Europe, according to the UNHCR (2023), while 11 million are food insecure (WFP, 2023).Due to the ongoing armed conflict in Ukraine, farmers are sowing fewer crops, leading to a decline in both production and export of agricultural goods (EU, 2023). The armed conflict in Ukraine has resulted in various detrimental impacts on the agricultural sector. One of the consequences is the decline in soil fertility, as damaged lands are excluded from production. The destruction of agricultural infrastructure has further exacerbated the challenges faced by farmers. Additionally, the conflict has had devastating consequences for biodiversity in the affected areas. Furthermore, the conflict has contributed to increased air pollution in Ukraine. These combined factors pose significant challenges to the agricultural industry and have far-reaching effects on the environment and overall food security in the region.

The consequences of the ongoing conflict in Ukraine are not limited to the domestic market but have unwanted effects on a global scale. Indeed, the timing of the conflict in Ukraine, coinciding with existing challenges such as the COVID-19 pandemic, climate change, and high food demand, has further exacerbated the increase in food prices. The conflict adds another layer of disruption to the already strained global food supply chain, leading to heightened market volatility and potential supply disruptions. This, in turn, puts additional pressure on food prices, making them more susceptible to upward price movements. The combined impact of these factors creates a challenging environment for food security and affordability, particularly for vulnerable populations.

The conflict in Ukraine cannot be solely blamed for the increase in food prices. This is evident from the fact that while food price inflation is growing in most countries, the overall food price index is decreasing. Various factors, including global supply and demand dynamics,

weather conditions, transportation costs, trade policies, and other geopolitical events, as well as localized factors contribute to fluctuations in food prices. Localized factors that can contribute to high food prices can include corruption or the influence of lobby groups. Corruption within the food system can lead to inefficiencies, rent-seeking behavior, and price manipulation, which can drive up prices for consumers. Lobby groups representing specific agricultural sectors may also exert influence on government policies, regulations, and subsidies that can distort market dynamics and contribute to higher food prices. These factors can undermine fair competition, limit market access for smaller producers, and create barriers that impact the affordability and availability of food for consumers.

Due to the escalating fertilizer prices, it is anticipated that farmers worldwide will likely make adjustments in their agricultural practices. They may choose to reduce fertilizer usage, which could lead to reduced crop yields. Alternatively, farmers, following the example of American farmers(Reuters, 2022), may opt to decrease the areas dedicated to crops like corn and wheat while increasing the areas dedicated to soybeans that typically require less fertilizer compared to other crops. These strategic shifts may also contribute to a further increase in food prices. Additionally, soybean producers may potentially gain more benefits compared to producers of other crops.

To summarize, as long as major grain suppliers do not impose significant export restrictions, the conflict in Ukraine is not expected to have a substantial impact on global trade volume, assuming other factors remain unchanged (ceteris paribus). Additionally, until now, the conflict has not significantly affected wheat production or export volumes. However, it is crucial to note that the conflict in Ukraine could have more significant negative environmental consequences than its economic impact. The long-term environmental repercussions may necessitate substantial resources and time for mitigation, potentially surpassing the immediate economic consequences.

Conflict of interests

The authors declare no conflict of interest.

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COMPARATIVE FINANCIAL ANALYSIS OF FRUIT AND VEGETABLE JUICE PRODUCTION SECTORS IN SERBIA AND CROATIA

Nenad Mihailović[1], Željko Radovanović[2], Sanja Radovanović[3]

**Corresponding author E-mail: nenad.mihailovic@vipos.edu.rs*

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ABSTRACT

The paper analyzes fruit and vegetable juice production sectors in Serbia and Croatia, with a special emphasis on the analysis of financial performance indicators. Cost-effectiveness, profitability and liquidity indicators over the five-year period have been calculated on the basis of financial data. The aim of the paper is to examine whether there is a statistically significant difference between these indicators in the sectors of the two countries. Having in view that previous research results indicate a lower level of technical effectiveness of Serbian agriculture compared to EU countries, the paper examines the potential of the processing sector in generating new value and the possibility of creating a new product from primary agricultural products with considerably better business results. Based on the statistically significant difference in the mean values of financial indicators, the conclusion is that this sector in Serbia is more liquid and profitable than the counterpart sector in Croatia.

Introduction

Processing industry is among the most important economic branches in Serbia. The division line between the processing industry and other activities in the classification is not clearly drawn. Generally, activities performed within the processing industry imply transformation of materials into new products. Their output is a new product. However, the definition of what makes a new product can be subjective (Regulation on the Classification of Activities (Official Gazette of the RS, No. 54/2010))

1 Nenad Mihailović, Ph.D, Assistant, Western Serbia Academy of Applied Studies, Valjevo Department, Serbia, Vuka Karadzica 3a, Valjevo, Phone: +38163251192, E-mail: nenad.mihailovic@vipos.edu.rs, ORCID ID (https://orcid.org/0000-0002-3377-2686)

2 Željko Radovanović, Ph.D, Associate professor, Academy for National Security, Kraljice Ane bb, Belgrade, Serbia, Phone: +381117359070, E-mail: zradovanovic@apml.gov.rs, ORICID ID (https://orcid.org/0009-0000-1432-3917)

3 Sanja Radovanović, Ph.D, professor, Western Serbia Academy of Applied Studies, Valjevo Department, Serbia, Vuka Karadzica 3a, Valjevo, Phone: +381643015980, E-mail: sanja.radovanovic@vipos.edu.rs, ORCID ID (https://orcid.org/0009-0000-8449-5909)

According to the Classification of Activities, production of fruit and vegetable juices is classified in the Processing and preserving of fruits and vegetables group, within the Manufacture of Food Products division in Section C – Manufacturing.

Food industry is important for Serbia, as corroborated by numerous indicators, proceeding from the fact that it is one of the sectors with the greatest impact on industrial production growth, through its share in GDP averaging between 3.7% and 4.3% and its 12% share in the country's total export. (Ministry of Economy, 2017).

The analysis of the situation in the food sector in the Republic of Serbia, made by the Ministry of Economy in 2017, points to the fact that food industry of the Republic of Serbia accounts for 20% of all companies in processing industries and that they employ 21% of the total workforce in the processing industry. What is perhaps even more important is that this sector generates 27% of the total operating income of Serbia's manufacturing and that, unlike some manufacturing industries that operate at net loss, food industry operates with net profit (Ministry of Economy, 2017).

Accelerated technology and its practical implementation to increase production efficiency are the two main components for achieving national security and optimum level of food production (Suresh, A;2015). Having in view a lower level of technical effectiveness of Serbia's agriculture sector compared with the European Union (Djokic at all., 2022), the manufacturing sector is an opportunity for creating new value and for increasing economy's effectiveness and efficiency in the financial sense.

The paper analyzes fruit and vegetable juice production sectors in Serbia and Croatia over a five-year period between 2017 and 2021. The number of companies, revenues and expenditures in the sector are analyzed first. Particular emphasis is placed on the analysis of the financial performance indicators of companies in the sector. Cost-effectiveness, profitability and liquidity indicators, such as net profit margin (N_{pm}), current ratio (T_r) and return on equity (*ROE*) are analyzed based on available data from gross balance sheets of the participants in these sectors.

The aim of the paper is to examine whether there is a statistically significant difference between mean values of these indicators that would lend itself to the conclusion about greater degree of liquidity, cost-effectiveness and profitability in one of these two countries.

Having in view that previous research results indicate a lower level of technical effectiveness of Serbian agriculture compared to EU countries, the paper examines the potential of the processing sector to generate new value and the possibility of creating a new product from primary agricultural products with considerably better business results.

Materials and methods

Background information on the number of companies, balance sheet positions and basic financial indicators for the five-year observation period 2017–2021 have been taken from the Orbis database. Balance sheet positions are shown in USD. Current ratio is calculated according to the formula:

$$T_r = \frac{T_a}{T_p}, \quad (1)$$

where

T_r - current ratio,

T_a - current assets,

T_p - current liabilities.

Profit margin is calculated according to the formula:

$$N_{pm} = \frac{N_d}{P_p}, \quad (2)$$

where

N_{pm} - net profit margin

N_d - net profit

P_p - sales receipts.

Return on equity is calculated according to the formula

$$ROE = \frac{D_{po}}{V_k}, \quad (3)$$

where

ROE- return on equity

D_{po} - profit before taxation

V_k - total capital.

Statistical hypotheses on the significance of differences between median values of net profit margin, current ratio and return on equity indicators are tested using T-Test for Independent Groups.

Results

In the past five years, fruit and vegetable juice production sector in Serbia has been recording positive results and a growth trend of all indicators. The number of participants of this segment has doubled, from 30 manufacturers in 2017 to 65 companies in 2021.

Increasing number of manufacturers was accompanied by the growing sales revenue, though not in the same extent. Namely, revenues of the entire sector grew by 24% over the five-year period, as shown in Table 1.

Table 1. Financial data for the fruit and vegetable juice production sector in Serbia

	Years				
	2021 th USD	2020 th USD	2019 th USD	2018 th USD	2017 th USD
Accounting items	**Values**				
Operating revenue (Turnover)	273,882	236,139	211,760	202,146	220,995
P/L before tax	17,181	14,292	22,866	11,015	15,652
P/L for period [=Net income]	15,167	8,039	12,741	10,530	12,583
Cash flow	26,883	19,518	21,766	18,961	21,115
Total assets	373,817	365,647	328,793	295,860	291,474
Shareholders funds	223,771	217,789	203,450	182,186	182,135
Current ratio (x)	1.47	1.66	1.79	1.71	1.85
Profit margin (%)	6.28	6.07	10.81	5.46	7.09
ROE using P/L before tax (%)	7.65	6.56	11.21	6.08	8.58
ROCE using P/L before tax (%)	n.a.	n.a.	n.a.	n.a.	n.a.
Solvency ratio (Asset based) (%)	59.86	59.56	61.88	61.58	62.49
Number of employees	1,964	1,987	1,695	1,611	1,578

Source: Orbis database (2023)

Unlike in Serbia, the fruit and vegetable juice production sector in Croatia has recorded a negative result for the last five years. Despite the 17% revenue growth, the sector continued to operate at loss which amounted to USD 3,612,000 in 2021, as can be seen in Table 2. There was a slight increase in the number of manufacturers, totaling 31 at the end of 2021.

Table 2. Financial data for the fruit and vegetable juice production sector in Croatia

	Years				
	2021 th USD	2020 th USD	2019 th USD	2018 th USD	2017 th USD
Accounting items	**Values**				
Operating revenue (Turnover)	85,309	62,688	72,534	69,542	72,711
P/L before tax	-3,272	-6,788	-1,641	-1,174	-339
P/L for period [=Net income]	-3,612	-6,944	-1,413	-1,397	-691
Cash flow	1,655	-1,424	4,556	3,154	5,254
Total assets	98,318	96,666	88,693	84,460	87,395
Shareholders funds	28,104	22,720	27,514	21,523	24,731
Current ratio (x)	0.99	0.69	0.93	0.77	0.86
Profit margin (%)	-3.84	-10.83	-2.26	-1.69	-0.45
ROE using P/L before tax (%)	-11.21	-27.04	-3.74	-4.86	-0.51
ROCE using P/L before tax (%)	n.a.	n.a.	n.a.	n.a.	n.a.
Solvency ratio (Asset based) (%)	28.59	23.51	31.02	25.48	28.30
Number of employees	392	379	351	319	310

Source: Orbis database (2023)

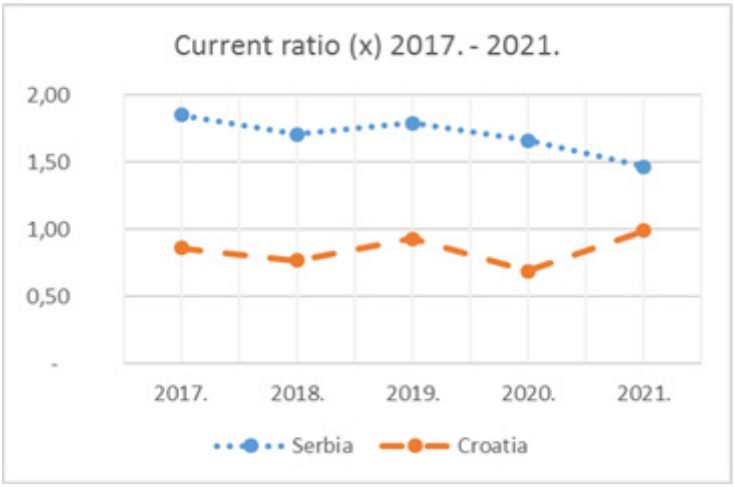
To compare financial performances of these two sectors, statistical hypotheses have been tested. Current ratios have been compared first (Table 3, Figure 1).

Table 3. Current ratio

	2017.	**2018.**	**2019.**	**2020.**	**2021.**	***min.***	***max.***	***average***
Serbia	1.85	1.71	1.79	1.66	1.47	*1.47*	*1.85*	*1.70*
Croatia	0.86	0.77	0.93	0.69	0.99	*0.69*	*0.99*	*0.85*

Source: author's own calculation

Figure 1. Current ratio developments in Serbia and Croatia



Source: author's own presentation

Current ratio, as a ratio of current assets to current liabilities, provides a good first insight into the ability of companies in the sector to meet their obligations on time. This indicator in Serbia ranged from 1.47 to 1.85. Besides a slightly negative trend, the fact that the indicator recorded its minimum in the last year of measurement also raises concern.

In Croatia, the indicator followed a slight upward trend, with its highest value of 0.99 recorded in the last year of measurement. The current ratio value suggests that companies from Croatia have a low level of liquidity and that short-term assets are not sufficient to settle short-term liabilities. The situation in Serbia is considerably better in terms of this indicator, because each USD of short-term liabilities is, on average, covered by USD 1.7 of short-term assets.

To examine statistical significance of the current ratio mean values, the null and alternative hypotheses have been defined:

H0: There is no statistically significant difference in mean values of the current ratio in fruit and vegetable juice production sector between Croatia and Serbia;

H1: There is statistically significant difference in mean values of the current ratio in fruit and vegetable juice production sector between Croatia and Serbia;

The average value of the current ratio in the Republic of Serbia is 1.70 (M=1.70) with standard deviation of 0.15 (SD=0.15), while in the Republic of Croatia it is 0.85 (M=0.85) with standard deviation of 0.12 (SD=0.12).

Table 4. Independent samples t test results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Curent ratio (x) 2017 - 2021	Equal variances assumed	.049	.830	10.022	8	.000	.84800	.08462	.65287	1.04313
	Equal variances not assumed			10.022	7.725	.000	.84800	.08462	.65166	1.04434

T test results, at the significance level of 0.05, suggests the presence of statistically significant difference between the mean values of the current ratio in Serbia and Croatia. More precisely, since Sig. = 0.000<0.05, it led to the conclusion that fruit and vegetable juice production sector in the Republic of Serbia is more liquid than the counterpart sector in the Republic of Croatia.

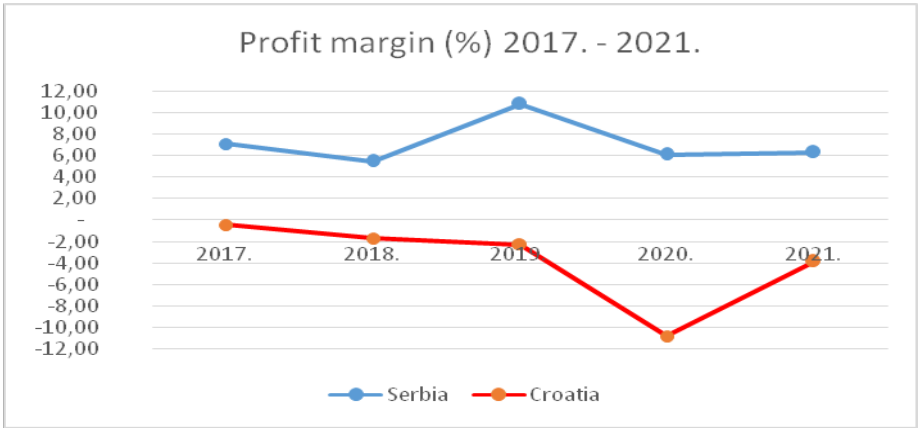
The results of profit margin comparisons of these sectors are presented in Table 5 and Figure 2

Table 5. Profit margin

	2017.	**2018.**	**2019.**	**2020.**	**2021.**	***min.***	***max.***	***average***
Serbia	7.09	5.46	10.81	6.07	6.28	*5.46*	*10.81*	*7.14*
Croatia	- 0.45	-1.69	-2.26	-10.83	- 3.84	*- 10.83*	*- 0.45*	*- 3.81*

Source: author's own calculation

Figure 2. Profit margin developments in Serbia and Croatia



Source: author's own presentation

The sector in Serbia recorded positive business results, with average profit margin of 7.14%. The sector achieved its maximum profit margin of 10.81% in 2019, while the lowest level was recorded in the first year of the covid pandemic. The same sector in Croatia had a negative business result, with the lowest value of -10.83% recorded in 2020.

To examine statistical significance of the profit margin mean values, the null and alternative hypotheses have been defined:

H0: There is no statistically significant difference in mean values of the profit margin in fruit and vegetable juice production sector between Croatia and Serbia;

H1: There is statistically significant difference in mean values of the profit margin in fruit and vegetable juice production sector between Croatia and Serbia;

The average value of the profit margin (%) in the Republic of Serbia is 7.14 (M=7.14) with standard deviation of 2.13 (SD=2.13), while in the Republic of Croatia it is -3.81 (M=-3.81) with standard deviation of 4.11 (SD=4.11).

Table 6. Independent samples t test results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Curent ratio (x) 2017 - 2021	Equal variances assumed	1.035	.339	5.294	8	.001	10.95600	2.06937	6.18402	15.72798
	Equal variances not assumed			5.294	6.010	.002	10.95600	2.06937	5.89439	16.01761

Source: author's own calculation

T test result, Sig. = 0.001<0.05, at the significance level of 0.05, suggests the presence of statistically significant difference between profit margin mean values of fruit and vegetable juice production sectors in the Republic of Serbia and the Republic of Croatia. Based on test results, it can be concluded that companies in this sector in Serbia are more profitable than their counterparts in Croatia.

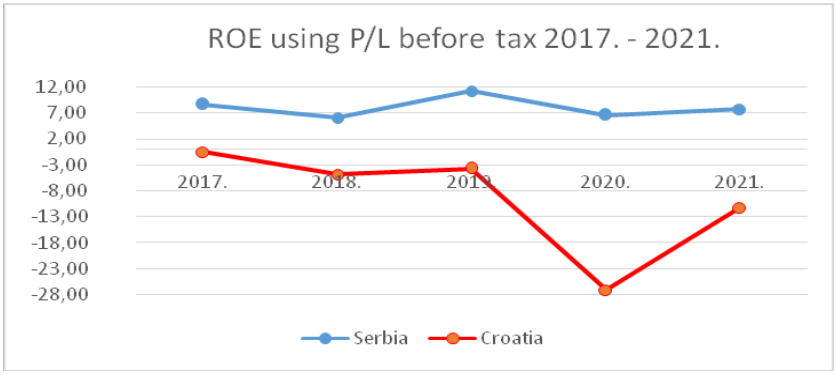
The results of return on equity (ROE) in these sectors are presented in Table 7 and Figure 3.

Table 7. Return on equity (ROE)

	2017.	**2018.**	**2019.**	**2020.**	**2021.**	***min.***	***max.***	***average***
Serbia	8.58	6.08	11.21	6.56	7.65	6.08	11.21	8.02
Croatia	- 0.51	- 4.86	-3.74	-27.04	-11.21	-27.04	-0.51	- 9.47

Source: author's own calculation

Figure 3. ROE in Croatia and Serbia



Source: author's own presentation

In Serbia, companies in the sector brought their owners an average return of 8.02% on invested capital, with ROE maximum value of 11.21% in 2019. Given the negative operating results, the owners of companies in Croatia suffered an average loss of 9.47% on their invested capital. The sector recorded its worst business results in 2020, when ROE fell down to -27.04%.

To examine statistical significance of ROE mean values, the null and alternative hypotheses have been defined:

H0: There is no statistically significant difference in mean values of ROE in fruit and vegetable juice production sector between Croatia and Serbia;

H1: There is statistically significant difference in mean values of ROE in fruit and vegetable juice production sector between Croatia and Serbia;

The average value of ROE using P/L before tax (%) in the Republic of Serbia is 8.02 (M=8.02) with standard deviation of 2.03 (SD=2.03), while in the Republic of Croatia it is -9.47 (M=-9.47) with standard deviation of 10.56 (SD=10.56).

Table 8. Independent samples t test results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Curent ratio (x) 2017 - 2021	Equal variances assumed	5.051	.055	3.636	8	.007	17.48800	4.80947	6.39733	28.57867
	Equal variances not assumed			3.636	4.296	.019	17.48800	4.80947	4.48977	30.48623

Source: author's own calculation

T test result, Sig. = 0.007<0.05, at the significance level of 0.05, suggests the presence of statistically significant difference between ROE mean values of fruit and vegetable juice production sectors in the Republic of Serbia and the Republic of Croatia. Based on test results, it can be concluded that companies in this sector in Serbia generate higher return on invested capital for their owners. Furthermore, it can be concluded that companies in this sector in Croatia make loss on invested capital to their owners.

Discussions and Conclusions

To measure profitability, productivity and efficiency in agriculture sector, various indicators have been used, with certain profitability indicators, such as different value added ratios, being used to compare comparative advantages of agriculture sectors of Canada and the EU (Latruffe, L; 2010).

The economic efficiency is a concept with a complex content, which expresses the effectiveness achieved in an economic activity, in relation to expenses claimed, or the effort to achieve it (Chetroiu; R;2013).

Adequate attention has been paid to the technical efficiency in the agriculture sector. According to the results of the research the technical efficiency in the Western Balkan countries improved in the period 1999/2016, although, however, it is still at a much lower level than in the EU. (Djokić, D. 2022). Making a parallel with the use of the DuPont formula for profitability analysis in the economy, a number of authors point to the importance of interrelationship between profit margin, turnover rate and assets to equity ratio, and therefore propose this formula as the main methodological framework for profitability analysis in the agriculture sector. (Mishra, A.K; at all 2009).

In the whole concept of profitability measurement in the agriculture sector, return on equity (ROE) and return on assets (ROA) continue to have a key role (Mishra, A.K; at all 2012).

As far as the CEFTA market is concerned, Serbian agri-food products have comparative advantages in all Western Balkan countries, while processed agri-food products have a higher level of intra-industrial specialization (Matkovski, B;. at all, 2022). While in relation to the EU countries, this relationship is in their favor.

Serbia achieves a positive foreign trade balance in the exchange of agricultural and food products with EU countries and CEFTA members, while the trade surplus with neighboring countries has been constantly increasing (Dragica, B; 2016).

In view of the current research of profitability and liquidity at the corporate level based on indicators, such as the current ratio, profit margin and return on equity, one can conclude that the present analysis of the fruit and vegetable juice production sector in Croatia and Serbia fully complies with the empirically verified methodological framework and best practice. Primary data, including financial data, were obtained by querying the Orbis database, which is currently the most comprehensive and competent database of business companies in the world.

The results of the research conducted in the fruit and vegetable juice production sectors in Serbia and Croatia lead to the following conclusions:

1. The fruit and vegetable juice production sector in Serbia has, for the last five years, recorded positive financial results and a growing trend in the number of companies in the sector.
2. The sector in Croatia is characterized by a low level of liquidity. Short-term assets are not sufficient to cover short-term liabilities.
3. In Serbia, each USD of short-term liabilities is, on average, covered by USD 1.7 of short-term assets, and the sector is therefore more liquid in Serbia than in Croatia.
4. In Serbia, the sector recorded positive business results with an average profit margin of 7.14%, while in Croatia it recorded an average loss of 3.81%.
5. Companies in the sector in Serbia earned their owners an average profit of 8.02% on invested capital, while owners of companies from Croatia sustained a loss on invested funds that averaged 9.47%.

The results of the research provide a solid base for the above conclusions. They indisputably point to the better performance of the sector in Serbia, being financially more efficient than the same sector in Croatia according to all tested indicators. We consider the mentioned results significant because the financial aspect of the corporate analysis of the Serbian food sector has not received additional attention in a scientific sense.

Conflict of interests

The authors declare no conflict of interest

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FOREIGN TRADE AND COMPETITIVENESS OF RASPBERRY OF THE REPUBLIC OF SERBIA AND SELECTED COUNTRIES

Marija Nikolić[1], Ivan Božić [2], Dragica Božić [3]

**Corresponding author E-mail: mnikolic@agrif.bg.ac.rs*

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ABSTRACT

The subject of this study is the analysis of foreign trade and competitiveness of raspberries from Serbia and selected major producers and exporters (Poland and Ukraine), as well as from neighboring countries where raspberries play an increasingly important role in production and export (Bosnia and Herzegovina and Bulgaria), in the period 2010-2021. The aim of the paper is to examine the competitive position of raspberries from Serbia and selected countries on global market and to give insight into changes between countries regarding competitiveness of raspberries. The results show that Serbia and Poland are leaders in the global market of frozen raspberries. Frozen raspberries from Serbia, Ukraine and Bulgaria are quality competitive, while Polish raspberries are competitive in price. The decrease in competitiveness of the leading countries on global market of frozen raspberries is noticeable, while the greatest increase in competitiveness was achieved in Ukraine.

Introduction

Raspberries have a special economic importance for the overall economic development of the Republic of Serbia, such as increasing employment and total income, developing the food industry, improving infrastructure, contributing to the reduction of the overall foreign trade deficit of the economy, etc.

The high yields and permanent export to the global market contributed to the development and intensification of raspberry production. The high economic results obtained in

1 Marija Nikolić, Assistant professor, University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia, mnikolic@agrif.bg.ac.rs, ORCID ID (https://orcid.org/0000-0002-8691-7113)

2 Ivan Božić, M.Sc., M.Econ., LuxPayroll S.a.r.l., 15, Rue de Industrie, L-8069 Luxembourg, +352 28 77 34 50, E-mail: ivan.s.bozic@gmail.com, ORCID ID (https://orcid.org/0009-0008-7603-1168)

3 Dragica Božić, Full Professor, University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia, bozdrag@agrif.bg.ac.rs, ORCID ID (https://orcid.org/0000-0001-8376-5241)

production led to investments in perennial raspberry plantations and the establishment of an economically profitable business. Intensive raspberry production requires an organized approach to improve product quality, increase economic efficiency of primary production and processing, and an active role of the state (Kljajić, 2017).

Raspberry production in Serbia meets domestic needs, and significant quantities are exported. This market has certain specifics – it can be evaluated as a perfect competitive market on the supply side and an oligopoly on the demand side. It is also characterized with low level of organization of purchases, producers and processors (Pantić et al., 2021). Raspberries are one of the most profitable agro-industrial products, ranking third from 2017 in export value (behind maize and tobacco). About 92% of raspberries produced in Serbia are exported as frozen products (Užar & Radojević, 2020).

The biggest competitors of Serbian raspberry production on the global market are Russia, Poland and Chile. Russia place more than 90% of its raspberry production on the domestic market. Poland, Chile and Serbia compete for competitive positions in global market (Radosavljević, 2014). In the region, main Serbian competitor is Poland, while potential competitors are increasingly important raspberry producers: Ukraine, Bosnia and Herzegovina, and Bulgaria. By joining the EU, Poland obtained certain competitive advantages towards the growing and realization of raspberry comparing to Serbia. Some of the leading EU agro-food companies have built their capacities for raspberries processing in Poland, what confirmed the exporting status of this country in the European raspberry market (Kljajić et al., 2023). Therefore, it is important to analyze to what extent Serbia is competitive on the global raspberry market, especially in comparison with selected producers and exporting countries.

Competitiveness is related to competition, rivalry, or the process of bidding for the best possible results in international trade. It can be observed at the level of the economy, sector, company or product. Competitiveness is the result of many factors, which is why its measurement is associated with many difficulties, especially for agriculture and its products (Božić et al., 2021). Competitiveness in global fruit market depends on internal and external factors, where internal factors relate to production condition, availability of labour, domestic prices and investments, while external factors include uniqueness of products, proximity of demand markets etc. (Erdem, 2020).

The aim of this paper is to conduct a comparative analysis of foreign trade exchange and competitiveness of raspberries from Serbia and selected neighbouring countries on global market in the period 2010-2021. Three starting hypotheses were defined in the paper. (1) Serbia and the selected countries are net exporters of raspberries and they have a revealed comparative advantage on the global market of frozen raspberry. (2) Serbian raspberries have quality competition comparing to raspberries from other selected countries on global market. (3) The competitiveness position of selected countries is changing, i.e. the position of current leaders is threatened.

Materials and methods

The analysis of the characteristics of foreign trade of frozen raspberries in the Republic of Serbia and selected countries was carried out using descriptive statistics, relative indicators of dynamics (average growth rates and indexes) and structural indicators. The countries included in the analysis are the main producers and exporters of raspberries (Poland and Ukraine) and neighboring countries where raspberries play an increasingly important role in production and export (Bulgaria and B&H).

Fresh raspberries do not have a significant share in the foreign trade of Serbia and selected countries (with the exception of Poland), so the analysis of competitiveness was carried out only for frozen raspberries, which occupy a dominant position in foreign trade. To study the competitiveness of raspberries in foreign trade of Serbia and neighboring countries in the global market, the following indexes were calculated: modified Revealed Comparative Advantage Index (RCA_1) or Net Export Index (NEI); RCA_2; Unit value (or price) of exports and imports; and Relative unit value (RUV).

The RCA_1 index (NEI) is calculated for a country level from the ratio between the foreign trade balance of a given product and the total volume of that product's trade with the world (Balassa and Noland, 1989):

$$\mathrm{RCA_1\ /NEI} = \frac{(X_{ij} - M_{ij})}{(X_{ij} + M_{ij})}$$

where X – export, M – import, i – country, j – product.

The RCA_1 index ranges from -1 to +1. If the value of the index is less than zero, the country is a net importer of a given product and has no comparative advantage in trade; a value of RCA_1 greater than zero indicates that the country is a net exporter of that product, the production productivity of that product is higher than the international average, and there is a comparative advantage of the country in trade of that product (Jovović & Jovović, 2018).

RCA_2 is calculated according to the following formula (Utkulu & Seymen, 2004; Božić et al., 2021):

$$RCA_2 = \frac{\frac{X_{ij}}{X_{it}}}{\frac{M_{ij}}{M_{it}}} = \frac{\frac{X_{ij}}{M_{ij}}}{\frac{X_{it}}{M_{it}}}$$

where X – export; M – import; i – country; j – product; t – group of products.

The RCA_2 index of comparative advantage refers to one country. It represents the ratio of the share of exports of one good in a country's total exports to a given market and the share of imports of that good in the country's total imports from that market. A value greater than 1 means that a country's product has a comparative advantage on a certain market in relation to other sectors of the national economy.

For the analysis of the competitiveness of frozen raspberries, in addition to the RCA indicators, indicator of unit value of export and import was used. It was calculated as the ratio of export and import of a given product, expressed in value and quantity, and is therefore also called unit price of export (Pxj) or unit price of import (Pmj). Product with a higher exports than imports (Xj > Mj) and higher unit price of exports than imports (Pxj > Pmj) has quality competitiveness on the foreign market. If the unit price of imports exceeds the unit price of exports (Pmj > Pxj) the product is competitive in price. If a country's imports are higher than its exports, the country does not achieve external competitiveness at all (Jefferson Institute, 2006; Marković, 2019).

The relative unit value (RUV) was used for the analysis of competitiveness in quality. It was calculated from the ratio between the unit price of exports (Pxj) and the unit price of imports (Pmj) (Brkić & Velić, 2021):

$$\text{RUV} = \frac{\text{unit price of export (Pxj)}}{\text{unit price of import (Pmj)}}$$

The RUV indicator is used to analyze intra-industry trade, which can be horizontal and vertical. Vertical trade refers to the exchange of products with different degrees of processing and quality, while horizontal trade involves the simultaneous export and import of products with approximately the same quality.

Data on raspberry production in the world, the Republic of Serbia and selected countries, which are important producers and exporters of raspberries, were taken from the database of the UN Food and Agriculture Organization (FAOSTAT).

Data on foreign trade of fresh and frozen raspberries by individual country and at the global level were obtained from the International Trade Center (ITC) database. These data were used to calculate indicators of foreign trade exchange and competitiveness of raspberries for Serbia and selected countries. The ITC database uses the Harmonized System (HS) which is a standardized numerical method of classifying traded goods used worldwide. Due to limited access to data, especially on the lower interval groups, and inconsistent availability of data for individual countries, it was not possible to collect data on exports of fresh and frozen raspberries at the individual product level for Bosnia and Herzegovina, Ukraine, and for the global level. Instead, for B&H, Ukraine and global level for fresh raspberries we used data for group 081020 Fresh raspberries, blackberries, mulberries and loganberries and for frozen raspberries data for group 081120 Raspberries, blackberries, mulberries, loganberries, black, white or red currants and gooseberries.

Results and Discussion

The total production of raspberries in the world has steadily increased in 2010-2020, reaching 895.8 thousand tons last year. The largest raspberry producers in the world are the Russian Federation (with 182 thousand tons, i.e. 20% of the world production in 2020), Mexico (146.3 thousand tons), Poland (121.7 thousand tons), Serbia (118.7 thousand tons) and the USA (100.6 thousand tons) (FAOSTAT, 2022).

Poland is the largest producer of raspberries, accounting for 51% of total EU production (USDA, 2021). The country has a long tradition of growing raspberries and invests heavily in research and development, creating a solid foundation to becoming one of the world's largest exporters of frozen raspberries (Paraušić & Simeunović, 2016). Ukraine is an increasingly important raspberry producer and is expected to soon pose a serious threat to polish producers given competitive prices and lower costs (Wroblewska et al., 2019). Bosnia and Herzegovina is increasing raspberry production mainly due to high prices for this fruit (Životić et al., 2018). In Bulgaria, there is a revival of raspberry production and growing interest in this crop (Domozetova, 2012).

In the foreign trade of raspberries at the global level, frozen raspberries have a much higher value than fresh ones. The world's leading exporters of fresh raspberries in 2021 were Spain and Mexico, which exported nearly half and, together with the United States, Morocco, and Portugal, more than 80% of the value of global exports of this fruit. The world's largest importers of fresh raspberries are the USA (42.3% of total imports), followed by Germany, Canada and the UK (with a share of 10% each) (calculation based on the ITC database).

Fresh raspberries are not significantly represented in the exports of the Republic of Serbia and selected countries. The value of fresh raspberry exports from Serbia in 2021 amounted to 6.8 million US dollars (2.3% of the value of total Serbian raspberry exports), while the average import of fresh raspberries reaches just 56 thousand US dollars. The exception among the selected countries is Poland, which has higher export and import value of fresh raspberries, but stil significantly lower than the leading European exporters.

Foreign trade of frozen raspberries in Serbia and selected countries

The Republic of Serbia is the world's largest exporter of frozen raspberries with a share of about one third in 2021 (in the total berry group - 081120). Large exporters of these fruits are also Poland, Chile and Ukraine (*Table 1*).

Table 1. Main exporters and importers of frozen raspberries* in the world in 2021

10 leading exporters			10 leading importers		
Countries	**Value (000 US $)**	**Share in total export (%)**	**Countries**	**Value (000 US $)**	**Share in total import (%)**
Serbia	**527,704**	**32.4**	Germany	325,225	19.0
Poland	305,989	18.8	USA	172,289	10.1
Chile	118,775	7.3	France	160,320	9.4
Ukraina	93,267	5.7	Belgium	134,861	7.9
Belgium	71,037	4.4	Poland	130,179	7.6
Germany	69,889	4.3	Canada	84,131	4.9
B&H	59,883	3.7	Great Britain	81,233	4.8
Mexico	43,644	2.7	Austria	72,270	4.2
Netherlands	42,554	2.6	Netherlands	64,223	3.8
China	42,416	2.6	**Serbia**	**42,200**	**2.5**

* Data at the global level are for HS group 081120

Source: Authors'calculation based on data extracted from ITC Database

The value of Serbian exports of frozen raspberries increased from an average of US$180 million in the first observed five-year period to US$ 241.5 million in 2015-2019, or by 34% (*Table 2*). In the last two years of analysis, the value of exports continued to increase, reaching US$ 424.2 million in 2021 (2.4 times higher than in the first five-year period). The export of frozen raspberries accounts for 97.7% of the export value of this fruit in 2021.

Raspberries have high demand on the world market. Over 95% of harvested raspberry fruits from Serbia are directed to global markets, while only small quantities are placed on the local market (Kljajić et al., 2023). Numerous factors have contributed to the Republic of Serbia's leading position in the global market of frozen raspberries, where competition is becoming increasingly fierce. In addition to the production volume and quality of this fruit, Serbia's place on the list of world exporters also depends on the production in other competing countries, price fluctuations on the domestic and foreign markets, etc. The organization of the distribution channel for frozen raspberries is also an important factor. The largest competitors on the global market (Chile and Poland) are working on improving standards in raspberry production in order to fully develop their competitive position on the global market (Stojanović & Radosavljević, 2013).

In terms of the value of exports of frozen raspberries, Poland ranks second in the world. After a long period of stable exports, Poland exported US$ 223 million worth of frozen raspberries in 2021.

Ukraine is a major competitor of Serbia and Poland, ranking fourth among exporters in 2021 with exports of frozen raspberries worth US$ 93.3 million. Among the selected countries, Ukraine achieved the most significant increase in the value of frozen raspberry exports. Compared to the average of 2010-2014, exports in 2021 increased 48 times. The growing production of berries in Ukraine, combined with limited consumption, may threaten the relative stability of the raspberry market in both Poland and Serbia (Wroblewska et al., 2019).

Table 2. Export value of frozen raspberries from Serbia and selected countries

	Export (000 US$)				Rang in the world in 2021**	2021/ Ø(2010-2014)
	Average 2010-2014	Average 2015-2019	2020	2021		
Serbia	**180,025**	**241,513**	**295,217**	**424,241**	**1**	**236**
Poland	113,758	110,358	113,626	223,159	2	196
Ukraine*	1,950	15,919	44,087	93,267	4	4783
B&H*	14,575	36,838	40,930	59,883	7	411
Bulgaria	11,553	14,144	13,117	17,214	14	149

* Data for HS group 081120; ** The rank for individual countries was calculated based on data for HS group 081120 at the global level

Source: Authors'calculation based on data extracted from ITC Database

Bosnia and Herzegovina recorded significant growth in the export of frozen raspberries, which reached a value of US$ 59.9 million in 2021 (four times higher than the average of the first five years) and ranked 7th on the list of global exporters. The export of frozen raspberries is very significant in fruit and vegetable exports from B&H, both in terms of volume and revenue generated (Životić et al., 2018).

The value of Bulgarian exports of frozen raspberries has grown more slowly compared to other countries, reaching US$ 17.2 million in 2021, placing the country 14th in the world.

The value of imports of frozen raspberries in Serbia and in all selected countries increases significantly and amounts to US$ 29.4 million in 2021, which puts Serbia on the 10th place in the world (*Table 3*).

Poland recorded the highest value and the most significant increase in the value of imports of frozen raspberries throughout the period. In 2021, it ranked fifth with imports worth US$ 113 million, just behind the world's leading importers (Germany, United States, France, and Belgium). The leading exporters of frozen raspberries are also major importers, which can be explained by increasing re-exports. These countries have developed marketing channels to resell raspberries imported from other countries, thus generating additional revenue (EastFruit, 2021).

Table 3. Import value of frozen raspberry from Serbia and selected countries

	Import (000 US$)				Rang in the world in 2021**	2021/ Ø(2010-2014)	Foreign trade coverage ratio in 2021 (%)
	Average 2010-2014	Average 2015-2019	2020	2021			
Serbia	**7,230**	**16,081**	**21,007**	**29,451**	**10**	**407**	**1,440**
Poland	9,527	27,489	50,103	113,006	5	1186	197
Ukraine*	639	275	1,073	1,244	49	195	7,497
B&H*	936	2,043	2,836	4,925	36	526	1,216
Bulgaria	1,041	750	1,453	4,318	35	418	399

* Data for HS group 081120; ** The rank for individual countries was calculated based on data for HS group 081120 at the global level

Source: Authors'calculation based on data extracted from ITC Database

Bosnia and Herzegovina, Bulgaria, and Ukraine also increase the value of imports of frozen raspberries, but they are significantly lower than the leading importers. Export-import values show that all studied countries (except Ukraine in 2011) have a positive foreign trade balance for frozen raspberries, which is highest in Serbia with 394.8 million US$ in 2021, or 2.3 times higher compared to the period 2010-2014.

The Republic of Serbia and selected countries achieve a high coverage of imports by exports, which may indicate the success and advantages they achieve in the production of this fruit. In the last year of the analysis, Ukraine has the highest coverage index of imports by exports of frozen raspberries, which is mainly due to the low value of imports of this fruit (*Table 3*).

Since frozen raspberry dominates in foreign trade of the Republic of Serbia and selected countries, its competitiveness in foreign trade is analyzed below. The importance of this analysis stems from the fact that Serbia and its competitors (Poland and Ukraine), as well as selected neighboring countries, export frozen raspberries to approximately the same destinations.

The Republic of Serbia exports frozen raspberries to more than 30 countries in the world, with the top ten countries taking more than 90% of the total export value of this product. Almost one third of exports of frozen raspberries goes to the German market (Užar & Radojević, 2020), and then to the world's leading importing countries: France, USA, Belgium and Poland. Poland exports frozen raspberries more or less to the same destinations: Germany, Belgium, France, the Netherlands and the UK. Besides Poland, the main export destinations of Ukraine are Germany, the Netherlands and France. These countries are also among the leading export destinations for frozen raspberries from neighboring countries (B&H and Bulgaria).

Competitiveness of frozen raspberries in foreign trade of the Republic of Serbia and selected countries

In order to determine the competitiveness of Serbia and selected countries on the global market, the index of revealed comparative advantage RCA_1 (or Net Export Index – NEI) was calculated. The values of this index are positive in the observed period for all studied countries (except for Ukraine in 2011) (*Table 4*). Positive values of the RCA_1 indicate that countries are net exporters of frozen raspberries and that they achieve higher production productivity than the international average, i.e. they have a revealed comparative advantage (Božić et al., 2021).

The Republic of Serbia had the highest values of the RCA_1 index for frozen raspberries in the first years of the analysis (until 2013), which indicates higher competitiveness on the global market compared to the selected countries. The decrease in competitiveness of Serbian frozen raspberries on the global market was caused by a number of business factors (prices, organization of purchasing, i.e. distribution channels, etc.), as well as by a higher growth rate of the value of imports compared to exports.

Table 4. RCA_1 index of frozen raspberry from Serbia and selected countries

	Serbia	Poland	Ukraine	B&H	Bulgaria
2010	0.96	0.86	0.32	0.73	0.78
2011	0.97	0.82	-0.08	0.82	0.79
2012	0.90	0.87	0.36	0.90	0.81
2013	0.90	0.87	0.43	0.91	0.85
2014	0.90	0.82	0.81	0.93	0.91
2015	0.90	0.71	0.90	0.94	0.96
2016	0.90	0.73	0.94	0.94	0.97
2017	0.85	0.57	0.97	0.95	0.89

	Serbia	Poland	Ukraine	B&H	Bulgaria
2018	0.85	0.53	0.99	0.91	0.84
2019	0.87	0.38	0.98	0.75	0.80
2020	0.87	0.39	0.95	0.87	0.80
2021	0.87	0.33	0.97	0.85	0.60

Source: Authors'calculation based on data extracted from ITC Database

Research by Wroblewska et al. (2019) confirms that the competitiveness of other countries has increased compared to the current leaders in the European raspberries market. Lower production costs in Ukraine have a significant impact on the increased competitiveness of raspberries compared to the current leaders in the European raspberry market (Serbia and Poland).

The most significant decrease in competitiveness of frozen raspberries on the global market in the studied period, measured by the RCA_1, is characteristic for Poland, which is mainly due to the higher growth rates of the value of imports compared to exports. Wroblewska et al. (2019) point out that the different operating conditions on the raspberry market are likely to put Polish producers in a more difficult position compared to foreign producers, who are subject to relatively lower production costs. Given the low supply and high prices of domestic fruits, imports of frozen raspberries from Ukraine to Poland at significantly lower prices are increasing. For this reason, Polish raspberry producers will have to change significantly in terms of improving production efficiency and fruit quality in order to effectively compete with both Serbia and Ukraine.

The largest increase in competitiveness of frozen raspberries was achieved in Ukraine, where the value of exports of this fruit reached a significant increase (by 48 times) compared to the increase in imports (by 95%) in the studied period. The increase in competitiveness with smaller fluctuations is also characteristic for selected neighboring countries.

In the following part of the analysis, the Index of Revealed Comparative Advantage (RCA_2) is calculated. The value of this index, which is greater than 1 for all years and all countries, indicates that frozen raspberries have a comparative advantage in foreign trade in the global market compared to other products of these countries (*Table 5*).

Table 5. RCA_2 index of frozen raspberries from Serbia and selected countries

	Serbia	Poland	Ukraine	B&H	Bulgaria
2010	75.2	14.5	2.3	12.1	9.9
2011	106.5	10.9	1.0	18.9	9.8
2012	31.4	14.9	2.6	38.7	12.0
2013	25.9	14.6	3.0	37.8	14.6
2014	27.0	10.3	9.9	54.8	24.8
2015	24.9	5.9	19.6	54.6	55.3
2016	24.5	6.1	37.9	51.2	63.5

	Serbia	Poland	Ukraine	B&H	Bulgaria
2017	16.1	3.6	68.5	58.2	18.5
2018	17.2	3.3	175.0	33.7	13.0
2019	19.8	2.2	127.4	12.1	10.2
2020	19.0	2.3	44.9	23.2	9.9
2021	19.0	2.1	79.6	18.4	4.5

Source: Authors'calculation based on data extracted from ITC Database

The highest value of the RCA_2 in the first years of the analysis was recorded in Serbia and was 106.5 in 2011, which confirms the extraordinary importance of frozen raspberries for the country's overall foreign trade. In the following years, the value of the indicator generally decreased, which points to the decrease in competitiveness of frozen raspberries in comparison with other sectors of national economy, which is also characteristic for Poland during the analysed period.

At the same time, the value of the RCA_2 increased in the neighboring countries – Bosnia and Herzegovina and Bulgaria, except in the last years of the analysis. The highest value of RCA_2 was reached in Ukraine in recent years (175 in 2018), indicating the growing importance of frozen raspberries in foreign trade and the growth of competitiveness comparing with other sectors of the economy.

For the analysis of competitiveness of Serbia and selected countries in the global market of frozen raspberries, the unit price of exports (Pxj) and the unit price of imports (Pmj) were calculated. Although Serbia is the leader in raspberry production measured by quantity, this does not mean that it can dictate the export price, as it does not have well-organized marketing channels. The price of raspberries on foreign and domestic markets is also influenced by the supply from other countries (Stojanović & Radosavljević, 2013). The price of agricultural products on the global market is influenced by other factors such as product quality, demand, barriers to entry etc. (Nikolić et al., 2021).

The unit price of export (Pxj) of frozen Serbian raspberries ranged from $2,048 to $4,343 per tonne and was higher than unit price of export in Poland, Ukraine and Bosnia and Herzegovina, in all years, while it was generally lower than the unit price of export in Bulgaria (*Table 6*).

The particular climatic location of the Republic of Serbia and a warmer climate, characterized by a longer growing season, allows raspberries to be harvested earlier than in competitor countries which ensure a slightly higher price. The higher price of Serbian raspberries compared to those in Poland and Ukraine is the result of many years of improvements in cultivation as well as the ability to maintain high fruit quality both during and after harvest (Wroblewska et al., 2019).

Table 6. Unit price of export of frozen raspberry in Serbia and selected countries (US$/tons)

	Serbia	Poland	Ukraine	B&H	Bulgaria
2010	2,702	2,085	1,348	2,194	2,526
2011	2,397	1,938	1,508	2,276	2,640
2012	2,111	1,617	1,348	2,163	2,282
2013	3,051	2,100	1,387	2,853	2,933
2014	3,224	2,583	1,570	2,926	3,073
2015	2,853	2,375	1,360	2,675	3,319
2016	2,881	2,457	1,268	2,596	3,570
2017	2,483	2,026	1,356	1,788	3,106
2018	2,184	1,818	1,275	1,680	2,776
2019	2,048	1,710	1,519	1,669	2,533
2020	2,750	2,322	2,062	2,390	3,214
2021	4,343	3,730	1,838	4,192	4,764
Average	2,752	2,230	1,488	2,450	3,061

Source: Authors'calculation based on data extracted from ITC Database

The lowest unit prices of export for frozen raspberries were recorded in Ukraine (*Table 6*), which can be explained by the lowest production costs. With a similar technological level, the main factors determining the level of costs are human labor and natural conditions. Due to significantly lower costs per labor hour and fewer basic protection and fertilization treatments resulting from more favorable natural conditions, the direct costs of raspberry production in Ukraine were only slightly higher than half of those in Poland and Serbia (Wroblewska et al., 2019).

By comparing the unit prices of exports and imports, conclusions can be drawn about the source of competitiveness of products in the global market. Higher unit prices of exports indicate that a particular country sells products at higher prices than its competitors, implying that this product has certain non-price dimensions of competitiveness, which may be quality.

A higher unit export price is not necessarily an indicator of the quality of export goods. Low unit export prices may be the result of various factors such as low costs. However, a good whose export value is higher than the import value (Xj > Mj) and which achieves a higher unit price of exports than imports (Pxj > Pmj) is assumed to be qualitatively competitive in the foreign market. If the first condition is met, but the unit price of imports exceeds the unit price of exports (Pmj > Pxj), the product is price competitive.

The unit price of frozen Serbian raspberry exports was generally higher than the unit price of imports (*Table 6 and 7*). This indicates that frozen Serbian raspberries are competitive on the global market in terms of quality. The higher quality of Serbian raspberries is related to the sugar content of the fruit, i.e. the particular climatic location of the Republic of Serbia, the cultivated varieties, and the maintenance of high quality of the fruit during and after harvest.

Table 7. Unit price of import of frozen raspberry in Serbia and selected countries (US$/tons)

	Serbia	Poland	Ukraine	B&H	Bulgaria
2010	2,899	3,309	1,064	2,334	3,040
2011	2,136	2,672	1,164	2,358	2,780
2012	1,995	2,450	1,132	2,324	2,393
2013	2,508	3,366	920	2,813	2,411
2014	2,936	3,185	890	2,290	2,517
2015	2,869	2,982	851	2,327	3,144
2016	2,663	2,516	733	2,036	3,164
2017	1,878	2,049	880	1,779	2,409
2018	1,650	1,784	1,016	1,919	2,872
2019	1,828	1,848	1,695	1,923	2,908
2020	2,620	2,546	1,646	2,338	3,307
2021	4,525	4,247	2,029	4,114	4,563
Average	2,542	2,746	1,168	2,380	2,959

Source: Authors'calculation based on data extracted from ITC Database

Regarding the relationship between export and import unit prices for frozen raspberries, there are differences between the selected countries. In Poland, the value of exports of frozen raspberries is higher than that the imports, and the unit price of export (Pxj) is lower than the unit value of import (Pmj) in all years of analysis (except 2018). This confirms that Polish frozen raspberries are price competitive on the global market. Poland, as a member of the EU, achieves significant price competitiveness through extensive investment incentives from EU funds, as well as through well-organised channels for the sale, purchase, processing, and export of frozen raspberries.

Ukraine generally has higher unit prices of export than import for frozen raspberries, which, along with the surplus in the exchange of this fruit, indicates that frozen raspberries from Ukraine achieve competitiveness in terms of quality on the global market. Low export prices of Ukrainian raspberries (lower compared to prices in other selected countries) are primarily the result of lower production costs and may not necessarily be an indicator of the quality of exported frozen raspberries.

Bosnia and Herzegovina generally has a higher unit price of exports than imports, which, together with the surplus obtained in the exchange of frozen raspberries, indicates that the country is competitive in terms of quality on the global market. It is similar with Bulgaria, which has the highest export prices for frozen raspberries and is competitive on the global market in terms of quality.

For further analysis, the RUV (Relative Unit Value) indicator was determined as the ratio between unit prices of export and import. The RUV indicate that there are significant differences between the selected countries in terms of the degree of specialization in the trade of frozen raspberries.

Horizontal IIT specialization occurs when export and import of frozen raspberries are of approximately the same quality. This was the case in Serbia in most years, as well as in Bosnia and Herzegovina and Bulgaria.

Table 8. RUV of frozen raspberry in Serbia and selected countries

	Serbia	Poland	Ukraine	B&H	Bulgaria
2010	0.93	0.63	1.27	0.94	0.83
2011	1.12	0.73	1.30	0.97	0.95
2012	1.06	0.66	1.19	0.93	0.95
2013	1.22	0.62	1.51	1.01	1.22
2014	1.10	0.81	1.76	1.28	1.22
2015	0.99	0.80	1.60	1.15	1.06
2016	1.08	0.98	1.73	1.27	1.13
2017	1.32	0.99	1.54	1.00	1.29
2018	1.32	1.02	1.26	0.88	0.97
2019	1.12	0.93	0.90	0.87	0.87
2020	1.05	0.91	1.25	1.02	0.97
2021	0.96	0.88	0.91	1.02	1.04

Source: Authors' calculation based on data extracted from ITC Database

If the RUV indicator is above 1.15, it is considered a high quality export. This was found in Ukraine, which means that frozen raspberries of higher quality are exported and those of lower quality are imported (Table 8). If the RUV is below 0.85, it is considered to be a low-quality export, meaning that a country exports products of lower quality (at lower prices) and imports products of higher quality (at higher prices). This was found in Poland in the first years of the analysis.

Conclusion

The Republic of Serbia and selected countries (Poland, Ukraine, Bosnia and Herzegovina, and Bulgaria) are major producers of raspberries and exporters of frozen raspberries. Serbia is the world's largest exporter of frozen raspberries, and its biggest competitors are Poland and Ukraine.

The values of RCA_1 and RCA_2 show that the selected countries are net exporters of frozen raspberries and achieve productivity in production higher than the international average, i.e. they have a revealed comparative advantage. It was confirmed that Serbia and Poland are leaders in the frozen raspberry market, but other countries also have a growing competitive position, especially Ukraine. This implies that all starting hypothesis in the paper are confirmed.

The higher unit price of export of Serbian frozen raspberries compared to the unit price of import indicates that Serbia is more competitive on the global market in terms of quality compared to the selected countries. Lower unit price of export compared to

import and positive foreign trade balance confirm that Polish frozen raspberries are price competitive on the global market, but also that this competitiveness is decreasing.

During the observed period, Ukraine had the lowest unit price of export for frozen raspberries. This means that Serbia and other countries need to improve the economic efficiency of raspberry production and processing, while improving quality, in order to successfully compete in the global market of frozen raspberries.

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Conflict of interests

The authors declare no conflict of interest.

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THE MARKETING MYOPIA OF SERBIAN RAKIJA DISTILLERS

Slobodan Adžić[1], Milan Bubulj[2], Aleksandar Jovičić[3]

**Corresponding author E-mail: s.adzic@famns.edu.rs*

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ABSTRACT

The aim of this explanatory research is to contribute to the knowledge of the marketing of spirits through research into Serbian rakija producers, with an emphasis on the marketing of their alcoholic beverages. In order to demonstrate that marketing results in higher product prices and revenues, three hypotheses related to the elements of the marketing mix will be investigated. In this quantitative survey, the questionnaire was distributed online to Serbian distillers (N = 104); hence, the sample was intentional and predetermined. The key finding is that only 4% of distillers have fully mastered marketing in the sense that they use all four elements of the marketing mix in their businesses; they also achieved significantly higher prices. It seems that it is not clear to Serbian rakija distillers exactly who they are targeting with their marketing and who will buy their products.

Introduction

The aim of this study is to contribute to the marketing knowledge of spirits through research into Serbian rakija producers, with an emphasis on the marketing of these beverages. Despite accounting for more than half of the world's alcohol use, spirits are much less studied than most other alcoholic beverages (Cockx et al., 2021). To the best of our knowledge, the marketing of Serbian rakija producers has not been investigated to date, and with this research the authors are willing to closing that gap. The findings of this research will contribute to scarce academic knowledge in the field of marketing of strong alcoholic beverages. The authors hope that this research will allow for a certain insight into how to improve the marketing position of Serbian rakija producers, which is of significant importance after Serbian plum brandy šljivovica was included on the UNESCO intangible heritage list (UNESCO, 2022).

1 Slobodan Adžić, Ph.D., Full Professor, Faculty of Management FAM, University Union – Nikola Tesla, Address: Njegoševa 1a, 21205 Sremski Karlovci, Serbia, Phone: 00381212155045, E-mail: s.adzic@famns.edu.rs, ORCID ID (https://orcid.org/0000-0002-8827-5492)

2 Milan Bubulj, MA, Assistant, Faculty of Management FAM, University Union – Nikola Tesla, Address: Njegoševa 1a, 21205 Sremski Karlovci, Serbia, Phone: 00381212155045, E-mail: bubulj@famns.edu.rs, ORCID ID (https://orcid.org/0009-0002-3184-3441)

3 Aleksandar Jovičić, Ph.D., Assistant Professor, Faculty of Business Studies, Megatrend University, Address: Bulevar oslobodjenja 215, 11000 Beograd, Serbia, Phone: +38163362824; E-mail: jovicicaleksandar@yahoo.com, ORCID ID (https://orcid.org/0000-0002-4059-8006)

Many cultures have an extensive history of producing and using alcoholic drinks (McGovern, 2009), and in this Serbia is no exception. The traditional national Serbian distilled spirit is rakija, especially šljivovica (a.k.a. slivovitz), a brandy-like alcoholic beverage (Nikićević, 2021). As a cultural icon, Serbian rakija is mentioned much more often in folk songs than in business plans. In one of a few academic papers that covers the areas of rakija business, Adžić (2023) notices an almost critical ignorance and misunderstanding of business processes among rakija producers that can make their business with spirits successful.

Marketing practices of the distilled spirits industry

The relevant Ministry (Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, 2020) estimates that 50 to 60 million liters of rakija are distilled in Serbia. 600 such distilleries are currently registered (Politika Online, 2019), yet is considered that as much as 80% of the market is actually illegal (Biznis & Finansije, 2021), meaning that manufacturers do not pay alcohol-related taxes and excise charges. Further, despite the hundreds of registered distilleries, only a small number of brands are available on the market. For a Serbian distiller, branding is just a legal issue and usually ends with the registration of the product name. Although a good name is an excellent way to successfully promote a product (Shaw, 2002), this is not the case in Serbia as the name usually contains only the manufacturer's last name. To be successful in the present era, marketers need to adopt the best marketing practices (Lewnes & Keller, 2019). However, investing in marketing to Serbian producers is either expensive or they believe that quality can sell the product, even if it is sold in used plastic mineral water bottles. Today's consumers rely on brand names to locate goods that satisfy their preferences (Buccafusco et al., 2021). Brands provide assurance of provenance and quality, as well as a guarantee of satisfaction (Gordon, 2003). Therefore, good branding is key to the long-term prosperity of any business.

The cause of poor-quality rakijas is the unwillingness of a large number of producers to apply modern production methods during the distillation process (Adžić, 2023). Rakija is not a profitable industry in Serbia, despite the presence of 600 recognized distilleries and tens of thousands of pot stills operated by small-scale producers. Historically, there has never been a "golden" era in the rakija industry (Vacić, 2016). Despite Serbia being third worldwide in terms of the area of harvested plums, Serbian exports of plums and plum products are not significant (Matković, 2015). Therefore, the areas under harvested plums are decreasing in Serbia (Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, 2019).

Marketing myopia is the inability to grasp the "big picture" of what customers truly want in favor of narrowly focusing on the sale of goods and services (Levitt, 2004). Levitt's core concept is that you are not selling products but buying customers. It is critical for all businesspeople to recognize that industry is a customer satisfying process, not a goods-producing process. There are different ways of producing rakija in Serbia, including those who state, "I will work the way my grandfather did". If the

"grandfather's way" produced a superior rakija, this could be considered a plus, if the focus is added value to the consumer experience. Unfortunately, in the "grandfather's way" the focus is a cheaper way of producing rakija with no consideration of the consumer experience, which perfectly fits into the Levitt's view of marketing myopia.

The most expensive bottles often contain rakija of the most dubious quality to taste (Adžić, 2021). In many cases, the packaging is more expensive than the basic product, but who buys drinks purely because of the bottle? Consumers are not attracted to either the contents or packing alone; rather, establishing the proper mix of both content and packaging is a key starting point to any meaningful attempt at marketing (Gordon, 2003). Remy Martin Louis XIII cognac is a perfect example of such a product - it is 40 to 100 years old, so its price can be over 2,000 euros for a standard bottle (Suresh, 2011; Pantić et al., 2022). Such drinks also require expensive packaging. Luxury drinks in the spirits industry are marketed by companies not only for profit, but also for prestige (Paschen et al., 2016). Earnings are made on the basic range, where the prices of the associated packaging and finished products are more moderate but the profit is much greater because the basic product is sold in much greater volumes than the exclusive lines.

According to Adžić (2021), the greatest tragedy that befell rakija and today's underdeveloped rakija market was the poor attitude on the part of the first serious private producers of rakija that emerged on the market with the collapse of the socialist system. Their attitude was that rakija is better than Scotch single malt whisky and French cognac. Because the correctness of that attitude was never considered, the associated thinking conditioned the high price of rakija, not only above the price of single malt, which is itself a premium product that can carry a premium price (Sjostrom et al., 2016), but at a price point that was clearly beyond the purchasing power of the vast majority of domestic consumers. Those who said that their product was superior were not too worried because they were convinced that their rakijas would conquer the world strong alcoholic beverage market. However, their businesses failed not only in terms of exports but also in the domestic market, with one of the lessons being that one should not attempt to conquer the world market until one has beaten the domestic ones. Unfortunately, most manufacturers who followed in the footsteps of their failing forefathers accepted the slogan of rakija's superiority and thus learnt nothing from previous failures. Even today, distilleries are closed en masse, and new ones fail regularly, supporting Pitt's (2017) assertion that the price-quality relationship in the alcoholic beverage business is nonlinear. With traditional slow double-distillation, it is indeed possible to obtain a complex drink of high quality; however, for the consumer, complexity did not correlate with a willingness to pay more for the product (Wang & Spence, 2019).

The best-selling brand of spirits in Serbia is not rakija, but a brand of domestic brandy similar to cognac called vinjak, as produced by the former state-owned company Rubin, which has survived the transition period. Rubin's brandy has annual sales of 3 million liters (Cafebarrestoran, 2021). When a Serb does not drink beer or wine, their options are rakija or vinjak. Even the cheapest whiskey on the market is more than twice as expensive as vinjak. Vinjak and rakija can be substituted for each other; if

you do not have one, you can easily replace it with the other. They are drunk from the same glass, both are used as an aperitif, before meals. Official statistics suggest that the average retail price of vinjak is 937.35 dinars, whilst the average price of rakija in Serbian retail stores is 667.57 dinars (Statistical Office of the Republic of Serbia, 2022). The store shelves are dominated by industrial rakija, which is made from ethanol with artificial flavors, not fruit. Quality fruit rakijas made according to strict oenological techniques must be cost-effective and of a similar pricing to vinjak to be sold in stores. The price should be approximately 1,000 dinars on average, which would represent an equilibrium price. This, according to Adžić (2021), is both the reference price and the psychological limit for Serbian customers (with an exchange rate of around 117 dinars per euro, that would be around 8.5 euros).

The two channels are commonly referred to as the on- and off-premises trades in the alcoholic beverages industry. The on-premises trade relates to consumption in pubs, hotels, and restaurants, whereas off-premises trade refers to retail shops such as supermarkets and other stores (Gordon, 2003). Small quantities of product are the biggest problem for rakija producers in terms of entering the market for retail stores and cafes. The biggest problem for small producers is if they perform alone. Distribution is a step that many cannot skip - it is impossible for small ones, and the processes of association due to joint appearance on the market does not take place (Adžić, 2021). The leveraging of individual, shared resources, and customer focus are the dimensions of a successful entrepreneurial distiller (Chaudhury et al., 2014). In a consolidated market for alcoholic beverages dominated by large players, with the development of a niche strategy (Barnes, 2002), Serbian spirits producers might be able to present a strong identity at both the wholesale and retail levels. Serbian rakija producers should focus their niche marketing efforts on young men aged 21-30, as this is the demographic that spends the most on alcoholic beverages (Andry, 2021), but they should also consider other market trends, such as rising middle-class alcohol consumption and increased purchasing by females (Esser & Jernigan, 2015; Pingali, 2011).

The market for alcoholic beverages is a mature (Wilcox et al., 2012) and consolidated market (Barnes, 2002) and in such markets advertising should be intensely competitive. Nevertheless, there are restrictions on the types of media that may be used to advertise alcoholic beverages and care must be taken to adhere to both the associated legal framework and any voluntary rules of behavior (Gordon, 2003). However, since 1971 in the United States, total expenditures on alcoholic beverage advertising have surged by over 400% (Wilcox et al., 2015). One study (Woodside, 1999) reveals that a 0.15% increase in absolute alcohol consumption was associated with a 1% share increase in hard liquor advertising, whilst a 0.25% decrease in absolute alcohol consumption was associated with a 1% share increase in beer advertising. Although ”surrogate advertising“ (advertising that intensively multiplies the image of one product to promote another product of the same brand) is possible in a market where alcohol advertising is prohibited (Sharma & Chander, 2007), it is possible to communicate with the market even without TV spots, newspaper ads, or billboards. The options are

various, with the internet, YouTube, and e-commerce, to name but a few (Thach, 2009). Social networks are the most commonly used communication channels in marketing nowadays (Atkinson et al., 2021; Ilić et al., 2022; Lockshin & Corsi, 2012; Nicholls, 2012). Finally, word-of-mouth (WOM), sponsorships, and events. WOM remains the most effective form of promotion, and the recommendation of an acquaintance or influencer is a top marketing weapon (Kaikati & Kaikati, 2004).

Materials and methods

This quantitative research aims to present the state and prospects of marketing in the Serbian spirit industry. The research was conducted during the period from October 18, 2021, to October 31, 2021, via Facebook, in two groups of 50,000 members that brought together hobbyists and professionals involved in the distillation of rakija in Serbia, as well as those who are interested in this matter. The sample was intentional and consisted exclusively of rakija distillers. Google Forms was used to create the questionnaire. To the best of the authors' knowledge, this is the first research conducted on the topic of distillery marketing in Serbia. The answers, which were analyzed using IBM's SPSS for Windows v. 25, provided 104 subjects (N = 104). Taking into account the sample size and population size, and according to the formulas to calculate sample size (Israel, 2013; Krejcie & Morgan, 1970), the level of precision or sampling error is 9.6% if a standard 95% confidence or risk level is chosen (within two standard deviations of the mean). The results obtained are considered reliable because the sample is representative at a 95% confidence level with a sampling error of less than 10%.

In the literature review, it was demonstrated that businesses in the alcoholic industry that use marketing have proved to be superior to those that do not in general. Therefore, we wanted to test this claim on the specific case of the rakija market in Serbia. We will test three hypotheses in the research section to demonstrate that marketing results in higher product pricing and better revenues, where these hypotheses address the elements of the marketing mix:

H1. The more science is applied in the production of rakija, the higher the prices will be.

H2. If promotional activities form part of the marketing mix for rakija, the prices will be higher.

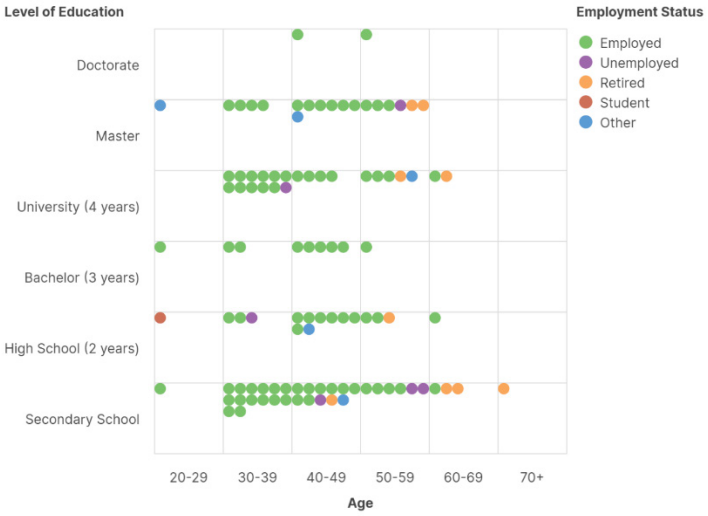
H3. If rakija were sold in shops and bars, it would have higher prices.

Results

The survey was completed by 104 distillers, of which as many as 103 were men. Rakija is made by individuals of diverse ages, levels of education, and occupation (Figure 1). Of all the respondents, only eight had registered a distillery and can be considered to professionally distill rakija. Respondents annually produce 106,940 liters of rakija and sell 43,450 liters. The average price of rakija is 950.78 dinars. The variables of rakija

production and rakija sales are continuous. The continuous variable average selling price of rakija is a dependent variable, and we will test the answers to multiple choice questions on the use of oenological agents, adding sugar to fruit distillate, diluting fruit distillate with water, and conducting anaerobic fermentation, as well as dichotomous questions about the implementation of promotional activities and distribution to on- and off- premises locations.

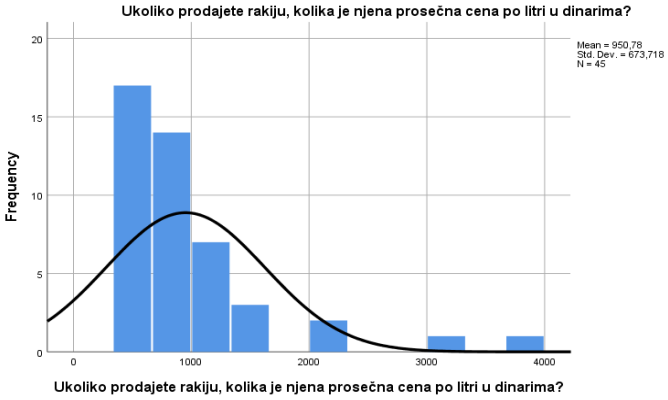
Figure 1. Descriptive Statistics



To determine which statistical techniques to use, the first step was to assess the normality of the dependent variable, the average selling price of rakija. We found a significant deviation in the distribution of the observed set from the normal curve (Figure 2). The result of the Kolmogorov-Smirnov normality, *Sig. = 0.0*. is also lower than the minimum required 0.05 to confirm the normal distribution. As the assumption of normality has not been confirmed, and due to our intention to use parametric tests, which are much more powerful than non-parametric ones, we attempted to intervene with the observed set (Pallant, 2016, p. 64). We first modified the variable by removing atypical points, four points in our case. The *Sig*. value was still 0. The next theoretical possibility is to transform variable with mathematical functions (Pallant, 2016, p. 92). Based on the appearance of the curve on the histogram (Figure 2), we conclude that it bears the most similarity to a quadratic function. After deriving the square root of all elements of the set of dependent variables and estimating the normality of the new curve, the *Sig.* value was found to have remained unchanged. The set of a dependent variable cannot be arranged to have a normal distribution. In most medium and large sample applications, parametric techniques give acceptable *p* values (Green & Salkind, 2013, p. 171). As the volume of our sample is far greater than 30, which is the size of the average sample, we decided to apply parametric techniques. However, in the

manner of any cautious analyst, we also opted for nonparametric analyses because they do not require a normal distribution in the dependent continuous variable.

Figure 2. Histogram and distribution curve of the variable „average selling price of rakija“



The influence of the method of preparation of the fruit distillate during rakija distillation on selling price was examined by one-factor analysis of variance. Methods of preparation can be grouped into four categories: (1) whether oenological agents are used (yes, some according to my choice, no), (2) whether sugar is added to the fruit ferment (yes, sometimes, no), (3) whether the fruit ferment is diluted with water (yes, sometimes, no) and (4) whether anaerobic fermentation is applied (yes, with occasional stirring, no). ANOVA tests with a significance level of 0.05 revealed no statistically significant differences for the oenological agents, $F(2, 42) = 2.368$, $p = 0.106$, for sugar use, $F(2, 42) = 0.847$, $p = 0.436$, for water addition, $F(2, 42) = 2.496$, $p = 0.095$, or for anaerobic fermentation, $F(2, 42) = 0.138$, $p = 0.871$.

The Kruskal-Wallis H test is a nonparametric alternative to one-factor analysis of variance. This test did not show a statistically significant difference in the level of sales prices for the sugar group, $H(2, n = 45) = 1.820$, $p = 0.403$, the water group, $H(2, n = 45) = 2.674$, $p = 0.263$, or for the fermentation group, $H(2, n = 45) = 1.191$, $p = 0.551$; however, with a significance level of 0.05, a statistically significant difference was found for the oenological group, $H(2, n = 45) = 7.563$, $p = 0.023$. The median price of those who use all oenological agents ($n = 12$) is 900 dinars, while the median of those who do not use them ($n = 11$) is 600 dinars. Those who use oenological agents by choice ($n = 22$) have a median of 712.50 dinars.

To increase the sensitivity of the tests, we narrowed these groups down to two factors. For oenological agents, we have divided distillers into those that do not use oenological agents at all (NO) and those that use some (YES); for sugar, those that do not use sugar at all (NO) and others (YES); as well as for water and for anaerobic fermentation, we have those who use these completely (YES) and others (NO). T-tests conducted with independent samples did not reveal statistically significant differences for sugar

(*t(43) = -1.317, p = 0.195*), for water (*t(43) = 0.376, p = 0.709*), and for fermentation (*t(43) = 0.113, p = 0.911*). However, oenology recorded a statistically significant result. With a significance level of *0.01*, *t(41,173) = 2.899*, *p = 0.006*, there is a significant difference between the group of those who use oenological agents (*M = 1048,68, SD = 745,430*) and the group of those who do not use them at all (*M = 648,18, SD = 173,598*). According to Cohen's guidelines, we estimate the magnitude of this difference to be large (*η2 = 0.16*). In this sample, advocates of oenology achieved an average selling price of over 1,049 dinars, while opponents of oenology achieved an average price of only 648 dinars.

The Mann-Whitney U test is a nonparametric alternative to the t-test of independent samples. Similar to the parametric t-test, no statistically significant differences were found in the three groups, i.e., sugar, *U = 191, Z = -1.295, p = 0.195*, water, *U = 250.5, Z = -0.034, p = 0.973,* and open fermentation, *U = 196.5, Z = -0.506, p = 0.613.* In the fourth group, the results of the nonparametric test of the group of those who use oenological agents (*Md = 800, n = 34)* and the group of those who do not use them (*Md = 600, n = 11)* correspond to the results of the parametric test. The statistical difference between these groups was confirmed, *U = 103, Z = -2.233, p = 0.026*. According to Cohen, the magnitude of the influence is in a zone of medium influence, *r = 0.33*.

According to the results obtained, the H1 hypothesis about the influence of the method of fruit ferment preparation on the realized selling price can be partially accepted. Both parametric and nonparametric techniques have positively tested the claim that the use of oenological agents, which are the most important part of the application of science in the production process, increases the selling price on the market.

We used the parametric t-test to evaluate the hypothesis that investing in promotion results in higher sales prices. This test found no statistically significant difference, *t(43) = 1.449, p = 0.141,* between those who promote rakija (*M = 1329.17, SD = 644.674*) and those who believe that promotion is unnecessary (*M = 892.56, SD=666.928*). However, the Mann-Whitney U test found a significant difference in the level of sales prices between those who promote their products (*Md = 1150, n = 6*) and those who do not (*Md = 700, n = 39*), *U = 52, z = -2.185, p = 0.029.* According to the Cohen criteria, the magnitude of the difference is *r = 0.32*, which is regarded the average difference. As the number of distillers that make promotional activities is very small and there are only six of them, such a small sample tolerates non-parametric techniques better. Based on this fact and the results obtained, the H2 hypothesis that higher sales prices can be achieved by conducting promotional activities can be accepted.

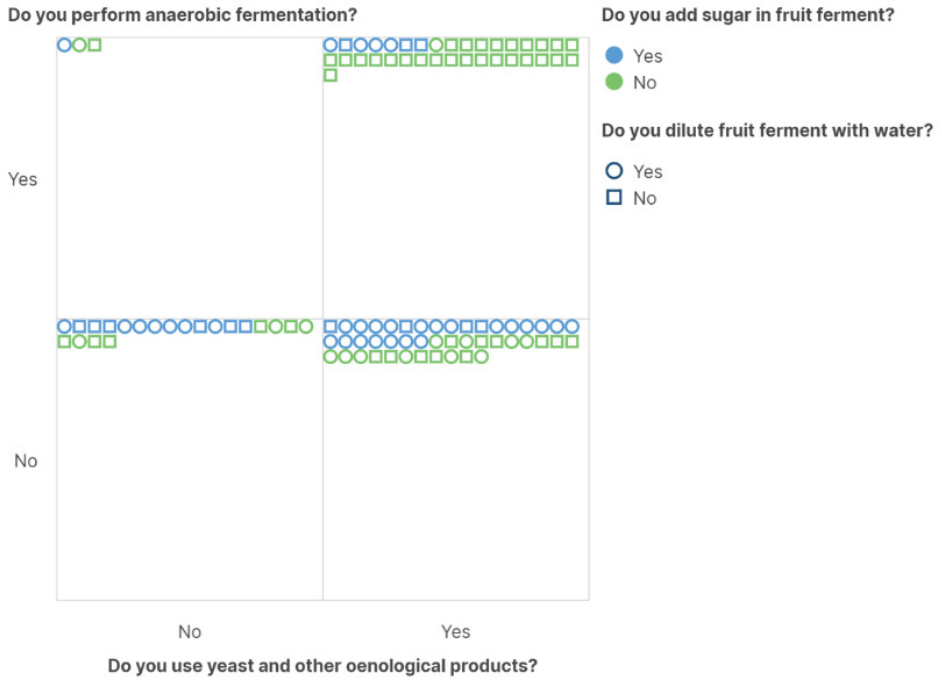
The H3 hypothesis was confirmed by both parametric and nonparametric techniques. Namely, the group of those who won shelves in stores (*n = 5*) and who achieve an average selling price of 1,575 dinars (*SD = 557.898*) differs significantly from the group of those who do not sell their products through retail (*n = 40*) and which have a significantly lower selling price of 872.75 dinars (*SD = 651.125*). This difference was also confirmed by parametric t-test, *t(43) = 2.302, p = 0.026* and nonparametric Mann-

Whitney U test, $U = 28, z = -2.618, p = 0.009$. The magnitude of the difference, $\eta 2 = 0.11$, is moderate according to Cohen's guidelines. Also, the same tests, parametric, $t(43) = 2.838, p = 0.007$ and nonparametric, $U = 92.5, z = -2.512, p = 0.012$, showed a significant statistical difference between those who placed their product in bars and restaurants ($n = 11$) and those who did not ($n = 34$). The first group achieved a significantly higher average price than the second group, i.e., 1,415 dinars ($SD = 991.229$) and 800.29 dinars ($SD = 460.444$), respectively. The impact of the difference so determined, according to Cohen's guidelines, is large, $\eta 2 = 0.16$. These results positively tested and allowed the acceptance of the hypothesis that rakija found in different places of distribution compared to non-found will have a higher price.

Discussions

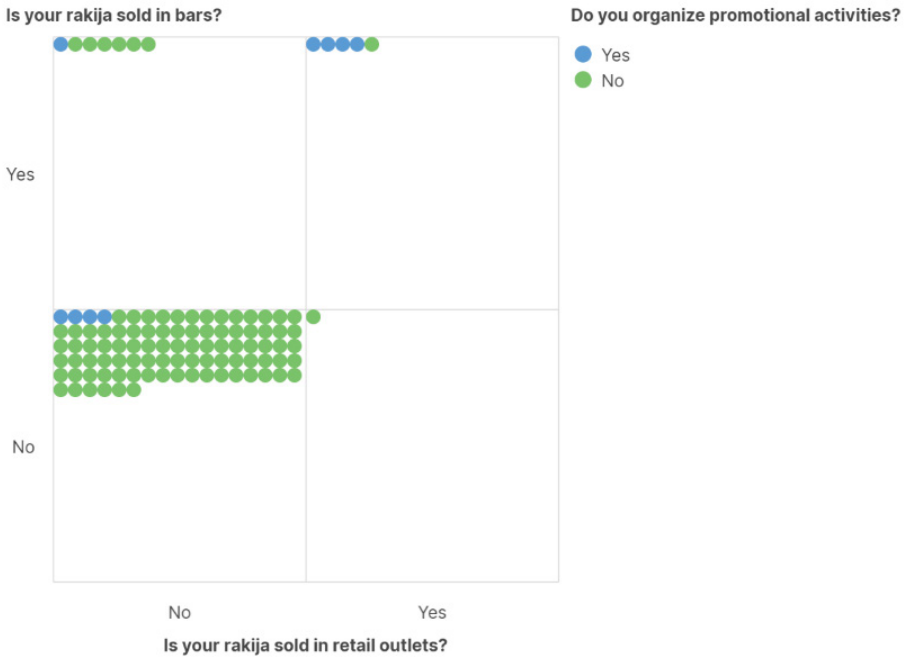
The most important results are those relating to the application of science in the production of rakija, which implies the use of oenological agents. The employment of yeast, enzymes, and other aids intended specifically for the ultimate distillation of alcoholic drinks results in a considerably higher-quality final product and aroma-rich rakija. Anaerobic fermentation means that the barrels are closed and not opened until the fermentation is complete in order to retain the aroma in the ferment. The addition of water increases the acidity of the ferment and lowers the quality of the rakija due to the fact that many distillers do not use – or do not know how to use – modern distillation pot stills. Adding sugar deceives consumers because one liter of rakija is produced from one kilo of sugar. Sugar is cheaper than fruit, but it has no aroma, so sugar can only be detected in the laboratory. The law on alcoholic drinks prohibits the addition of sugar. About 23% of distillers oppose the use of oenological agents, 64% do not perform any anaerobic fermentation of the ferment, 43% constantly or occasionally use sugar, and 45% constantly or sometimes put water in the ferment. Only 27 out of 104 distillers produce rakija according to modern and scientifically accepted processes (Figure 3). The group that uses oenological agents ($M = 1049, SD = 745$) and the group that does not ($M = 648, SD = 176$) differ significantly, with a reliability of greater than 99%. The magnitude of the impact is large. Rakijas produced by proponents of new trends and science in production will undoubtedly sell at a higher price than those produced by others. Oenologists achieved an average selling price of 1,000 dinars, while opponents of oenology with an attitude of "I will work the way my grandfather did" achieved an average price of only 600 dinars. Consumers are well aware of the difference in taste and prefer oenologically produced rakija, as evidenced by the fact that they are prepared to pay significantly more for it.

Figure 3. Rakija producers in relation to the application of modern processes in distillation



Promotion and place are the two indispensable elements of the marketing mix. Communication with the market has a favorable commercial impact because the price of rakija realized by distillers who communicate with the market is statistically significantly higher than that realized without promotion. Moreover, it is to be expected that the use of different distribution channels will increase product sales, as the product is better and more diversely exposed to the consumer. In this research, we confirmed the hypotheses that such a product, i.e., Serbian rakija that is properly distributed and promoted, will achieve a higher price. However, only rakija from 11 distillers are sold in bars, and from five distillers in stores. There is also only a small number of those who perform promotional activities, which is six. Figure 4 graphically indicates the importance of marketing in the rakija business. It can be seen that less than one in ten distillers carried out promotional activities; nonetheless, four out of five distillers who have successfully used distribution channels to win shelves in shops or bars are conducting promotions. This is also the same group of distillers that have the strongest position in the market. The only problem that remains is why the other 96% of distillers do not see the same thing, which is a clear example of their marketing myopia.

Figure 4. Organization of promotional and distribution activities by rakija producers in Serbia



In our sample, the average realized price of rakija on the market is 950.78 dinars. The average price in the sample is higher than the average price given in the official statistics because the so-called "domestic" rakijas, i.e., rakijas distilled by small distillers in the traditional way, carry the perception of being of higher quality. Unfortunately, these rakijas are often not characterized by high quality, which explains why the curve of the variable for the average price has shifted to the left, that is, where the selling prices are lower.

The market for the sale of rakija is quite limited. Rakija is used together with meze or as an aperitif. Meze, as concept of small dishes, is commonplace in the East but not in the West. Cognac, which is exported in a high percentage of 97% (Song et al., 2018), is a digestif. Single malt whisky and cognac are mostly consumed after meals, and thus rakija is not a competitor in terms of consumption in relation to usual consumer habits. Although all four elements of the marketing mix contribute to market competitiveness, small distillers in Serbia do not utilize them. It certainly does not result in quality products at the lowest possible prices that are favorable to the consumer. It seems that Serbian rakija distillers are unclear as to who they are targeting with their marketing, which target group the product is intended for, and who will buy it.

Conclusions

By verifying the hypotheses established in this research, we positively validated that businesses that use marketing are superior to those who do not, especially in terms of achieving greater levels of pricing for goods sold. With the marketing approach on the Serbian rakija market, potential distillers will enter the market with a quality brand that will attain higher pricing and reach customers through different distribution channels, successfully communicating through a promotional mix.

In the title, we raised the issue of Serbian rakija distillers' marketing myopia. Only four out of 104 respondents use all aspects of the marketing mix, and it is these respondents that are now achieving above-average pricing and likely business results. 100 distillers out of 104 appeared to have failed to understand marketing. We can certainly assume the connection between critical ignorance of marketing and almost the invisible business results of fruit products ideal for a higher degree of processing by distillation in a country that is at the top of the world in terms of the number of fruit plantations, such as plums.

The main shortcoming of this research is that it did not provide an answer to the question of *why* distilleries do not adopt marketing in business, namely whether it is ignorance, lack of money, or something else. We expect that future research will look in this direction. However, with this research, we have reached a certain level of representativeness and obtained results that have statistical significance, which is its main advantage. We hope that our conclusions will lead Serbian distilleries to understand that marketing can be of significant help to them in their efforts to succeed in the market. In addition, this study opens the door for further research in this area, of which examining the attitudes and opinions of rakija consumers is perhaps the most significant.

Conflict of interests

The authors declare no conflict of interest.

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THE FACTORS OF BUSINESS EFFICACY OF THE FOOD MARKET AND THEIR CORRELATION TO THE MARKETING IN FARMERS

Miroljub Ivanović[1], Milivoje Ćosić[2]

**Corresponding author E-mail: miroljub.ivanovic@gmail.com*

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ABSTRACT

The relevant research subjecs of this study are the contemporary models of economic studies, the factors of business efficacy of the food market, and the marketing of farmers. The aim of this transversal study was to define the latent structures of business efficacy and their linear correlation with the marketing of agricultural food farmers. The pertinent sample included (N =156) male farmers from Kolubara district, Serbia. The average age of participants was 44.26 ± =10.35). The questionnaire regarding farmer's entrepreneurial success in food production was used in this research. The values of the Cronbach's alpha (α) coefficient of internal consistency were higher than 0.70, which means that the variables used in this research possess satisfactory psychometric criteria. Four components were extracted by analyzing the exploratory factorial analysis, with Kaiser–Guttman criterion, and the oblimin rotation of the variables. The extracted four-factor groups of latent dimensions, on the level of statistical conclusion of 0,01, were interpreted as: quality – FI, economic privilege – FII, social privilege – FIII, and competition – FIV, which together account for 68.26% of the variance. The obtained findings on the coefficient of internal consistency (Cronbach's) confirmed the reliability and validity of the applied measuring instrument, and thus future longitudinal studies can use it for examining the farmer population in Serbia.

Introduction

The increased interest in food supply and consumption indicates that consumers require quality, which means that there is an ethical context in understanding food consumption as a segment of social, economic, and ecological sustainability. That is why the function of

1 Miroljub Ivanović, Academician, PhD, Serbian Academy of Innovation Sciences, Belgrade, Serbia , Beograd, Višnjicka 91a, Phone: +381 64 875 28 32, E-mail: miroljub.ivanovic@gmail.com, ORCID ID (https://orcid.org/0000-0002-6999-2963)

2 Milivoje Ćosić, research associate, Forestry Institute, Belgrade, Kneza Viseslava 3, Serbia, Phone: +381 69 8215204, E-mail: micko.cosic@gmail.com, ORCID ID (https://orcid.org/0000-0002-6999-2963)

food farmers is becoming more important, especially because consumers demand higher quality standards, such as nutritional value, healthy food, ecological methods of production (Shahnaj et al. 2023). That is the reflection on the current needs of consumers, and the increased conscientiousness of people who, even with limited finances, have a need to buy traditionally grown products from local farmers (Çakmakçı & Çakmakçı, 2023).

Incentive program for local food farmers gives farmers a chance to grow and develop economy, for example to create work positions, and create brands from local products. At the same time, this way of supporting local economies contributes to creating prerequisites for security during the times of crisis, as well as for positive demographic trends which are fundamental factors for healthy socioeconomic communities (Rossi et al., 2023). The aforementioned authors believe that qualitative and quantitative assessment of local food market improves economic, social, and ecological privileges, which leads to the increased possibility of employing locals. Transfer on knowledge and funding's is motivated, so is the intensified absorption of money at the local level. Additionally, social interactions which contribute to finding access to healthy food are also support and development of local markets, ecology and health (Vujić et al., 2019; Luković & Šilc, 2021; Đurović & Božić, 2022; Yang et al., 2023). Best ways to achieve this is to support farmers to use modern technologies to produce conventional foods.

The term local food marketplace implies narrow geographical region, distance 20 to 100km from the place where food is produced to the place food is delivered (Nosirov & Raximov, 2023). Relevant number of people uses local food marketplace (ecological, economic, and social) and that stems from the physically short distance between producer and consumer, which reduces the energy, time and transport spent, which leads to locally produced food keeping more of the organoleptic and nutritional properties. Additionally, increased awareness about the importance of local food generally increases public awareness about nutrition, its health and preventive characteristics, responsibility about managing and protecting the environment, and higher control of nutrition system (Umarjonovna, 2023). By decentralizing the production of traditional foods, food safety risks are being reduced, meaning that local production is regarded as the significant component of transition towards more sustainable method of food production. So, local food marketplaces imply other types of agri-food systems which include various forms which are characterized by the complete or partial elimination of the middleman between consumer and producer. Additionally, it primarily represents systems of small food producers. The main food producers in Serbia are family agricultural holdings (as the most efficient form of agricultural entrepreneurship), with quantitatively limited production and compliance to equal access to food market. Organizing local food market within the agri-food sector is an opportunity for small agricultural holdings. Chances given to agricultural producers are based on the stimulation of producers, by creating additional consumer values, which is a prerequisite for stable earnings. The possibility to stabilize production bases can be realized through local arrangements, by additional employment of local workforce and resources, which has an additional effect on the local community and employment rate (Lin et al., 2023).

Particularities of local food market are generated by excluding the middleman in the chain, so that producers become direct participants and have contact with consumers. That means that aside from production, the basic factor of efficacy is the skill of marketing decisions. Namely, before shopping, the consumer analyses the origin of a product, assesses the region of the product origin, specificities of the food quality, ingredients, organoleptic properties assessed by using sight, smell, taste, and touch, as well as the matter of tradition, seasonality, etc.

Food producers from Kolubara district organize food delivery in a conventional way, by using entrepreneurial tools which do not help them take full advantage of their real possibilities, so the strategic turn in marketing and operating activities is necessary. The causes for this are following: non-existence of one's own brand, unsuitable quality standards of visual communication, lack of direction and disjoint production (Hina et al., 2023). Additional problem is the lack of practical knowledge and skills in the marketing area. Aside from the lack of organization in marketing products, another problem may be the local network of producers necessary for creating joint centers for selling and distributing of goods. The products of local farmers can be bought from middlemen such as local grocers, or directly from farmers in their households. It should be said that consumers are willing to pay more for local food.

Keeping the findings of earlier research in mind, and the indisputable significance of the research matter, as well as the fact that identical studies have not been conducted in Serbia before, *the aim* of this cross-sectional study was to examine the latent structure of business efficacy of food farmers and its connection to the variables of marketing – product characteristics and brand. In accordance with the earlier empirical studies and the aim of the research, two *hypotheses* have been formulated: H_1 – it is expected that the application of the exploratory factor analysis – method of main components, will extract from the group of manifest morphological variables the most representative hierarchical latent structure of the factors of business efficacy of agricultural food farmers, and H2 – it is expected that there will be intercorrelations between the manifest variables of marketing (product characteristics and brand) and factors of business efficacy of food farmers.

Methods

Participants and procedure

The pertinent sample included (N =156) farmers from Kolubara district, Serbia. The average age of participants was 44.26 ±10.3, age range 17-73 years. The empirical quantitative research was conducted on participants from: Valjevo, Lajkovac, Osečina, Ub, and Ljig during the month of June, 2023.

Before filling in the questionnaires, the participants were give detailed instructions and the aim of the research was explained to them, without explaining the purpose each measuring instrument in detail (in order to prevent desirable responding). The

participants were asked not to overthink the answers and in case of doubt choose the answer they lean more to. They were also told that they could quit at any time without consequences, and that the results would be analyzed solely on a group level. All participants gave their written consent to take part in this anonymous research. The testing took approximately 30 minutes, and it was conducted by the authors of this research. The research was approved by the science council of the Serbian Academy of Innovation Sciences in Belgrade, and was conducted in accordance with the ethical principles based on the Declaration of Helsinki.

Measuring instruments

A highly structured questionnaire (Jerčinović, S. (2019)) was taken for the purpose of this research, and it measures business efficacy of farmers – food producers. The measuring instrument included 34 items. The participant's task was to circle a number on a five-point Likert-type scale (1 = *I fully disagree*, 2 = *I mostly disagree*, 3 = *I neither agree nor disagree*, 4 = *I mostly agree*, and 5 = *I fully agree*). This questionnaire allows for measuring of intensity, not just the direction of participant's attitude towards the matter measured. Total score is presented as the arithmetic mean of the answers to all the claims presented in the questionnaire, where higher score means higher level of participant's business efficacy. The internal reliability of the measuring instrument was measured using the *Cronbach's alpha* coefficient of internal consistency, which for all items was $\alpha = 0.81$, which for the questionnaire of this size suggests high level of consistency (Kline, 2011).

Statistical methods of data processing

The analysis of the reliability of the questionnaire regarding farmer's entrepreneurial success in food production in this cross-sectional study was conducted using the Cronbach's alpha, while the Pearson correlation coefficient and explorative factorial analysis with oblimin rotation and Kaiser–Guttman criterion were used to assess the structure of the factor of business efficacy of the food market and its linear correlation to marketing. Using the SPSS version 17.0 for Windows, metric characteristics and factorial structure of the questionnaire were determined. Statistical conclusions were conducted on the significance level of ($p \leq 0.05$).

Results and discussion

Thorough marketing construct is based on four main instruments of management (product, price, presentation, and distribution), and it is a prerequisite for achieving competition, for example, determining criteria for product marking and quality, origin, methods of production and branding. This allows producers to become the most significant food suppliers in the local market (Dilip et al., 2021; Graciola et al., 2021).

The descriptive parameters of the examined variables of marketing are shown in Table 1. Analyzing the descriptive scores has confirmed that the participants consider variables

product characteristics and product brand relevant determinants in determining partial strategy of managing product marketing.

Table 1. Basic descriptive parameters of the marketing variable

Variables	M	SD	Sk	Ku
Product characteristics	3.96	0.87	0. 17	0.32
Brand characteristics	2.98	1.14	0.36	0.56

Legend. M = arithmetic mean; SD = standard deviation; Sk = standardized skewness; Ku = standardized kurtosis. Standard error value *(SE)* of Sk is 0.07, and of Ku is 0.22.

Testing the scores of the normality distribution, it has been determined that the values of the standardized asymmetry coefficients – skewness and kurtosis, are acceptable because they range within the standard values, between +-1 (Tabachnick & Fidell, 2012), which indicates that there are no statistically significant variations of the scores from the Gaussian bell curve which is a prerequisite for conducting further parametric analyses.

With the aim of reducing 18 items, as a starting group of manifest variables, in the questionnaire regarding farmer's entrepreneurial success in food production and the extraction of its latent dimensions, exploratory factor analysis (EFA), method of main components, is shown in Table 2 (Bro & Smilde, 2014). Before applying this multivariate statistical method, the *Kaiser-Meyer-Olkin coefficients* (KMO = 0.79) were calculated in order to discard all the variables that have insufficient amount of information, and the Bartlett's test of Sphericity $\chi^2(55)=483,17$ ($p \leq 0.01$) was conducted in order to test the null hypothesis of the non-existence of the significant correlation between the manifest variables, which all indicates that the prerequisites for conducting the factorization are met.

Table 2. Characteristic roots and the percentage of the explained variance

Main components	Lambda (λ)	% of total variance	cumul. % of variance
1	14.05	31.24	31.24
2	4.55	9.98	41.33
3	3.50	7.82	50.09
4	2.69	5.99	55.16

Legend. Lambda (λ) = maximum value of the characteristic root-like value; % of total variance – percentage of the proportion of the explained variance (sum of the square of standard deviation); cumul. % – percentage of the proportion of the explained variance

Using the *Promax* rotation, with *Guttman-Kaiser* criterion, and with the assumption of the minimum variance of the error in measuring, four characteristic roots were extracted which account for 68.26% of the mutual variability of the group of manifest variables, where first characteristic value accounts for 31.24% of the total variability of all 10 original variables, second accounts for 9.98%, third 7.82%, and fourth 5.99%. That meets the criteria for reproducing the valid information contained in the all analyzed variables. So, the multivariate contribution in explaining the total square standard deviation of the applied system of the variables belongs maximally to the first reduced characteristic

root, because it is condensed using the projections, which have maximum variability, meaning the biggest linear correlations with the manifest variables. It is clear that four isolated characteristic roots contain significant proportion of the all variations projected in the factorial space, so they realistically transmit relevant data and represent basic latent dimensions in this population of participants. Adding up the partial values of the isolated characteristic roots from the condensed matrix, one can see that together they take up more than ½ of the examined space, which points to the relatively valid informativeness of the isolated latent dimensions which are applicable to the variance of the applied sample of variables and the objectivity in measuring which varies within acceptable limitation.

Table 3 shows the factorial saturations of the manifest variables.

Table 3. Matrix of the group of factorial saturations of the used questionnaire

Items	F_1	F_2	F_3	F_4
1. We always invest in improving the quality of our products	0.79			
2. We are ecologically responsible	0.74			
3. We try to apply ecological standards in the production process	0.77			
4. We continually work of securing the quality of our products	0.69			
5. We are directly involved in preserving biodiversity	0.67			
6. Our selling/production methods allow for some other/different ways of financing		0.79		
7. We sell our products at a higher price		0.75		
8. By cooperating with other producers it is possible to balance current business expenses		0.73		
9. We regularly talk with consumers about the importance of producing and buying local food		0.70		
10. When offering our products we also try to have a creative influence	0.52		0.76	
11. We always talk about and emphasize origin of our products	0.68		0.62	
12. Business efficacy is based on continuous development and learning	0.57		0.75	
13. We always work on creating same products	0.55		0.60	
14. We are directly involved in creating jobs	0.49		0.53	
15. Cooperation with other producers enables us to have current market				0.76

Items	F_1	F_2	F_3	F_4
16. Cooperation with other producers intensifies or position on the market				0.65
17. We are always working on improving our products				0.53
18. Local producers are not our rivals but an opportunity for cooperation				0.71

The first main component, the linear combinations of the observed variables, has five items: We always invest in improving the quality of our products, We are ecologically responsible, We try to apply ecological standards in the production process, We continually work of securing the quality of our products , and We are directly involved in preserving biodiversity. Analyzing the first main components, where we have shown only correlations above 0.30, we can see the first isolated factor, which is highly saturated, and can be called F_I – *Quality*. The second main component included four items: Our selling/production methods allow for some other/different ways of financing, We sell our products at a higher price, By cooperating with other producers it is possible to balance current business expenses, and We regularly talk with consumers about the importance of producing and buying local food. That component can theoretically be identified as F_{II} – *Economic privilege*. The third main component included five items: When offering our products we also try to have an educational influence, We always talk about and emphasize origin of our products, Business efficacy is based on continuous development and learning, We always work on creating same products, and We are directly involved in creating jobs. Based on the saturations of the items grouped within this main component, this factor F_{III} can hypothetically be interpreted as *Social privilege*. The fourth main component has four items: Cooperation with other producers enables us to have current market, Cooperation with other producers intensifies or position on the market, We are always working on improving our products, and Local producers are not our rivals but an opportunity for cooperation. Based on the saturation of the items within this main component, F_{IV} can be defined as *Competition*.

By comparing the obtained findings from this research, one can see that they are in accordance with the existing results of the earlier empirical studies (Hackl et al., 2023; Hussain et al., 2023; Jerčinović, 2019; Niloy et al., 2023; Sandberg et al., Sandberg et al., 2023; Vrabcová & Urbancová, 2023; Wati, et a., 2023). So, upon conducting the exploratory factor analysis, and reducing 18 manifest variables, four factor model was condensed to following latent dimensions: *Quality* (F_I), *Economic privilege* (F_{II}), *Social privilege* (F_{III}), and *Competition* (F_{IV}), which means that the hypothesis H_1 is confirmed, or that it is expected that the application of the exploratory factor analysis will extract the hierarchical latent structure – the factors of business efficacy of agricultural food farmers.

The correlational analysis has been conducted with the aim of examining the statistically significant linear correlations between certain variables of the marketing and business efficacy of food farmers (Table 4).

Table 4. Intercorrelations (*r*) between the scores on the variables marketing and business efficacy of food farmers

Variables	Product characteristics	Product brand	Quality	Economic privilege	Social privilege	Competition
1. Product characteristics	–					
2. Product brand	0.18*	–				
3. Quality	0.51**	0.50**	–			
4. Economic privilege	0.19**	0.60**	0.53**	–		
5. Social privilege	0.16*	0.31**	0.42**	0.61**	–	
6. Competition	0.53**	0.42**	0.37**	0.57**	0.59**	–

Annotation. Level of statistical significance * $p \leq 0.01$; **$p \leq 0.01$.

The calculated *Pearson correlation* coefficients have positive indicators and point to statistically significat and moderate correlation between the variables product characteristics and quality ($r = 0.51$, $p \leq 0.01$), relatively low correlation between that variables and the variable economic privilege ($r = 0.19$, $p \leq 0.01$), and the variables product characteristics and social privilege ($r = 0.16$, $p \leq 0.01$). Additionally, statistically significant correlation has been found between product characteristics and competition, with positive direction and moderate intensity ($r = 0.53$), with the probability of 99%. The aforementioned data shows that participants with the higher level of product characteristics are more likely to experience economic and social privilege, and vice versa. Also (on the level of 0,01), participants with better product characteristics perceive higher level of competition.

Based on the defined statistically significant parameters in the correlation matrix, one can see that the agricultural products of farmers dominantly correlate to the latent variable quality which they deliver, which represents the possibility for more efficient planning in all stages of marketing. Even though the economic privileges are a direct consequence of planning and conducting marketing activities, one can see that investing in product development is a chance to increase profit, an option for various alternative types of financing, as well as a chance to create more jobs and thus improve general economic climate and competition among the examined sample of farmers. Despite the fact that the scores of Pearson product-moment correlation have shown that product development and its general market characteristics are in intense correlation with achieving social influence on the market, it should be pointed out that the local farmers' agricultural products offer contributes to the factor quality of life of local population, as well as the social emphasis of the economic privileges. So, when explaining the construct marketing food, developing product brand has plays an important role, which confirms how important it is to develop and create one's own brand of food producer. Therefore, on the level of statistical conclusion of 0,01, the significance of the product brad is in direct intercorrelation with the factor product quality, and with

the factor economic privilege which food producers can take into account along with the development of personal brand. Also, the identical correlational role is given to the factor competition. Finally, it is significant to point out the slightly lower statistical significance between the latent variables of product brand and social privilege. So, the calculated Pearson product-moment correlation with the significance level ($p \leq 0.01$, $p \leq 0.01$) indicate that the tested hypothesis on the linear correlation between the manifest variables of marketing (product characteristics and product brand) and factors of business efficacy in agricultural food farmers has been confirmed.

With the insight into the obtained results of this research, it can be seen that they are in accordance with the findings of previous empirical studies (Ansarii et al., 2021; Fernando et al., 2019; Hameed et al., 2020; Islam et al., 2022; Mazwi et al., 2019; Ntshangase et al., 2018; Rambe & Khaola, 2021; Rashid, et al., 2023).

Conclusion

The aim of this cross-sectional study was to examine the latent structure of the business efficacy of agricultural food farmers and their interaction with the variables of marketing – product characteristics and product brand, using the sample of farmer population. The pertinent sample consisted of 156 Serbian agricultural food producers from western Serbia, age 17-73. The average age of participants was 44.26 ±10.3.

The Croatian questionnaire for assessing the variables of marketing and business efficacy of agricultural food farmers offers very useful and reliable information, and can be used in future empirical studies on Serbian population.

The research findings of the exploratory factor analysis, on statistical level of conclusion of 0,01, show that there is a four-factor model of latent dimensions which is defined as: quality (F_I), economic privilege (F_{II}), social privilege (F_{III}), and competition (F_{IV}). The results of the Pearson product-moment correlation coefficient ($p \leq 0.01$, $p \leq 0.01$) indicate that there is statistically significant and moderate linear correlation (of positive direction) between the variables of marketing – product characteristics and product brand, and the factors of business efficacy – quality, economic privilege, social privilege, and competition among agricultural food farmers, which means that the increase in the value of manifest marketing variable follows the increase of the value of the variable business efficacy on food market. Therefore, the obtained factorial and correlational results can serve as basis for reaching conclusions about the structure of the factor of business efficacy of the food market and correlation of marketing among agricultural food producers.

Conflict of interests

The authors declare no conflict of interest.

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THE PERCEPTIONS OF WINE CONSUMERS REGARDING THE USE OF DIGITAL WINE LISTS IN DIGITALLY ORIENTED RESTAURANTS

Pero Labus[1], Jelena Lukić Nikolić[2]

**Corresponding author E-mail: jelena.lukic@mbs.edu.rs*

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ABSTRACT

The aim of this paper is to examine and analyze the perceptions of wine consumers regarding the use of digital wine lists in restaurants. The empirical research was conducted using a specially designed questionnaire, which was completed by 406 respondents from 2020 to 2021. The data analysis applied descriptive statistics, Kolmogorov-Smirnov test, Levene's test, and the Kruskal-Wallis H test. The results showed that restaurants with digital wine lists are preferred by consumers who are at the young age group (between the ages of 18 and 35), have no prior knowledge about wine, and visit restaurants frequently (a few times per month). These respondents are willing to recommend digitally oriented restaurants and their services to others. The results and conclusions presented in this research could serve as a foundation for decision-makers and managers in restaurants to consider the introduction of digital wine lists and to improve their restaurant's attractiveness.

Introduction

The use of digital technologies provides several benefits to restaurants, including faster service, higher quality of service, lower operational costs, increased productivity, heightened guest satisfaction, improved guest experience, the ability to personalize services, and increased market attractiveness of the restaurant (Buhalis & O'Connor, 2005; Melian-Alzola et al., 2020). The restaurant business is evolving due to globalization and the rapid development of technological solutions. In the digital age, modern technology-driven concepts play a significant role in the operation and function of restaurants. According to Grewal et al. (2022), numerous opportunities exist for the hospitality industry to thrive by utilizing digital technologies and tools for online

1 Pero Labus, PhD, Director of Food and Beverage/Consultant full time, hotel Ambasador; Retoi d.o.o., Split, Croatia, Phone: +385916255002, E-mail: peterlabus@hotmail.com, ORCID ID (https://orcid.org/0000-0001-8098-7711)

2 Jelena Lukić Nikolić, PhD, Associate Professor, Modern Business School, Terazije 27, Belgrade, Serbia, Phone: +381628506256, E-mail: jelena.lukic@mbs.edu.rs, ORCID ID (https://orcid.org/0000-0003-0632-8974)

ordering, online payment, social media presence, and providing various self-service tools for customers. Restaurant owners are transforming their previous business models and embracing modern technological solutions. That expands their business scope and enables them to stay ahead of the competition (Yim & Yoo, 2020). They are making substantial efforts to adopt new digital technologies that will increase their efficiency and enhance customer service (Martin-Martin et al., 2022).

Digital menus and wine lists have become integral components of the restaurant digitalization process. Digital menus provide more information, greater flexibility in product presentation, more current information, automatic translations into other languages, and various nutritional details (calorie count, salt, fat, saturated fat, sugar, and allergy information) (Labus & Jelovac, 2022). Because a digital interface can more easily incorporate a greater amount of information than a traditional paper format, digital menus can increase customer satisfaction and reduce customer uncertainty during the decision-making process (Beldona et al., 2014). Due to space constraints in traditional paper menus, restaurants have heavily relied on their personnel to provide all important information and detailed explanations of menu items to guests (Zulkifly et al., 2016). With the advancement and widespread use of modern digital technologies and tools, many restaurants are now focusing on digital menus and wine lists.

The aim of this paper is to examine and analyze the perceptions of wine consumers regarding the use of digital wine lists in restaurants. The paper is structured as follows: the first part focuses on the literature review and theoretical background, referring to the role and importance of digital wine lists in digitally oriented restaurants. The second part is dedicated to research methodology, hypotheses, research results, and discussion of research findings. The conclusion presents the key implications of the research, as well as the limitations of the conducted research, and proposes areas for future research on this topic.

The role and importance of wine and digital wine lists

Wine is an essential product for both the hotel and tourism industries (Chen et al., 2016). Furthermore, wine has long been one of the most popular alcoholic beverages at restaurants, pubs, and clubs (Hall et al., 2004; Kelley, 2022). The earliest evidence of grape wine has been found in China (around 7000 BC), Georgia (around 6000 BC), Iran (around 5000 BC), Greece (around 4500 BC), and Sicily (around 4000 BC) (McIntyre & Gremov, 2018). Today, it is almost unthinkable to organize any event, be it festivities, entertainment, various life events, culinary concepts, or touristic trips without wine (Anđelić et al., 2019). Wine has begun to take up a more substantial role in many countries' tourism offerings, creating a distinct tourism product (Razović, 2015). It is crucial to note that the definition and concept of the *wine tourism* are not unified, with most definitions including the experiences and motivations of travelers or tourists. Johnson (1997) describes wine tourism as visits to vineyards, wine cellars, wine festivals, and showings organized for recreational purposes, while Hall et al. (2000) emphasize the appeal of a wine region's natural charms as the primary reason

for a visit. Visitors to wine regions constitute distinct types of specialized tourist, and according to some authors, these visitors differ from other tourists based on the type of wine and the winery they choose to visit (Charters & Ali-Knight, 2000).

There are many different types of wine, commonly classified by color (white, pink, and red wine), residual sugar content (still wine-dry, semi-dry wine, sweet wine, semi-sweet wine), and quality (table wines, premium wines, quality wines with a protected designation of origin, archival wines, sparkling wines, carbonated wines, pearl wines) (Ružić, 2011). Wine quality can be assessed from various perspectives, including the technical aspects of production, wine characteristics, consumer preferences, and purpose of consumption (Ilak Peršurić et al., 2023). The complexity of wine description is analyzed and presented by Croijmans et al. (2020) in their *Text-Based Wine Wheel*. These authors identified many unique terms used for wine description and classified them into three broad categories and twelve subcategories, as shown in *Table 1*.

Table 1. Categories and subcategories in Text-Based Wine Wheel

Categories	**Subcategories**
aromas	fruit; spices; food; non-food
taste/texture	technical tasting; taste proper; texture
technical vocabulary	grape varieties; modifiers; occasion; vinification; other

Source: adapted from Croijmans et al., 2020

Guests typically inform themselves about wines at restaurants through the wine list, an informational document that the buyer or guest uses to gain information about the wine offerings. It is essential for the wine list to include as many different types of wine as possible to help the end-consumers make the best decision (Labus, 2023). The wine list should include information such as the wine's name, type, quantity, price, vineyard, year of production, producer's name, alcohol content, acidity, tannin quantity, and taste (Barth, 2011). The wine label offers essential information that might assist consumers in making wine purchasing decisions, helping them assess information and make well-informed purchasing or consumption choices (Bernabeu et al., 2012).

The restaurant industry has recognized the role and significance of digital menus and their various interactive options. Studies suggest that since the advent of digitalization, most customers have placed their orders online via restaurant websites, while purchases have been made using mobile phone applications (Brewer & Sebby, 2021). The primary benefits of digital menus stem from the use of digital screens, such as computer screens or various touchscreens. Guests can use these screens to browse and select food products by using visuals and detailed descriptions. Furthermore, digital menus provide a wealth of information that can be frequently and inexpensively updated in real time. They provide vibrant photographs of food and meals, extensive explanations, an interactive customer experience, greater consumer involvement in the food decision-making process, more enjoyment, and improved sales (Yim & Yoo, 2020). Customers can readily access information about the products on the menu and select products that meet their interests and health needs (for example, allergies and

intolerances) (Şahin, 2020). They can view images of the available products and select their preferred language, which simplifies menu usage by eliminating any potential language barrier issues.

Research methodology, materials, and methods

The aim of this paper is to examine and analyze the perceptions of wine consumers on the usage of digital wine lists in restaurants. In the conducted research, three hypotheses were examined:

Hypothesis 1: Younger consumers prefer restaurants with a digital wine list.

Hypothesis 2: Consumers who frequently visit restaurants prefer those with a digital wine list.

Hypothesis 3: Consumers with no knowledge about wine prefer restaurants with a digital wine list.

The empirical research was conducted using a specially designed questionnaire. The first part of the questionnaire included questions about respondents' gender, age, education, marital status, employment status, frequency of restaurant visits, and level of wine knowledge. After these profile questions, respondents were asked to answer statements regarding their perceptions about digital wine lists in restaurants. Eight statements were grouped into a Likert scale named "Consumer preferences towards a digital wine list in restaurants" and were measured on a five-point Likert scale, from 1 - strongly disagree, to 5 - strongly agree. The statements were based on the understanding that restaurant customers are becoming more engaged in the digital environment, which is changing the patterns of interaction between customers and restaurants (Kim et al., 2020). Additionally, restaurant operations are characterized by a highly competitive market and increasingly diverse offerings (Martin-Martin et al., 2022). These factors significantly impact a restaurant's strategy and its market attractiveness.

During the period 2020-2021, the questionnaire was distributed in hotel restaurants in two locations: Split-Dalmatia Country (Croatia), and Belgrade (Serbia). During that period, 406 respondents who used digital wine lists in restaurants completed the questionnaire. All responses were analyzed using the Statistical Software for Social Sciences, SPSS, version 21.0.

Cronbach's Alpha coefficient for the measurement scale "Consumer preferences towards a digital wine list in restaurants" was 0.823, indicating high reliability for the scale (DeVellis, 2003). The normality of the data distribution was examined using the Kolmogorov-Smirnov test, as well as histograms, skewness, kurtosis, the normal probability curve, and the boxplot. The results for the scale "Consumer preferences towards a digital wine list in restaurants", Sig. = 0.000, indicated that the assumption of normal data distribution was not met. As a result, non-parametric statistical techniques were used for statistical analysis within the measurement scales. The Kruskal-Wallis H test was used to compare differences between three or more groups

with a 95% confidence interval. Levene's test for equality of variances was used in all tests comparing differences between groups, meeting the assumption of variance homogeneity in all cases ($p > 0.05$).

Research results

Table 2 presents the respondents' answers to the profile questions. The research included 224 (55.2%) males and 182 (44.8%) females. The majority of respondents, 177 (43.6%), were between the ages of 18 and 35, while 161 (39.7%) were between the ages of 36 and 55. Only 68 (16.7%) of those surveyed were aged 56 or older. Out of the total number of respondents, 336 (82.8%) were employed, while 210 (51.7%) were married. In terms of education, the majority of respondents, 312 (76.8%) had completed university, bachelor's or master's studies. There were 70 (17.2%) respondents who had completed high school, and a smaller group, 24 (5.9%), who had finished doctoral studies.

In terms of frequency of restaurant visits, most respondents (65.8%) could be classified as frequent visitors. 135 (33.3%) respondents visited restaurants several times a month (no more than three times), while 132 (32.5%) respondents visited restaurants once a week. Respondents also rated their level of wine knowledge. Most respondents, 144 (35.5%) reported having solid knowledge about wine, followed by those with only basic knowledge about wine, 139 (34.2%). It is worth noting that there were 48 (11.8%) respondents who considered themselves wine experts, but also 75 (18.5%) respondents who reported having no knowledge about wine at all.

Table 2. Basic information about respondents

Category	N	%
Gender		
Male	224	55.2
Female	182	44.8
Age		
18-35	177	43.6
36-55	161	39.7
Over 55	68	16.7
Education		
High school	70	17.2
Bachelor's and master's degree	312	76.8
Doctoral degree	24	5.9
Marital status		
Married	210	51.7
Single (unmarried, divorced/widowed)	196	48.3
Employment status		
Employed	336	82.8
Unemployed (student, retired)	70	17.2
The frequency of restaurants visits		
Almost every week in a month	132	32.5
Few times a month, but not more than three times	135	33.3

Category	N	%
Once or twice a month	68	16.7
Once in three months	41	10.1
I rarely visit restaurants	30	7.4
Wine knowledge		
None	75	18.5
Basic	139	34.2
Solid	144	35.5
Expert	48	11.8

Source: Authors' calculations

The mean and standard deviation for answers on the scale "Consumer preferences towards a digital wine list in restaurants" are presented in *Table 3*, while the frequencies and percentages are presented in *Table 4*.

Table 3. Mean (M) and standard deviation (SD) for answers on the scale "Consumer preferences towards a digital wine list in restaurants."

Statements	M	SD
I prefer restaurants that offer a digital wine list.	3.90	1.311
I had a very positive feeling after using the digital wine list.	3.21	1.241
I'm glad that I had the chance to learn more about the restaurant's digital wine list.	3.23	1.314
All my expectations were met when I used the digital wine list.	3.63	1.250
If someone asks me for a recommendation, I will mention this restaurant, particularly because of the digital service.	3.82	1.196
I will enthusiastically recommend this restaurant's digital service to others.	3.52	1.262
For hygiene reasons, I prefer the digital wine list.	3.40	1.411
Because of the digital wine list, I will visit this restaurant again.	2.10	1.311

Source: Authors' calculations

The statement that respondents prefer restaurants offering a digital wine list had the highest mean value (M=3.90). This was followed by the statement that respondents would recommend restaurants with digital services (M=3.82). The third highest mean value (M=3.63) was associated with the statement that respondents were satisfied with the digital wine list they used and that their expectations were met.

Table 4. Frequency (N) and percentage (%) of answers for the statements on the scale "Consumer preferences towards a digital wine list in restaurants"

Statements	Answers	N	%
I prefer restaurants that offer a digital wine list.	Agree	280	68.96
	Neutral	58	14.29
	Disagree	68	16.75
I had a very positive feeling after using the digital wine list.	Agree	188	46.30
	Neutral	130	32.02
	Disagree	88	21.68
I'm glad that I had the chance to learn more about the restaurant's digital wine list	Agree	184	45.32
	Neutral	112	27.59
	Disagree	110	27.09
All my expectations were met when I used the digital wine list.	Agree	260	64.04
	Neutral	60	14.78
	Disagree	86	21.18
If someone asks me for a recommendation, I will mention this restaurant, particularly because of the digital service.	Agree	272	67.00
	Neutral	74	18.23
	Disagree	60	14.78
I will enthusiastically recommend this restaurant's digital service to others.	Agree	252	62.07
	Neutral	64	15.76
	Disagree	90	22.17
For hygiene reasons, I prefer the digital wine list.	Agree	218	53.69
	Neutral	92	22.66
	Disagree	96	23.65
Because of the digital wine list, I will visit this restaurant again.	Agree	68	16.75
	Neutral	58	14.29
	Disagree	280	68.96

Source: Authors' calculations

The results presented in *Table 4* show that the majority of respondents prefer and recommend restaurants with a digital wine list due to their preferences towards digital service (68.96%), positive impressions about this kind of service (67%), fulfilled expectations (64.04%), and hygienic reasons (53.69%). However, it is important to note that the digital wine list does not influence respondents' decision to revisit a restaurant. Almost 70% of respondents disagreed with the statement that they would revisit a restaurant because of the digital wine list. If respondents are dissatisfied with the overall service at the restaurant, the digital wine list will not be a compelling reason for them to return. Moreover, nearly a third of respondents (32.02%) held a neutral stance on the statement that, after using the digital wine list, they had a very positive feeling. While more than half of respondents agreed with this statement, 21.68% disagreed. This implies that the digital wine list should be reorganized and improved to foster better customer feelings and easier navigation.

To examine the proposed hypotheses, the Kruskal-Wallis H-test was conducted. The results obtained are presented in *Table 5.*

Table 5. The results of Kruskal-Wallis H-test

	Answers	N	Mean	Md	χ2	df	p
Age	18-35	177	225.53	3.75	18.851	2	0.000*
	36-55	161	200.47	3.63			
	Over 55	68	153.32	3.38			
Frequency of visits	Almost every week	132	197.01	3.63	51.880	4	0.000*
	Few times a month	135	248.79	3.88			
	Once or twice a month	68	187.07	3.50			
	Once in three months	41	186.99	3.38			
	I rarely visit restaurants	30	88.07	2.06			
Wine knowledge	None	75	248.49	3.88	14.549	3	0.002*
	Basic	139	186.17	3.38			
	Solid	144	199.92	3.50			
	Expert	48	194.13	3.56			

Source: Authors' calculations

The Kruskal-Wallis H test results showed that there are statistically significant differences in respondents' answers based on age structure. $\chi2(df=2, n=406) =18.851$, $p=0.000$. When compared to the other two age groups, respondents aged 18 to 35 had the greatest median of results (Md=3.75). These results confirm *hypothesis 1*, which states that younger consumers prefer restaurants with a digital wine list.

Further, the Kruskal-Wallis H test results revealed statistically significant differences in responses based on the frequency of restaurant visits. The data, $\chi2(df=4, n=406) =51.880$, $p=0.000$, indicated that respondents who visit restaurants a few times per month had the highest median of results (Md=3.88) compared to others. Those who visit restaurants on a weekly basis had the next highest median (Md=3.63). These results confirm *hypothesis 2*, which states that frequent restaurant visitors prefer establishments with a digital wine list.

Finally, the Kruskal-Wallis H test results revealed statistically significant differences in responses based on respondents' knowledge of wine, $\chi2(df=3, n=406) =14.549$, $p=0.002$. Respondents with no knowledge of wine had the highest median of results (Md=3.88), thereby confirming *hypothesis 3*, which states that consumers with no knowledge of wine prefer restaurants with a digital wine list.

Discussion of research findings

According to the findings of this study, restaurants with digital wine list are preferred by consumers who belong to a younger age group (between the ages of 18 and 35), have no prior knowledge about wine, and visit restaurants frequently (a few times per month). These results are consistent with many other studies showing that individual attributes such as age, gender, financial resources, and habits often influence the type of wine ordered in a restaurant (Brata et al., 2022).

Digital technologies are becoming increasingly prevalent in our lives, altering the way guests and consumers interact with restaurant offerings (Spence & Piqueras-Fiszman, 2013). In practice, there has been a rising interest in the use of digital technologies with the aim of improving the consumer's experience of food and drink (Spence, 2023). Younger generations show a particular interest in digital technology, not only in business but also in everyday life (Lukić & Lazarević, 2022). Members of Generation Z, who have had access to the internet and digital devices since birth, are often referred to as the digital generation (Sidorcuka & Chesnovicka, 2017). Their innate familiarity with digital services leads them to expect such amenities in diverse settings, including restaurants. Many respondents in this research fall into this digital-native category.

Respondents who stated that they had no prior knowledge of wine preferred restaurants with a digital wine list. In traditional paper-based menus, restaurants have limited space for descriptions of menu items, and they rely on personnel to provide information and explanations to guests (Zulkifly et al., 2016). One of the factors that contribute to guest enjoyment and experience is the menu description. Marketers believe that "content is king" which can be applied to menu design and content (IP & Chark, 2023). According to Ellies and Thompson (2018), wine is a complex and information-intensive product, making it critical to accurately describe it on the wine list. What consumers know or can learn about a product influences their decision-making process and final decision (Ellis & Caruana, 2018). Because more informational content can be provided more easily in a digital menu interface than in a traditional paper format, digital menus can increase customer satisfaction and reduce customer uncertainty throughout the decision-making process (Beldona et al., 2014). Furthermore, image rotations, enlargements, 3D views, and virtual reality are examples of modern technical advances that enable a high level of customer engagement and influence their overall satisfaction with their choices (Yim & Yoo, 2020). This is why respondents with no prior knowledge about wine prefer digital wine lists.

A digital wine list is a unique communication method and tool with the ability to influence guests' choices of wine. The results showed that those respondents who frequently visit restaurants and drink wine prefer digital wine lists. One explanation for this could be that respondents prefer quick service and do not want to wait for the waiter to bring them a paper menu and wine list. Instead, they can effortlessly explore and navigate a digital list to make their selections. Another explanation is that these customers occasionally want to try something new and different. The digital wine list allows them to make informed decisions.

Conclusion

The aim of this paper was to examine and analyze wine consumers' perceptions of the use of digital wine lists in restaurants. Research results in which 406 respondents from Serbia and Croatia participated confirmed all hypotheses. According to the results, young consumers (hypothesis 1), those who frequently visit restaurants (hypothesis 2), and those without prior knowledge of wine (hypothesis 3), prefer restaurants with

a digital wine list. Furthermore, the majority of respondents were satisfied with the digital wine list they used and felt that their expectations were met.

The results presented in this paper constitute a significant contribution to the existing literature by presenting important findings that address the consumer preferences for digital wine list. The practical implications of conducted research are also evident for restaurants that do not yet offer a digital wine list. The results and conclusions presented in this research could be used as the basis for decision-makers and managers in restaurants to consider introducing digital wine lists and improving restaurant attractiveness in the market. This is especially important in the digital age, as customers are more oriented toward current digital solutions and want to take advantage of all their benefits.

While this research provides significant insights, it does have certain limitations. With 406 respondents from two countries, Croatia and Serbia, the extent of the participant pool was limited. As a result, the findings may not be applicable to all countries or demographics. Furthermore, the questionnaire used as a research technique in this study included a limited number of closed-ended questions, which prevented respondents from expressing their unique feelings and experiences regarding digital wine lists. Furthermore, the study relied on self-reported data from a questionnaire, which could bring subjectivity of respondents into the results.

These limitations provide useful recommendations for future research on this topic. By including more participants from a wider range of countries, researchers can gather more comprehensive and diverse data. Using other research methodologies, such as open-ended questions or interviews, could provide a broader understanding of consumer experiences and perspectives regarding digital wine lists. Addressing these limitations in future studies would contribute to a better understanding of customer attitudes about digital wine lists and their use in restaurants.

Conflict of interests

The authors declare no conflict of interest.

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MANAGING THE PRODUCTIVITY PROCESS IN AGRICULTURE, A FRAMEWORK FOR IMPROVING THE MARKET POSITION OF AGRICULTURE OF THE REPUBLIC OF SRPSKA

Saša Čekrlija[1], Zoran Đuričić[2], Radomir Jovanović [3], Slobodan Pešević [4]

**Corresponding author E-mail: gong.sasa@gmail.com*

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ABSTRACT

Agriculture in Republika Srpska is the second largest sector with products of low added value. The biggest challenge is strengthening resilience and increasing competitiveness in the market. This paper analyzes the possibilities for improving the position of small farms and establishing a framework for more efficient development of entrepreneurship in the agricultural sector of the Republic of Srpska. The methods used in agro-economic research are used in the work, namely description, induction, deduction, synthesis, compilation, and data comparison and analysis. The increase in productivity is directly dependent on the diversification of production, the application of positive practices and increased resistance to climate change. Improved safety standards of agricultural products and food quality directly affect increased competitiveness and the potential for access to higher value markets. The application of climate-smart irrigation technologies and the improvement of water management in agriculture represents a revolutionary turning point in agriculture.

Introduction

Managing the productivity process in agricultural holdings is essential for achieving successful and sustainable agricultural activities. This paper analyzes the key elements that are important for the efficient management of the productivity process and establishing the framework of a strong market position in the field of agricultural of Republic of

1 Saša Čekrlija, associate professor, Nezavisni univerzitet Banja Luka, Veljka Mlađenovića 12E, Phone: +38766687759, E-mail gong.sasa@gmail.com, ORCID ID (https://orcid.org/0009-0005-9810-2420)

2 Zoran Đuričić, assistant professor, Phone: +38765924852, E-mail: zoran.djuricic@nubl.org, ORCID ID (https://orcid.org/0009-0008-2257-9355)

3 Radomir Jovanović, Associate Professor,University of Pristina, Faculty of Agriculture, Kopaonička Street nn, 38219 Lesak, Serbia,Phone +381 65 5613940, E-mail: radomir.jovanovic@pr.ac.rs, ORCID ID (https://orcid.org/0000--0001-7966-2768)

4 Slobodan Pešević, associate professor, Nezavisni univerzitet Banja Luka, Veljka Mlađenovića 12E, Phone: +38766164970, E-mail pesevics@yahoo.com, ORCID ID (https://orcid.org/0009-0008-1092-4836)

Srpska (RS). A technologically efficient and sustainable process of managing the overall activities of agricultural farming provides long-term benefits and helps in building a stable agribusiness. It is important that production takes place in a sustainable manner, protecting the environment and resources for future generations. Sustainable agriculture has long-term benefits and helps build stable farming operations. Understanding the market, demand and opportunities for product placement is key to efficient production management. It is very important to successfully find new customers, to achieve better prices that are the result of increasing the safety of food produced on the farm. Stable and sustainable production requires the acquisition of new knowledge and the application of positive practices. The legislative and legal framework is the basis for everything that follows on the way to the successful operation of agribusiness as an entrepreneurial activity. Laws and rules that stimulate development are a sound basis for improving production with the help of financial incentives from the budget money. Public resources also play an important role in the development of the market position and their use is a strong catalyst for the development of this segment of the economy. Climate change significantly affects the fulfillment of the plans of agricultural farms and small entrepreneurs, so it is realistic that the entire concept will change in the future in relation to climate change. Together, these elements form the basis for successful management of the productivity process in agricultural holdings and enable the achievement of greater efficiency, profitability and sustainability of agricultural operations.

Materials and methods

The biggest challenge for quality analysis of this problem is the abundance of available data concerning agribusiness in Republic of Srpska. These data vary significantly depending on which source is used. At the same time, important data are not publicly available, so the analysis cannot be serious and comprehensive. When the resources available to the agricultural sector today are analyzed, a good starting point for further analysis can be obtained. Correlation of available resources, volume of production, financial assistance of the state, quality of produced food and level of selling price give the final conclusion that my measures must be taken in order to improve the market position.

The first step is a deep analysis of resources, product spectrum and basic elements of the market in order to identify potential opportunities and define the framework for competition of own products. This analysis indicates trends in domestic agriculture and the food industry, which is important in drawing conclusions as to whether the production of individual products is profitable and in what percentage.

The identification of competitive advantages is the next step and it is based on the potential for increasing the volume of production, better irrigation, increasing the degree of product safety, ecological cultivation of some agricultural crops, as well as the possibility of participation in complementary economic activities. Production diversification can significantly reduce the risk of market fluctuations and enable new market niches. Finally, product quality plays a key role in gaining a stronger market

position. Finnish and legislative support of the state is a key measure in improving the quality and safety of agricultural products. The analysis of state aid measures and the process of monitoring the implementation of state aid are essentially important for the success of achieving the set goals.

Results

The natural features of Republic of Srpska are very complex, which is a consequence of its belonging to different natural-geographic entities. The differentiation of territorial regions and climatic conditions (ranging from plain to hilly-mountainous regions and from continental to Mediterranean climate) which is characteristic of the Republic of Srpska, corresponds to the development of the agricultural sector. Out of a total of slightly less than 980,000 hectares of agricultural land, of which 815,000 hectares are arable land, according to data for the year 2022, slightly less than 400,000 hectares are cultivated in the Republic of Srpska (*Table 1.*). Of the total area of arable land, 50.39% are arable land and gardens, 6.83% are orchards, 0.16% are vineyards, 25.76% are meadows and 16.86% are pastures. Compared to 2010, when the share of arable land and gardens was 48.47%, orchards 7.64%, vineyards 0.12%, meadows 31.75% and pastures 12.02%, we can conclude that in the previous period, there was no significant change in the structure of used agricultural land.

Table 1, Area of used agricultural land 2010-2022

Area of used agricultural land / year.		**2010**	**2015**	**2020**	**2021**	**2022**
Total (P)	ha	361,649	354,987	372,352	377,819	398,991
Area of arable garden	ha	175,293	176,308	204,301	201,428	201,057
Orchard area	ha	27,633	28,817	33,221	30,776	27,264
Vineyard area	ha	426	513	673	604	625
The surface of the meadow	ha	114,819	108,329	93,216	94,338	102,787
Area of pasture	ha	43,478	41,020	40,941	50,673	67,258

Source: Institute of statistics of Republic of Srpska

Table 2: Value of import and export of agricultural products

Export and import / year	**2010**	**2015**	**2020**	**2021**
Export value (1.000 BAM)	91,724	122,036	121,364	137,326
Import value (1.000 BAM)	200,325	236,729	194,939	218,248
Balance (export/import/1.000 BAM)	108,601	114,693	73,575	80,922

Source: http://www3.rzs.rs.ba:8080/rzs/faces/indicators.xhtml

In the economic structure of the Republic of Srpska, agriculture had a share of 7.56% in the domestic gross product during 2021, which makes it a very significant economic branch. In the period from 2012, the participation of agriculture in the total domestic product is continuously decreasing (*Table 3.*).

Table 3: Gross domestic product and gross value added, current prices 2012-2021

Year	2012	2015	2020	2021
The GDP of the Republic of Srpska (1.000 BAM)	8,638,111	9,224,129	11,131,849	12,501,722
Sector of agriculture, forestry and fishing (1.000 BAM)	841,558	862,895	997,631	945,094
Participation of the agriculture and forestry sectors. and fishing in the total GDP	9.74%	9.35%	8.96%	7.56%

Source: Statistical yearbook of the Republic of Srpska, 2022. p. 150-152.

The reasons for the decrease in the share of agriculture in the total GDP can be found in the intensive growth of the processing industry. The agricultural sector, with its participation in the total GDP of Republika Srpska of 9.74% in 2012, was just behind wholesale and retail trade. The share of wholesale and retail trade in 2012 was 12.06%. In 2021, the largest share in the total GDP of the Republic of Srpska, in addition to wholesale and retail trade, with a share of 11.67%, is the processing industry, whose share in the total GDP is 7.86% from 2012 increased to 12.34% in 20121. It is precisely in the growth of the processing industry that opportunities are opening up to export agricultural products to foreign markets in a higher form of processing.

Although there are 8,704 people formally employed in the agriculture, forestry and fishing sector in 2021 (*Table 4.*), real employment is much higher and is estimated to be around 30%. The reason for this is in the so-called informal (occasional) employment, which includes family members who primarily live in rural parts of the Republic of Srpska.

Table 4. The number of employees in the Republic of Srpska

Agriculture, forestry and fishing / year	2010	2015	2020	2021
Total employees	244,453	245,975	274,227	279,030
Employees in the agriculture, forestry and fishing sector	8,176	8,345	8,473	8,704
Employees in the agriculture, forestry and fishing sector (%)	3.34%	3.39%	3.09%	3.12%

Source: Statistical Yearbook of the Republic of Srpska, 2022, p. 122

When we analyze gross salaries in the agriculture, forestry and fishing sectors, we can conclude that they are lower than the national average. Despite the fact that their nominal growth in the previous period, their participation in the total paid gross wages continuously at the level of around 80% (*Table 5.*).

Table5. Average paid gross salaries 2012-2021

Average paid gross salaries / year	2012	2015	2020	2021
Republic of Srpska (BAM)	1,349	1,340	1,485	1,546
Agriculture, forestry and fishing sector (BAM)	1,074	1,105	1,201	1,239
Agriculture, forestry and fishing sector (%)	79.61%	82.46%	80.88%	80.14%

Source: Statistical Yearbook of the Republic of Srpska, 2022, p. 138

When we talk about livestock production, it represents an important indicator of the development of the agricultural sector of the Republic of Srpska. The reason for this lies in the fact that by increasing the livestock stock, the meadows and pastures of which there are 170,000 hectares in the Republic of Srpska are used and which are not used enough. At the same time, livestock production has a great impact on agricultural production.

Table 6. Number of animals at the beginning of the year

Number of animals / year	**2010**	**2015**	**2020**	**2021**
Number of cattle	210,067	204,890	189,350	186,112
Number of goats	25,241	33,369	39,018	29,488
Number of sheep	649,317	615,028	656,311	591,076
Number of pigs	435,485	457,033	515,020	619,415

Source: http://www3.rzs.rs.ba:8080/rzs/faces/indicators.xhtml

In the Republika Srpska, there is a noticeable trend of decreasing the fattening of cattle, goats and sheep, while the breeding of pigs is increasing. One of the problems faced by livestock production is the relatively small number of animals per farm and the fragmentation of the farm.At the time of submission of this work, swine fever was raging in Republika Srpska and the number of euthanized units exceeded 15,000 pigs. This will certainly have a significant impact on the problems in livestock production and at the same time will not emphasize the problem of low level of veterinary protection and the absence of procedures and protocols in emergency situations in order to minimize the harmful consequences. the analysis of harmful consequences will always be the topic of one of the author's next works.

Table 7. Production of selected agricultural products

Product /year	**unit**	**2010**	**2015**	**2020**	**2021**	**2022**
Wheat, mercantile	tons	21,523	24,311	46,975	41,427	45,619
Rye, mercantile	tons	62	695	318	172	152
Barley, mercantile	tons	657	1,170	2,170	2,165	1,235
Oats, mercantile	tons	288	354	247	648	162
Corn, mercantile	tons	14,074	24,387	42,491	54,039	60,054
Triticale	tons	461	396	512	404	231
Buckwheat	tons	-	24	24	2	2
Sunflower	tons	410	385	1,582	856	747
Canola oil	tons	496	1,487	4,190	3,225	2,413
Soy	tons	2,652	2,816	16,746	8,462	13,991
Vegetable, total	kg	10,006,599	11,675,116	16,722,908	16,225,320	14,552,884
Fruit, total	kg	19,455,826	29,272,124	25,533,094	24,682,271	23,105,902
Fish, total	kg	3,527,445	2,982,543	1,857,456	1,906,324	1,948,613

Source: Institute of statistics of Republic of Srpska, 2023

And finally, important input parameters for serious analysis are the average prices of agricultural products (*Table 8.*).

Table 8. Average price of selected agricultural products

Product name/year	unit	2010	2015	2020	2021	2022
Wheat, mercantile	BAM/ton	311	349	315	390	633
Rye, mercantile	BAM/ton	426	336	305	327	594
Barley, mercantile	BAM/ton	276	326	287	393	587
Oats, mercantile	BAM/ton	380	375	318	346	483
Corn, mercantile	BAM/ton	297	318	296	427	618
Triticale	BAM/ton	368	422	300	393	597
Buckwheat	BAM/ton	-	1,899	867	1,234	2,650
Sunflower	BAM/ton	573	678	652	1,033	1,198
Canola oil	BAM/ton	633	728	671	1,008	1,288
Soy	BAM/ton	592	669	661	1,013	1,092
Trout	BAM/kg	5	6	6	7	8
Carp	BAM/kg	4	5	6	6	8

Source: Institute of statistics of Republic of Srpska, 2023

Natural limitations and climate change

Soil degradation processes by definition result in a loss in soil productivity, although the ways in which this happens differ greatly with the various soil degradation processes. The degree to which the soil is presently degraded is related in a qualitative marmer to the agricultural suitability of the soil, to its declined productivity, to its possibilities for restoration to full productivity and in relation to its original biotic

Functions (Lal, Stewart: 1992; Ilić et al., 2022). Among the main factors of land reduction, both in terms of surface and quality, is the process of land erosion, which threatens about 84% of the world's arable land fund, namely: 56% water erosion and 28% aeolian erosion (Oldeman: 1992). In Europe, about 157 million hectares are threatened by water erosion with a tendency to further progress, especially in the area of agricultural lands that occupy 50.5% of the total surface of Europe (Oldeman: 1992). Today, the problem of soil erosion as a permanent loss of agricultural land is viewed from both the water management and ecological aspects. The water management aspect of soil erosion is much better known. It is related to the transport of sediment in river flows, that is, to the problem of accumulation of material because the erosion process exceeds the transport power of the watercourse, resulting in water management facilities, of which accumulations are the most threatened. However, the ecological aspect of the problem of soil erosion and the removal of erosion work products is less well known. Soil erosion has a new "dimension" because the erosive material of land used for agricultural production usually contains certain amounts of substances (nitrates, phosphates, pesticides) which, when moved to another area, represent dangerous and harmful substances. In times of serious climate change, agriculture must be diversified and adapt to the climate calendar. It is of particular importance that the volume of production is insured by insurance agencies, and it is also important to invest in quality certification. Certifications and standards are not an activity that

is primary in RS agriculture. It is important to consider obtaining certifications for organic production, food safety or other relevant standards. Certifications can improve consumer perception of your product and give you access to better markets.

Discussions

The Ministry of Agriculture, Forestry and Water of the RS annually awards financial incentives for the development of agriculture and villages. The Ministry adopts the Rulebook on the conditions and methods of obtaining monetary incentives for the development of agriculture and villages.

The Government of the RS and the relevant ministries are continuously working to improve the agricultural sector in the direction of increasing the income and quality of life of the agricultural and rural population, adapting to the rules and standards of the EU and the World Trade Organization, and increasing the competitiveness of this sector.

The provision of incentive funds for the development of agriculture and rural areas is regulated by law and by-laws and plans that are in accordance with the Strategy for the Development of Agriculture of the RS until 2015 and the Strategy for Rural Development until 2015, and the funds for incentives are allocated to basic groups of measures , such as: support for production and income, support for rural development, intervention measures and emergency needs, measures related to the protection of animal health, remediation of the consequences of natural disasters, primarily floods, and intervention measures on the market - purchase of market surpluses. The goal of these activities is to increase the physical volume of production, increase the quality and efficiency of production, and reduce costs and risks in agricultural production.

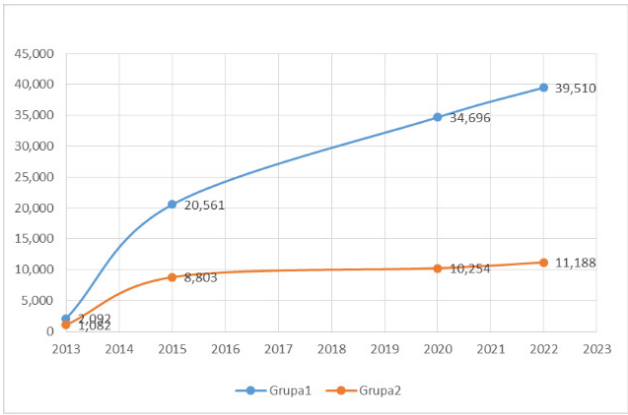
When we analyze the number of registered farms and the number of employees on farms who are beneficiaries of incentives in the Republic of Srpska, we see an exponential growth in the number of farms in the period 2013-2022 (*Table 9.*). However, the average area under cultivation (per farm) was reduced in the same period from 10.3 hectares to 5.2 hectares, which indicates that the beneficiaries of the analysis are encouraged for means and all masses.

Table 9. Number of registered agricultural holdings, number of employees on agricultural holdings and the total area of holdings receiving incentive funds (RS)

Year	**2013**	**2015**	**2020**	**2022**
Total number of farms	2,092	20,561	34,696	39,510
Number of employees	1,082	8,803	10,254	11,188
Total area of farms	21,594	144,125	190,142	206,776

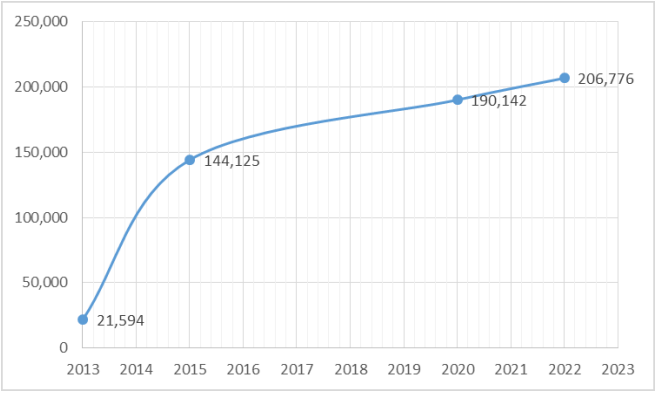
Source: Internial data from the register of the Ministry of Agriculture

Figure 1. The number of registered farms and the number of employees on farms



Source: Table. 9

Figure 2. The total area of farms of beneficiaries of incentive funds in the Republic of Srpska



Source: Table. 9

During the writing of this paper, these data were not publicly available and the transparency of the data really represents a problem in the preparation of a serious analysis that aims to improve the state of agriculture in the Republic of Srpska. In the mentioned period, there was an increase in the total area of used agricultural land from 361,649 to 398,991 hectares, which is an increase of 10.33% compared to 2010. It is precisely in this segment that we find one of the reasons for the growth in the production of agricultural products and, therefore, the increase in exports, which is shown in table 2. The conversion of part of the areas that are currently meadows, the area of which, according to the data for 2022, is 102,787 hectares, into other types of agricultural of land, as well as the further increase of the total used arable land are a prerequisite for further growth of agricultural production and export of agricultural products. At the same time, the analyzes showed that there are geothermal sources on almost 50% of agricultural land, which is one of the prerequisites for investing in the production of agricultural products in greenhouses, which would enable uninterrupted production throughout the year.

Deficit in the exchange of agricultural products with foreign countries, after a downward trend in the period 2010-2020. year, in 2021 it increased by as much as 10% compared to 2020, which leads us to the conclusion that it is necessary to approach an additional set of measures to improve domestic production. Due to geostrategic events, primarily the conflict in Ukraine, which additionally affected the disruption in the price market of both agricultural products and mineral fertilizers, we can expect that the data for 2022 and 2023 will be less favorable for the domestic economy in terms of the foreign trade deficit of the Republic of Srpska . The reason for this lies in the fact that due to the general increase in the prices of agricultural products, there will be an additional increase in the deficit for the simple reason that we still import more agricultural products than we export.

In the analyzed period, there was a partial change in the structure of produced agricultural products (*Table 7.*). The biggest changes occurred in the segment of grain production (wheat, corn, barley...). The reason for the above can be found in the fact that they are less labor-intensive, while at the same time a simpler method of storage and sale. Subsidizing wheat production on two basis (ha and kg) was one of the reasons for increased wheat production.

In the analysis of the average prices of agricultural products (*Table 8.*), a serious increase in prices is visible in 2022 compared to previous years in which prices were relatively stable. In any case, this trend will lead to an increase in the production of agricultural products in the coming period.

Incentives approved on the basis of the rulebook on the conditions and methods of obtaining monetary incentives for the development of agriculture and villages, the rulebook on the conditions and method of obtaining monetary incentives for capital investments in agricultural production and the rulebook on the conditions and method of obtaining support for agricultural producers in the conditions caused by the corona virus pandemic in in 2022. The total amount of incentives for 2022 was KM 106,414,270 BAM (Goverment od RS data: 2022). Total budget of the RS for 2022 approx. 4,024 billion BAM. In 2021, incentive funds were approved on the basis of the rulebook on the conditions and methods of obtaining financial incentives for the development of agriculture and villages, the rulebook on the conditions and methods of obtaining financial incentives for capital investments, the rules for the operation of the agricultural economy and the rules for the operation of the economy and economic producers in conditions caused by the virus pandemic corona. The agrarian budget amounted to 74,995,206 BAM, the funds of the Compensation Fund amounted to 13,199,790 BAM, which in total amounted to 88,194,996 BAM (Goverment od RS data: 2021). In 2023, the number of beneficiaries approved for the use of regressed diesel fuel is 42.478 (Goverment of RS:2023). Considering the costs of agricultural production viewed through the marginal cost, it can be concluded that the number of beneficiaries of this subsidy is equal to the number of producers who will do business more seriously in 2023 in the RS.

Resource analysis is a basic step in order to identify potential potentials as well as competition. Current trends in agriculture and the food industry show the cultivation of traditional varieties and species in the RS. RS agriculture can think about the unique advantages of agricultural products and services such as organic production, traditional cultivation methods, product quality or anything else that seriously sets it apart from the competition. Diversification of production seriously reduces the risk of market fluctuations and makes it possible to find a new market niche. Product quality plays a key role in gaining consumer trust and building a good reputation. It is mandatory to invest in modern equipment and technology in order to improve the quality of production.

Conclusions

The agriculture of Republic of Srpska is not technologically ready for the challenges of climate change. And yes, the traditional way of production and production preparation is primary. New technologies are partially applied on a certain number of farms, while a large part of farmers depends on climatic conditions from year to year. this is an area that must be significantly improved as soon as possible. Irrigation of arable land and provision of sufficient quantities of water for livestock is a condition without which no yield can be expected. The question is rightly raised, whether investments in incentives have resulted in an increase in the degree of dependence on climate change and whether the volume of production has increased. A special question is how to improve the level of safety of produced food. Funds are allocated from the ministries and there is a noticeable trend of growth in the allocation of incentives. However, achieving a competitive price on the market has not yet been defined as the final outcome. A free market economy is an economy of scale based on quality and planned quantities. The growth in the number of agricultural farms is to a significant extent a consequence of the division of larger farms into smaller ones in order to pay a larger amount of incentives. This can be clearly concluded when the growth in the number of farms and the number of employees in farms are correlated. The government must have quality monitoring for this kind of practice, which is not illegal but does not bring the desired results. More funds and education must be provided in the field of product quality improvement. Product quality and price are eliminatory indicators for market participation. It is important to ensure access to education and counseling for farmers in order to improve their skills and knowledge of modern agricultural practices and the market. The availability of laboratories must be better, quality control and risk monitoring must become an integral part of agricultural activity.

Conflict of interests

The authors declare no conflict of interest.

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THE CONCENTRATION OF THE AGRICULTURE AND LIVESTOCK SECTOR IN THE VISEGRAD GROUP AFTER MEMBERSHIP TO THE EUROPEAN UNION

Elif Tuğçe Bozduman[1]

**Corresponding author E-mail: tugce.bozduman@cbu.edu.tr*

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ABSTRACT

In the study, after the European Union (EU) membership of the Visegrad group (since 2004), both export and import levels were analyzed in products representing the agriculture and livestock sector. The results of the analysis show us that. The fact that the Visegrad group has EU membership has reduced the level of concentration over time. CR and HHI, the two most commonly used concentration analyses in the literature, were used as methods. Among the Visegrad countries, the country with the highest concentration of exports in agricultural and livestock products is Hungary and the country with the lowest is Poland. On the contrary, the country with the highest concentration of imports is Poland and the country with the lowest concentration is Hungary.

Introduction

The Visegrád countries (Hungary, Poland, Czech Republic, Slovakia) officially became members of the EU in 2004, although it was established in 1991. Although membership of the European Union was seen as a chance for Central European countries, was it really so? As stated on the official site of the Visegrad Group, the purpose of its accession to the EU was to promote optimum cooperation, especially with its neighbours. The Visegrad Group aimed to contribute to the construction of a European security architecture based on effective, functionally complementary and mutually reinforcing cooperation and coordination within the existing European and transatlantic institutions. The participating countries perceived cooperation as a challenge and its success as the best proof of their ability to integrate into such structures as the EU. Of course, after EU membership, the Visegrad group gained significant advantages both geographically and in terms of the ease of foreign trade. How has the post-EU accession period really affected the foreign trade of these countries? The Visegrad group was in a state of integration in which it could diversify its foreign trade, but in reality, how was the concentration of its foreign trade affected? Agriculture and livestock sector is one of

1 Elif Tuğçe Bozduman, Ress. Asst., Economics, Manisa Celal Bayar Universty, Prof. Dr. Ilhan Varank Campus, 45140, Manisa-TÜRKİYEE-mail: tugce.bozduman@cbu.edu.tr, ORCID ID: (https://orcid.org/0000-0002-6145-8571)

the most strategic sectors for all countries. Especially in this period when the world population is increasing, the production and trade of agriculture and animal husbandry are gaining more importance day by day. Therefore, it is very important to carry out an analysis of these sectors. In this context, in the study, we examined the levels of concentration of both imports and exports in the agricultural and livestock sector of the Visegrad group countries. In particular, in the study that dealt with the post-EU accession period (2004-2021), we considered the 3-digit product groups that included the agriculture and livestock section of the Standard International Trade Classification (SITC). In the analysis of 36 product groups, we determined the concentration levels using trade concentration (CR) and the Herfindahl-Hirschman index (HHI).

There are many studies in the literature in which the agricultural sector of the Visegrád group is examined. Some of these studies examined the competitiveness of agricultural products, while others examined the level of concentration. Some studies have examined the level of concentration on both sectoral and geographical basis. For example; Knězáčková and Pásler (2017) examined the level of concentration of specialization of the Visegrád group countries on a regional and sectoral basis, while Svatoš and Smutka (2012) examined both the product and regional competitiveness of the agricultural trade of the Visegrad Group countries in 1993-2008. The analyses show that the EU accession process reflects positively on the agricultural trade results, especially in Poland. In the Czech Republic and Slovakia, accession to the EU has likewise not led to a worsening of the consequences in the field of agricultural trade. In Hungary alone, serious structural problems are encountered in agricultural trade after joining the EU. Similarly, Zdráhal et al. (2018) investigate the effects of sector-by-sector concentration on the profitability of the dairy industry of the Visegrad countries between 2006 and 2014. The findings suggest that concentration has a significant impact on the performance of dairy businesses. Hegyi-Kéri (2013) tried to determine which sectors of specialization and concentration there were in the Visegrád countries between 2000 and 2007. Some studies have calculated the competitiveness and concentration levels of agricultural products together. For example; Vasary et al. (2014) analyzed the competitiveness of the Visegrád countries in agricultural products between 2001 and 2011 with the RCA and Export-Import ratio index and the level of concentration with the Herfindahl-Hirschman Index. Nagy and Jámbor (2019) focus on the dairy exports of the European Union (EU) and the Visegrad Group between 2000 and 2017 and analyze this with Balassa's RCA index. Similarly, Miklós (2012) analyzed the competitiveness of agricultural products of the Visegrad group countries with the export-import ratio and the Balassa index, and the level of concentration with the Herfindahl-Hirschman Index. The results of the analysis showed that the highest level of concentration was in Slovakia and the Czech Republic. Some studies have only analyzed the competitiveness of agricultural products. For example; Bielik et al. (2012) analyzed the comparative advantage of the Visegrad countries in agricultural trade with the RCA index in their study. According to the results of the analysis, the Czech Republic, Slovakia and Hungary do not have a global competitive advantage in agricultural trade. Szabo et al. (2018) examined the agricultural sector

performance of the Visegrad group between 2004-2013 through input-output analysis. The results of the analysis show that more investment is needed for the development of the agricultural sector.

In the literature, the competitiveness and concentration levels of the Visegrád countries in the agricultural sector have been examined in general, but no studies involving both export and import concentration have been found. This strengthens the originality of the study and its contribution to the literature. State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Materials and methods

The CR index is one of the most widely used methods in concentration analysis. Condensation rate index; It can be used for foreign trade of the company, product, sector or country. The CR index is formulated as follows (Topçu & Sarıgül, 2019):

$$CR = \sum_{i=1}^{k} Pi \ x \ 100$$

The CR index is valued between 0 and 100. If the index is below 30, there is low concentration, between 30 and 50 there is moderate concentration, between 50 and 70 there is high degree of concentration, and above 70 there is a very high degree of concentration (Ünlü & Yıldız, 2019).

HHI is a standard index used to analyze the degree of concentration of a particular industry in a particular geographic market. With the help of HHI, it is possible to measure how close a market is to a monopoly or a fully competitive market (Kozáková & Barteková, 2020). HHI, which is also used in the calculation of export and import concentration, is calculated by taking the square of the export shares of a certain sector in all countries. HHI is formulated as follows (Meilak, 2008):

$$HHI = (Pi)^2$$

Pi represents the share of exports or imports in the total of each of n groups of the selected size (geography or product). The square values of each Pi are added together and the export or import concentration rate of that country is calculated. If this concentration is calculated geographically, it measures the trade distribution between the partners of the exporter or importer in question (Karahan, 2017). The index value varies between 0 and 1. If the index value is below 0.01, there is little to no concentration (diversification is high) and this increases the country's foreign trade competitiveness. An index value below 0.15 indicates that the concentration is at a low level. If the index is between 0.15 and 0.25, there is a moderate level of concentration, and above 0.25 there is a high level of concentration (Vaid, 2018).

If the export or import is carried out only to a single country (trading partner), the index receives its highest value and the concentration is very high. An index value close to 1 indicates a very concentrate market. On the contrary, the larger the number of countries in which foreign trade is carried out (the greater the diversification of exports), the lower the possible value of the index. A value of 0 reflects a completely equal distribution of the countries in which exports or imports are carried out (Laskiene et al., 2017).

Visegrad Group Export Concentration Analysis

In this section, the export concentrations of the agricultural and livestock sectors of the Visegrad Group will be discussed. The product groups for which the concentration analysis was carried out were made on the basis of 36 product groups that deal with Standard International Trade Classification (SITC) Revision 3, 3 digit agricultural and livestock products (0 code in single digits). The product groups we consider for concentration analysis are shown in Table 1. The study covers the period from 2004 to 2021, as it covers the post-EU accession period of the Visegrad Group. Thus, we will try to reveal the structure of foreign trade in the agriculture and livestock sector.

Table 1. SITC Rev. 3, 3 Digit Agricultural and Livestock Products

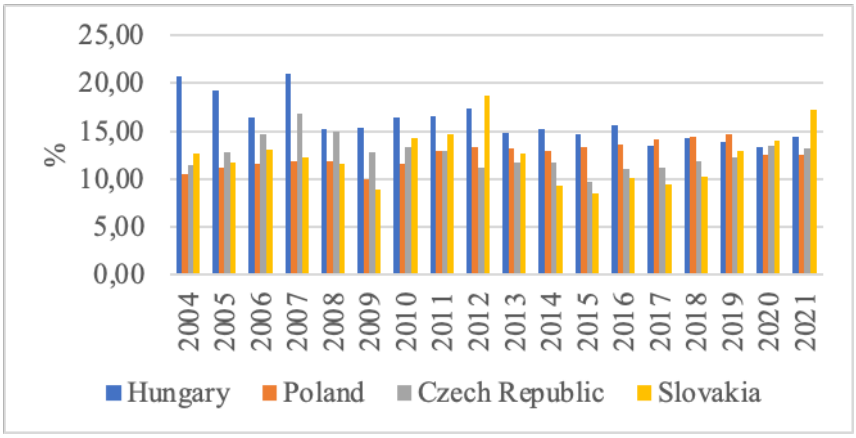
Product Code	Product Name	Product Code	Product Name
001	Live animals except fish	046	Flour/meal wheat/meslin
011	Beef,fresh/chilld/frozen	047	Cereal meal/flour n.e.s
012	Meat nes,fresh/chld/froz	048	Cereal etc flour/starch
016	Meat/offal preserved	054	Vegetables,frsh/chld/frz
017	Meat/offal presvd n.e.s	056	Veg root/tuber prep/pres
022	Milk pr exc buttr/cheese	057	Fruit/nuts, fresh/dried
023	Butter and cheese	058	Fruit presvd/fruit preps
024	Cheese and curd	059	Fruit/veg juices
025	Eggs, albumin	061	Sugar/mollasses/honey
034	Fish,live/frsh/chld/froz	062	Sugar confectionery
035	Fish,dried/salted/smoked	071	Coffee/coffee substitute
036	Crustaceans molluscs etc	072	Cocoa
037	Fish/shellfish,prep/pres	073	Chocolate/cocoa preps
041	Wheat/meslin	074	Tea and mate
042	Rice	075	Spices
043	Barley grain	081	Animal feed ex unml cer.
044	Maize except sweet corn.	091	Margarine/shortening
045	Cereal grains nes	098	Edible products n.e.s

Source: COMTRADE, 2023

When the CR index analysis of the Visegrad group is examined, the country with the highest concentration of single products is Hungary. However, we see that Hungary's concentration in the period from 2004 to 2021 is on a decreasing trend (Figure 1). In 2021, the country with the highest single product concentration analysis is Slovakia. The single crop concentration level in Slovakia and Hungary remains unstable, with

levels much higher in some years. Across the Visegrad countries, crop concentration has declined from around 20% in 2004 to 15% over the years. In fact, it can be said that the only product concentration in the Visegrad group is at the low concentration level.

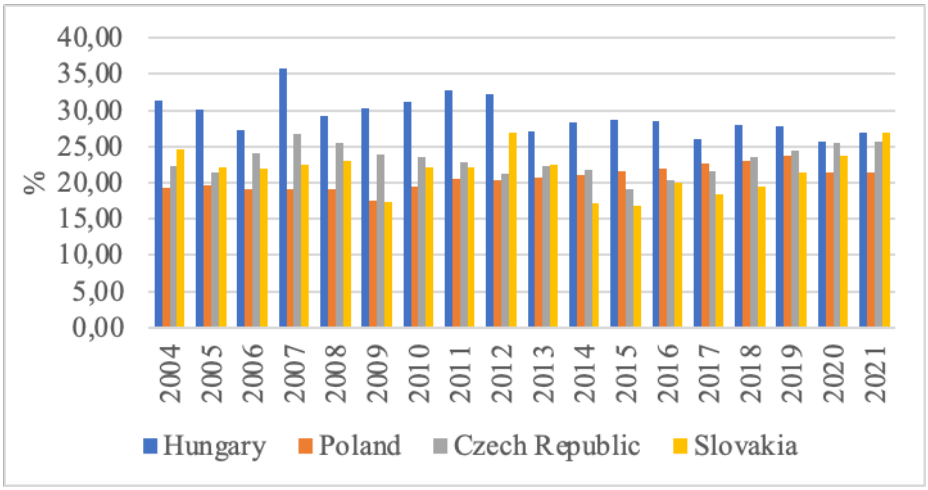
Figure 1. Visegrad Countries CR (1) Analysis Results



Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the country with the highest concentration of the two products according to the agriculture and livestock sector is generally Hungary (Figure 2). But as we get closer to 2021, the two product concentrations of Slovakia and the Czech Republic have undeniably converged. Poland is relatively better positioned than other Visegrád countries. When we examine the Visegrád countries in general, we see that the concentration levels have decreased from 30% to 25%. This shows that the level of concentration in the Visegrad group has decreased relatively after EU membership.

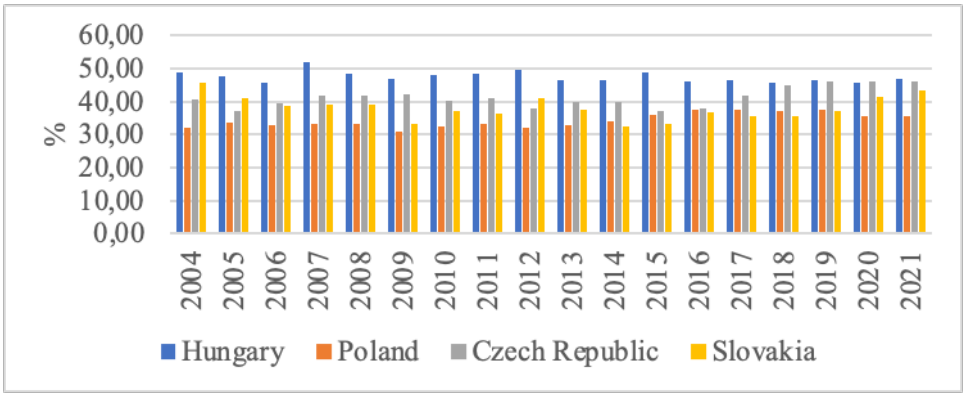
Figure 2. Visegrad Countries CR (2) Analysis Results



Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the country with the highest concentration of four crops by agricultural and livestock sector is generally Hungary and the Czech Republic (Figure 3). As we approach 2021, we see that Poland's product concentration, which is at 30%, is close to 50% in other Visegrad countries. Poland is again in a relatively better position than the other Visegrád countries. When we examine the Visegrád countries in general, we see that their concentration level has increased to 50%.

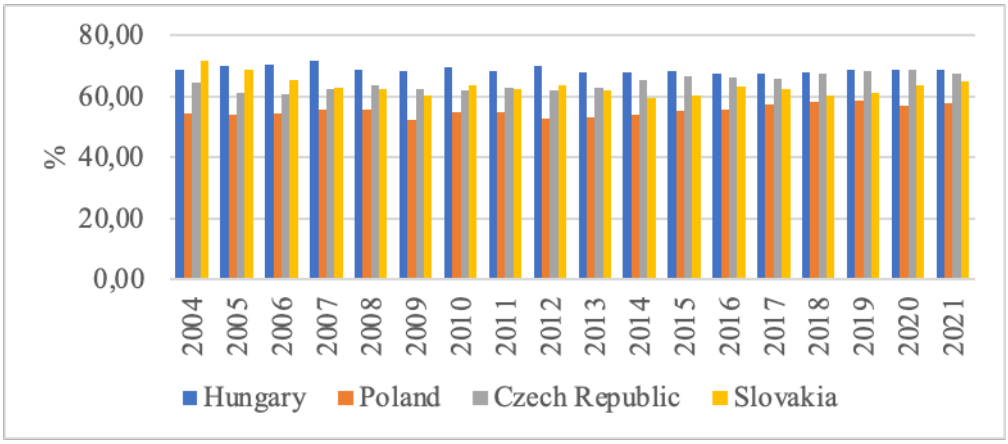
Figure 3. Visegrad Countries CR (4) Analysis Results



Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the countries with the highest concentration of eight crops by agricultural and livestock sector are generally at almost 70% in all countries except Poland (Figure 4). As the number of products increases, it is usual for countries' product concentration levels to increase and converge. Despite this, Poland is again in a relatively better position than the other members of the other Visegrád countries.

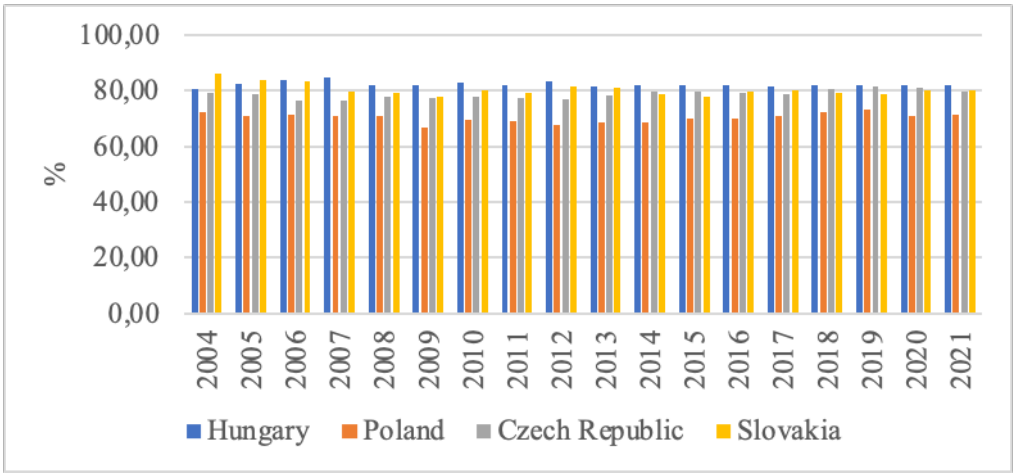
Figure 4. Results of CR (8) Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the countries with the highest concentration of twelve crops by sector of agriculture and livestock are just as in the concentration of eight countries. (Figure 5). As the number of products for which concentration analysis was carried out increased (meaning 3 in 36 products), the product concentration levels of the countries increased and converged. Poland, however, is again in a relatively better position than other members of the other Visegrád countries. The twelve crop concentration levels of the Visegrad group are around 80%, with the exception of Poland, of course.

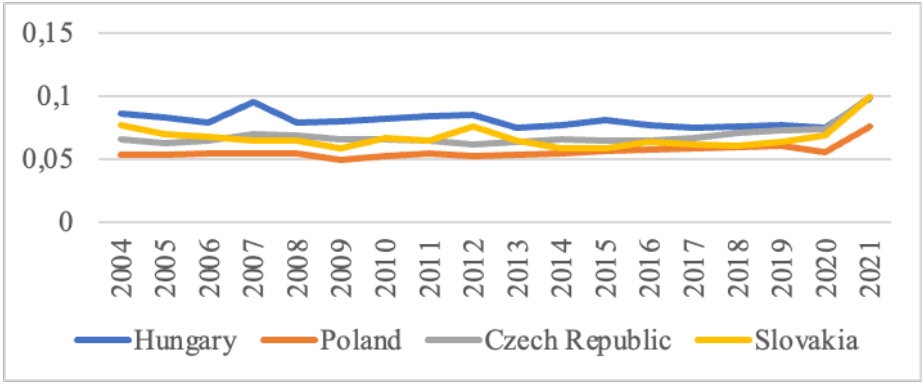
Figure 5. Results of CR (12) Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

The HHI analysis results of the Visegrad countries (Figure 6) are consistent with the CR index. According to HHI analysis scores, Hungary has the highest HHI index value and the highest product concentration. Again consistent with the CR index results, the country with the lowest product concentration is Poland.

Figure 6. HHI Results of Visegrad Countries



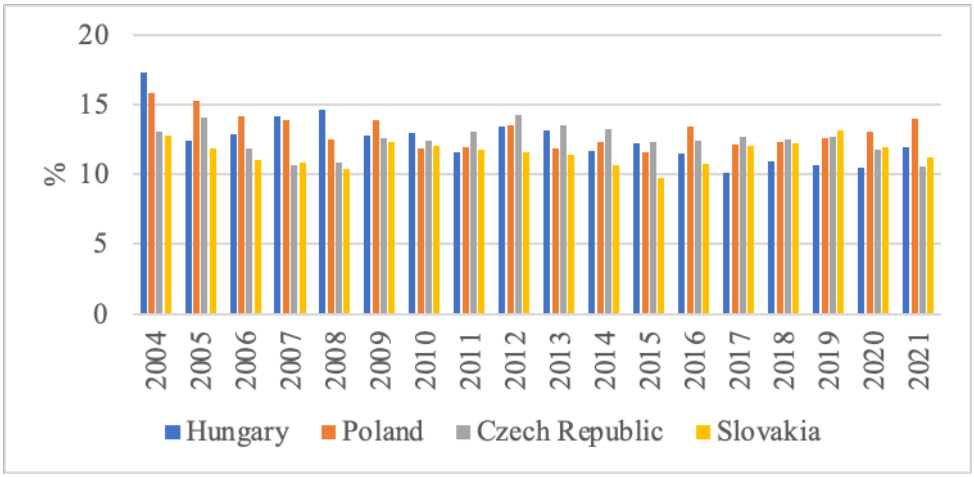
Source: It was calculated by the author using data from the COMTRADE database

Looking at the Visegrad countries in general, the results of the analysis for 36 product groups generally show a low level of product concentration. Again according to Figure 6, HHI values, which had a sharp decline in 2020, increased again in 2021.

Visegrad Group Import Concentration Analysis

In this section, the import concentrations of the agricultural and livestock sectors of the Visegrad Group will be discussed. The product groups for which the concentration analysis was carried out were carried out on the same product groups for which the export concentrations were analyzed (SITC Rev. 3, 3 digit agricultural and livestock products). For the product groups we consider for the analysis of import concentrations, see Table 1.

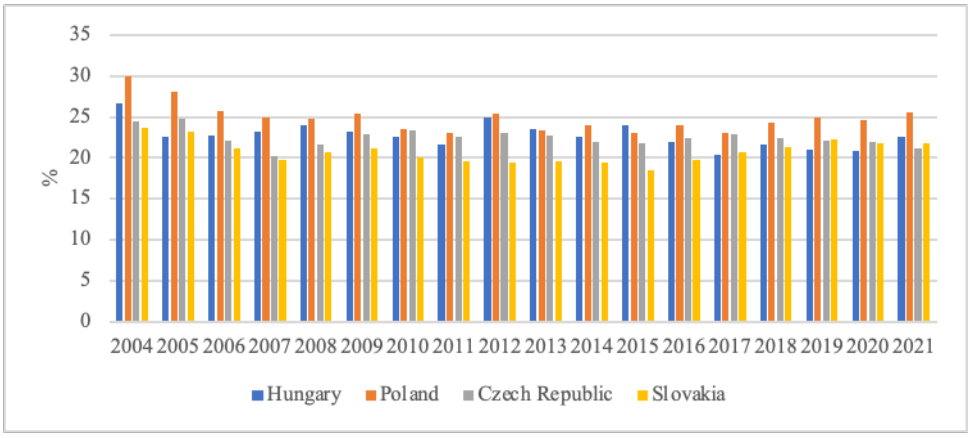
Figure 7. Results of CR (1) Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

When we examine the CR index analysis of the Visegrad group, the countries with the highest concentration of single products are Poland and Slovakia (Figure 7). The country with the highest concentration of imports in 2004 was Hungary, while in 2021 it was Poland. Slovakia and Hungary have a single crop concentration level that remains unstable, with lower levels in some years. Across the Visegrad countries, single crop concentration has declined from around 15% in 2004 to 10% over the years. In fact, it can be said that the only product in the import concentration in the Visegrad group, just like in the export concentration, is at the low concentration level.

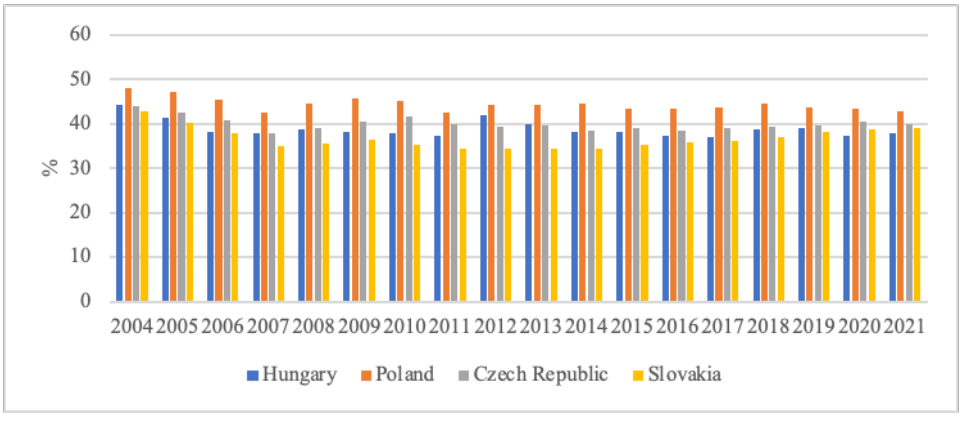
Figure 8. Results of CR (2) Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

In the Visegrad group, the country with the highest concentration of the two products according to the agricultural and livestock sector is generally Poland (Figure 8). However, as we approach 2021, the concentration of products in Slovakia and Hungary has also come undeniably close to each other. The Czech Republic is relatively better positioned than other Visegrád countries. When we examine the general population of Visegrád countries, we see that their concentration levels are in the 25% band.

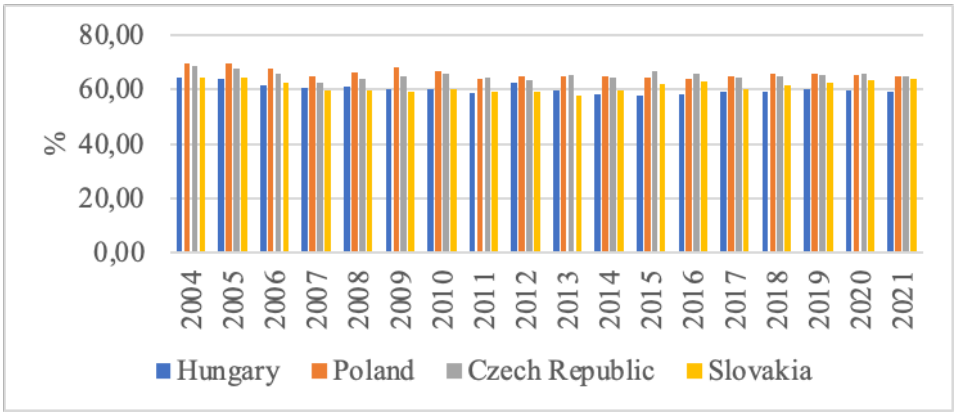
Figure 9. Results of CR (4) Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the country with the highest concentration of four products by agricultural and livestock sector is generally Poland (Figure 9). As we approach 2021, we see that Poland has an import concentration of close to 50%.

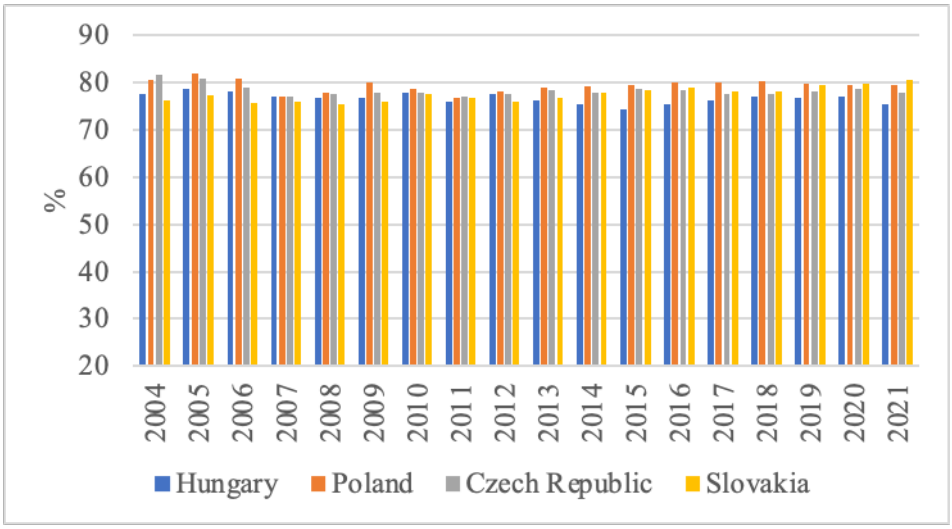
Figure 10. Results of CR (8) Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the countries with the highest concentration of eight products by agricultural and livestock sector are generally above 60% in all countries except Hungary (Figure 10). Just like in export concentration, as the number of products increased in import concentration, the product concentration of the countries approached each other. Despite this, Hungary is again in a relatively better position than the other members of the other Visegrád countries.

Figure 11. Results of CR (12) Analysis of Visegrad Countries

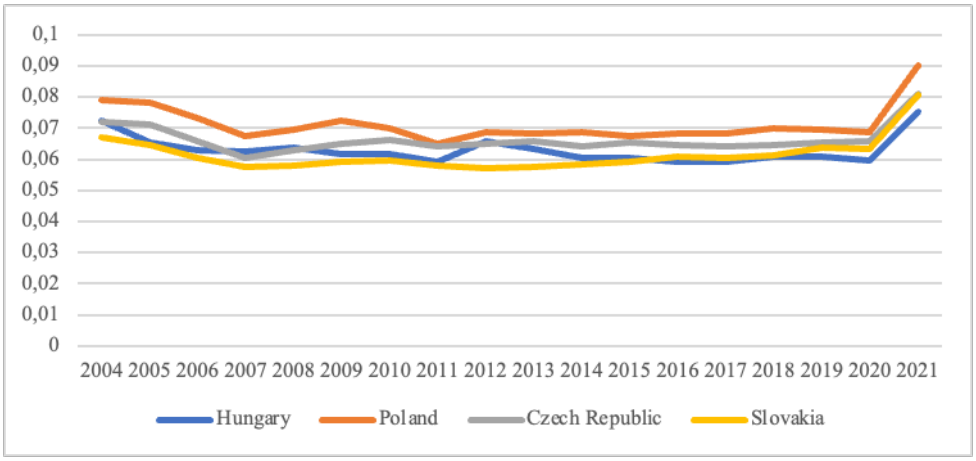


Source: It was calculated by the author using data from the COMTRADE database

Within the Visegrad group, the countries with the highest concentration of twelve crops by sector of agriculture and livestock are just as in the concentration of eight countries. (Figure 11). As the number of products for concentration analysis increased, the product concentration levels of the countries increased and converged. However, Hungary is

again in a relatively better position than the other members of the Visegrád countries. In general, the twelve product condensation levels of the Visgrad group are close to 80%.

Figure 12. Results of HHI Analysis of Visegrad Countries



Source: It was calculated by the author using data from the COMTRADE database

The HHI analysis results of the Visegrad countries (Figure 12) are consistent with the CR index. According to HHI analysis scores, the country with the highest HHI index value and the highest product concentration is Poland. Again consistent with the CR index results, the country with the lowest product concentration is Hungary. Looking at the Visegrad countries in general, the results of the analysis for 36 product groups generally show a low level of product concentration. Again, according to Figure 12, HHI values, which had a sharp decline in 2020, increased again in 2021.

Discussions

In the study, export and import concentrations were analyzed for 36 product groups in the agriculture and livestock sector of the Visegrad Group. First, export concentrations were discussed and it was found that Hungary had the highest concentration among the Visegerad countries in general. However, the fact that Hungary has a high concentration of exports has had the opposite effect in terms of import concentration. Likewise, in Poland, where export concentration is the lowest, import concentration is the highest. This means the following. Hungary exports agricultural and livestock products only to certain countries, but has a wider foreign trade portfolio in imports. Conversely, Poland imports agricultural and livestock products only from certain countries, but has achieved a higher diversification in exports.

Conclusions

The examination of the concentration level of the countries reveals the trade portfolio on both sectoral and product basis. The study helps us to examine the agricultural and livestock sector of the Visegrad countries and to understand the export diversification

of these countries in these sectors. The results of the analysis (CR (1), CR (2), CR (4), CR (8), CR (12) and HHI) show in which countries the concentration of exports and imports is higher. The fact that countries have both export and import concentration shows that they trade more with certain countries. Likewise, the decrease in both export and import concentration levels after EU membership in 2004 is a situation in favor of the Visegrad countries. After EU membership, the Visegrad countries managed to diversify their exports and imports for agricultural and livestock products.

Conflict of interests

The author declare no conflict of interest.

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SUPPORTING PROGRAMS FOR THE DEVELOPMENT OF COOPERATIVES IN THE REPUBLIC OF SERBIA

Marko Jeločnik[1], Jonel Subić[2], Zorica Vasiljević[3]

**Corresponding author E-mail: marko_j@iep.bg.ac.rs*

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ABSTRACT

Serbia is among few countries that have two ministries, the Ministry of Agriculture, Forestry and Water Management and the Ministry of Rural Welfare, active in solving actual problems linked to living and working conditions in rural space. Establishment of cooperatives, or joined action of rural population could enable developmental processes in rural areas. Both ministries offer certain programs of public support focused on cooperatives advancement or establishment, and indirectly securing the competitiveness and sustainability of cooperative members (i.e. mainly family farms). The main research goal is observing the economic impact of the one of program support lines of the Ministry of Rural Welfare directed to development of cooperatives, and further prevention of disappearing of rural communities in Serbia. Analysis shows that mentioned support has turned over the previous trend of shutting down the cooperatives into situation when over 1,100 new agricultural cooperatives have been established in last several years. Additionally, derived results initiate certain recommendations, useful both for policy makers and cooperatives.

Introduction

Usually the term "rurality" is linked to certain features such are low level population density, small scale settlements (villages, hamlets or small towns), specific style-life, usual practicing of agriculture or forestry, single or few member households, presence of farms and micro and small companies, limited level of economic activities, etc.

1 Marko Jeločnik, Ph.D., Senior Research Associate, Institute of Agricultural Economics, Volgina Street no. 15, 11060 Belgrade, Serbia, Phone: +381 64 66 88 357, E-mail: marko_j@iep.bg.ac.rs, ORCID: (https://orcid.org/0000-0003-4875-1789)

2 Jonel Subić, Ph.D., Principal Research Fellow, Institute of Agricultural Economics, Volgina Street no. 15, 11060 Belgrade, Serbia, Phone: +381 63 296 111, E-mail: jonel_s@iep.bg.ac.rs, ORCID: (https://orcid.org/0000-0003-1342-1325)

3 Zorica Vasiljević, Ph.D., Full Professor, Academic Board for the Village of SASA, Kneza Mihaila Street no. 35, 11000 Belgrade, Serbia, Phone: +381 64 14 39 942, E-mail: zoricav1313@gmail.com, ORCID: (https://orcid.org/0000-0002-3076-3303)

(Bogdanov et al., 2008). Measuring and expressing rurality could be done in several ways. According to the most often used OECD nomenclature (based on population density), the Republic of Serbia belongs to the group of predominantly rural countries, where the rural areas encompass about 85% of national territory (Gajić et al., 2021), while the rural space is inhabited by almost 55% of overall population (Radović, Radović Marković, 2016).

It is not so easy to precisely define the rural space and rural settlements in Serbia towards the mosaic structure of their network (Drobnjaković et al., 2022). They are usually classified in line to certain demographic, urban-morphological, functional, or socio-economic criteria (Drobnjaković, 2019). Some estimations show that in rural space functions almost 4,800 rural settlements (Antevski et al., 2012). Unfortunately, over the 25% of them is in the process of disappearing (Subić, Jeločnik, 2021), just with few inhabitants or without younger population. Rural business ambient is characterized by low diversification of economic activities, exposing the agriculture as dominant activity (Bogdanov, Vasiljevic, 2011). Ambient is also limited by low economic power of farms, unsatisfactory access to contents of physical and social infrastructure, presence of intensive rural-urban migratory processes and mainly negative natural increase (Šantić et al., 2017).

Serbia is one of the few countries that the focus on solving the actual issues within the rural space initially articulates throughout the work of two ministries, the Ministry of Agriculture, Forestry and Water Management (MAFWM) and the newly established Ministry of Rural Welfare (MRW), while there is no overlapping in competences of the previously mentioned public institutions.

The idea that cooperation and joined action of rural population could initiate developmental processes in rural space lives for centuries (Lipatova et al., 2021). In rural space, it's not so only, but it's usually focused on activities close to agriculture. Cooperation, or collective action of individuals is in the core of cooperatives. They tend to represent a functional type of horizontal integration of small entrepreneurs in certain sector that in long run strive to achieve overall business verticalization (Sexton, 1986). International Cooperative Alliance defines them as "people-centered" enterprises owned, controlled and run by and for their members to realize their common economic, social, and cultural needs and aspirations. They could be formed around many human activities and needs (Ostrom, 2010), but globally, the most of cooperatives belongs to the group turned to agriculture (Nilsson, 1998; Valentinov, 2007). Cooperatives could be organized in many forms, but generally they make their business activities in accordance to basic cooperative principles launched by the ICA at the end of XX century (Nikolić et al., 2021). Their sustainability is initially based on successful matching of economic and social axes of sustainability (Đurić et al., 2021).

There are strong beliefs that cooperatives and cooperation could be a successful tool in improving livelihood in rural areas (Kumar et al., 2015; Dubey et al., 2016), as they have positive impact on boosting the overall life and business conditions (Wanyama

et al., 2009). Farmers' low-level productivity and poor competitiveness, i.e. „market invisibility", is among the most pronounced motives for joining the cooperatives (Nestorov et al., 2015).

Public support to forming and strengthening the business activities of cooperatives is not the very new policy tool (Iliopoulos, 2013; Candemir et al., 2021). It usually supports initial joining of individual farmers and establishing of new cooperative (Normark, 1996; Ribašauskienė et al., 2019), approach to favorable credit lines or certain tax exemptions and tax holidays (Cook, 1993; Bijman et al., 2012), covering the part of price or supplying the required inputs, equipment, mechanization, insurance or some other costs (Ortmann, King, 2007; Kislev, 2015), setting and realization of marketing strategic activities essential for cooperative sustainability (Vergroesen, 1989; Getnet, Anullo, 2012), partial immunity towards antitrust laws, or free technical assistance (Knapp, 1962; Sexton, Iskow, 2021), linking with public administration securing the transfer of important information at national or local level (Bijman, Hu, 2011), etc. Mentioned support could occur as direct or indirect (Wanyama, 2016).

The most often throughout this support certain governments have been strived to stop the negative economic and social trends in agriculture, or rural areas, even to revive them (Torgerson et al., 1998; Yanbykh et al., 2019). It could impact slowdown in migration processes (Brown, Wardwell, 2013), offer a new business and entrepreneurial opportunity and decrease the unemployment in rural space (Aref, 2011; Tibi, Atoma, 2015), provide the increase in farm and local community incomes (Kwapong, Korugyendo, 2010; Ma, Abdulai, 2017), or provide new market possibilities, especially for small farmers (Markelova et al., 2009), initiate occurring of agricultural or some other activities out the agriculture that was not previously practiced (Kontogeorgos et al., 2016), facilitate improvement of physical infrastructure (Churk, 2015), boost the image of local community (Candelo et al., 2019), empower the overall living conditions in certain rural territory (Curl, 2010), etc.

In line to mentioned, it has to be noted that Serbia has long and very rich tradition of cooperatives in the sector of agriculture (Ševarlić et al., 2010; Krasavac, Petković, 2015). Milestone in cooperative's development in Serbia was set in the middle of XIX century. At the territory of Vojvodina (at that time a part of Austro-Hungarian Empire), during the 1846. in Bački Petrovac was established the first credit agricultural cooperative (in this moment third launched cooperative worldwide). At the territory of former Serbia during the 1894. was established the first partially agricultural cooperative (farmers' credit cooperative) in village Vranovo. At these times, very soon it has been established the several associations of cooperatives at national level, while they were jointly involved in launching the International Cooperative Alliance in UK (Bojić, Vapa Tankosić, 2015; Zakić, Nikolić, 2018; Nikolić et al., 2018).

Currently, at global level work over the three million cooperatives, gathering almost 10% of employed persons worldwide (Gulan, 2022). Contrary to that, in Serbia is active slightly over 2,900 cooperatives (almost 0.09% of active cooperatives worldwide), while

almost 75% of them are targeted as agricultural (CUS, 2023). They engage more than 123 thousand members (Laban et al., 2021). Sectors of economy that attracts top 100 cooperatives worldwide are agro-food complex, trading, and banking (Gavrilović et al., 2023). In the field of agriculture, as in many other sectors, despite some extremes, there are mostly limp links between the economically weak cooperative members. But, although the tenfold smaller number of cooperatives, or intensity of their business activities and available assets in Serbia compared to EU, throughout the cooperatives, farms have greater opportunity to decrease overall production costs, access cheaper and better-quality inputs, much easier market produced goods, approach to contemporary technological alternatives, or enlarge offered products' assortment and engaged activities, etc. (Kovačević, 2021).

Materials and Methods

Realization of the research primarily involved the use of "desk research" method, as well as methods of analysis and synthesis, which enabled an adequate assessment of specific measures and programs implemented by the competent Ministry (MRW) focused to the strengthening of competitiveness and position of the Serbian village and rural areas. The research was carried out based on available secondary data of MRW, together with the consultation of relevant literary sources. All data and results are presented in proper tables, while all values are given in RSD or EUR.

The main goal of research is to present the economic impact of one of MRW activities, i.e. supporting measure for the development of cooperatives at national level, realized towards the prevention of further dying out of rural communities in Serbia. Additionally, paper tries to define certain recommendations, useful both for public policy makers and grant's end users (cooperatives).

Results with Discussion

As a global issue, there are usually the incomplete data towards the number and economic strength of cooperatives. In previous period, cooperative sector initially has had a broader census in 2012 guided by the UN (Zakić, Nikolić, 2018). Some earlier estimation of the Cooperative Union of Serbia (CUS) shows that in 2017 there were registered around 2,600 cooperatives of all types, where over the 1,500 of them were active in sector of agriculture (Knežević, 2021). Meanwhile, in next five years their number is almost doubled (CUS, 2023).

Legislative background linked to cooperatives in Serbia is covered by the Law on Cooperatives, aiming to encourage determining of clear and easy follow rules and procedures for establishment, management and operation of cooperatives, as well as to offer sustainable model that will fit the general interests of local community, or to represents the specific instrument in fighting against poverty and social reintegration of vulnerable groups. Besides, it has to encourage true competition, especially in sectors where occur traditional dominancy of large enterprises, such are construction, trade, or agriculture), and to revive and boost the local economic development (MERS, 2021).

As was previously mentioned, basically there are two ministries competent for cooperative issues at national level (MAFWM and MRW).

Ministry of Agriculture Forestry and Water Management (MAFWM) is mainly involved through the nationally funded support program for improving the competitiveness of entities involved in agricultural production, i.e. two sub-programs. The first one covers incentives for strengthening the links within the market chain in primary agriculture and diversification of income in rural areas (eligible are the agricultural cooperatives that have at least five members as registered holders or as different family farms in active status). It includes reimbursement of investments in milk and meat production, beekeeping, aquaculture, fruit and vegetable production, or flowers, grapes, and crops production, as well as investments in old and artistic crafts. Grants will be directed to building farm facilities, purchase of equipment and greenhouses, or purchase of machinery and equipment for crop production in open field, as well as for irrigation and anti-hail systems, etc. Grants range from 20 to 50 thousand EUR. The second sub-program involves incentives for improving the links within the market chain in the area of purchasing, processing and marketing of primary agricultural products, as well as incentives for improving the marketing of handcrafts products. Grants for processing will cover investments in reception, manipulation, determination of quality, processing and fine-processing, and storing of crops, as well as investments linked to improving competitiveness in processing and marketing of milk and dairy products, or meat and meat products. Besides, it covers wine production and marketing, or investments in processing, packaging and marketing of bee products. At the end it covers investments in advancing the marketing of certified old and artistic crafts. Grants range from 25 to 400 thousand EUR (MAFWM, 2021).

Besides MAFWM makes redistribution of EU IPARD program financial assets, while the one part of the fund could be possibly directed to cooperatives. It usually involves investment in physical properties of the cooperative such are: a) investment in building production facilities (stables, various warehouses and silos, manure depots, fence, water filtration and waste management facilities, renewable energy production plants, greenhouses, irrigation systems, cages in chicken growing, plantations, internal road network, etc.), equipment, mechanization (mainly tractors) and special vehicles, etc. used in primary agricultural production (Measure 1); and b) investment related to processing and marketing of agri-food and fishery products, i.e. building or advancement of processing and accompanying facilities, and elements of internal physical infrastructure, investment in required equipment for food processing and facilities for production of renewable energy. There is expectation that implemented program will boost the overall performances of the milk (dairy) and meat (meat processing), as well as fruit and vegetable sectors, leading them to growth in productivity and competitiveness, or achieving the valid EU standards, better food products positioning at market, and increase in export (Measure 3), (Sim Cert, 2023; Krunet, 2023).

Meanwhile, cooperatives could also achieve certain level of public support aimed for various purposes throughout the several other funds, such are: a) Program of

the Development Fund of the Republic of Serbia that supports purchase, building or reconstruction of working space and warehouses, purchase of machines, vehicles and equipment, investment in permanent working capital, software and hardware, advancement of energetic efficiency or ecological issues, etc. (FRS, 2023); b) Program of Development Agency of Serbia that supports purchase of new production equipment, machines, vehicles for internal transport, specialized tools, improvement of energetic efficiency and ecology, building machines, etc. (DAS, 2023); c) Agro-credits given by listed commercial banks (e.g. Banca Intesa) supported by MAFWM through the subsidizing the interest rate, etc. (Agrosmart, 2023).

On the other side, main intentions of the Ministry of Rural Welfare (MRW) are to improve the living and working conditions in rural areas, which would slow down pronounced processes of demographic migration and lead to the revival of Serbian villages. In accordance with that, every year at the entire territory of Serbia, Ministry has been implementing several programs (grants distribution based on public competition), such are: a) Supporting program for the development of cooperatives; b) Supporting program for the purchase of rural households (houses with garden) by the young couples; c) Supporting program for the purchase of minibuses for the needs of certain local rural communities; d) Supporting program for the organization of specific rural events; etc. (MRW, 2023).

In line to the available MRWs' budget, in recent years, supporting programs have led to several positive trends, which as a result initiate the growth in economic activity and advancement of the quality of life in rural areas, i.e. greater interest of the population for the living in rural space.

Related to cooperative issues, not so far, based on initiative of the National team for the revival of the Serbian villages and in that time actual Minister in charge for balanced regional development, in 2017 has been started the implementation of the project "500 cooperatives in 500 villages" (Jeločnik et al., 2022).

From 2021 the project was transformed into a permanent measure of the newly established MRW. Through the project, or further program of the Ministry, to existing and newly established agricultural cooperatives were awarded grants (up to the level of previously determined amount) throughout the competitive public tenders (based on the proposed business idea). Intention was to support the development of cooperatives activity, to strengthen capacities and provide alternative sources of income in the agriculture sector, but also to support other rural activities (rural tourism, craftwork, social programs, etc.), to create new jobs in rural areas, or to provide survival and staying, or to attract the people to come and have quality life in rural communities (Aničić et al., 2019; Šantić, Antić, 2020).

So, there are financing the best ranked draft project ideas of cooperatives that will contribute the improvement or enlargement of current cooperatives' business activity, or drive them to totally new business activities that haven not been practiced yet (e.g. investment in mechanization, production and processing facility and equipment, new or

advanced technology, process or products certification, distribution channel, marketing strategy, etc.).

During the period 2017-2021., the mentioned project, and later the public measure, have had available almost 2.2 billion RSD (around 18.7 million EUR) of budgetary assets for further reallocation to agricultural cooperatives of different profiles (*Table 1.*).

Table 1. Available budgetary assets for supporting cooperatives (period 2017-2021, in RSD)

Year	Total assets available
2017.	200,000,000.0
2018.	823,515,000.0
2019.	667,463,000.0
2021.	507,500,000.0
Total	**2,198,478,000.0 RSD** (app. 18,697,720.0 EUR, exchange rate 117.58)

Source: MRW, 2023b.

There are expressed certain oscillation or exclusion in observed period regarding the available assets (Table 1.), what was mainly caused by national budget contractions and reallocation of budgetary assets to some other purposes (e.g. in 2020. and 2021. the size of available budget was affected by the Covid-19 issues). In average, in each year of observed period for support was available almost 550 million RSD (app. 4,7 million EUR). The ratio between the maximal and minimal available assets in some year is 1:4.12, while the highest was in 2018.

The selection criteria of grant calls are determined to favor the excellence of the cooperatives' business ideas, as well as to contribute the overall benefits for the certain local rural community, i.e. generally impact on employment of local population. By proposition to each selected cooperative was assigned maximally 7.5 or 15 million RSD, towards they are newly established or already existing cooperatives (Nikolić, 2020). In total for observed period was approved over the 2.13 billion RSD, while the overall efficiency of realized support was around 97% (the lowest was in 2018.), (*Table 2.*).

Table 2. Approved (spent) budgetary assets for supporting cooperatives (period 2017-2021, in RSD)

Year	Total assets approved	Share of approved in available assets (in %)
2017.	182,217,046.67	91.1
2018.	804,849,368.19	97.7
2019.	652,179,644.13	97.7
2021.	492,510,521.86	97.0
Total	2,131,756,580.85 RSD (app. 18,130,265.19 EUR, exchange rate 117.58)	

Source: MRW, 2023b.

In average, over the 260 cooperatives apply each year to program call (*Table 3.*), while the most submissions were in 2021. Unfortunately, in average, almost 40% of submitted draft proposals for the grant were improper, pointing out both, the complexity of selection methodology and lack of administrative skills or proper techno-economic knowledge of cooperative members that limit them in development of adequate draft project proposals. So, among 643 project proposals were selected those that were further financially supported.

Table 3. Total number of cooperatives that apply for the grant

Year	Number of applicants	Number of formally improper applicants	Number of formally adequate applicants	Share of formally adequate project proposals
2017.	218	105	113	52
2018.	208	71	137	66
2019.	293	99	194	66
2021.	329	130	199	60
Total	**1,048**	**405**	**643**	**61**

Source: MRW, 2023b.

The success of the measure realization in observed period could be seen in fact that grant was received by 207 cooperatives. So, almost 20% of the total number of applied cooperatives (selection threshold) win the grant, or around 32,2% of cooperatives with proper application. Meanwhile, almost 60% of cooperatives that gain the grant were classified as newly established (*Table 4.*). The most of cooperatives were granted in 2018. (34.8% of the total number of granted cooperatives in observed period), as in this year was delegated the highest sum of available assets from MRW budget. It could be noticed that there is opposite trend in selected newly established and old cooperatives, as general intention is to promote cooperative spirit and to pull in as much as possible new members and external labor from certain rural region.

Table 4. Number of granted cooperatives

Year	New cooperatives	Old cooperatives	Complex cooperatives	Total
2017.	9	12	-	21
2018.	39	31	2	72
2019.	33	22	2	57
2021.	40	17	-	57
Total	**121**	**82**	**4**	**207**

Source: MRW, 2023b.

Simplifying, if it is generally assumed that each granted cooperative in average have at least legal minimum of 5 members and additionally employ 2-3 new external employees throughout the realization of proposed project idea, it derives that in observed period awarded grants provide improvement in business activities and additional income to at least 1,035 cooperative members and 414 to 621 paid external employees. Further, if it is supposed that based on improved cooperative activities each cooperative member can earn additional 10 thousand RSD/month net for its farm, or each external worker got the net wage of 50 thousand RSD/month for its family, program earning capacity could be set at range 372.6 million RSD to 496.8 million RSD annually. So, throughout the final consumption or partly reinvesting in main cooperative business activity or livelihood elements at the level of individual households or local community, initially spent MRWs assets could be returned to wider community in 5.7 to 4.3 years. Gained assets returning could be much faster if they include package of taxes involved in gross incomes and wages.

Table 5. Dispersion of awarded cooperatives in line to field of activity

Field of Activity	Number of cooperatives	Share
Livestock breeding	32	15.5
Fruit and grape growing	34	16.4
Crop production	37	17.9
Processing of crop products	6	2.9
Fruit processing	32	15.5
Vegetable processing	14	6.8
Medicinal plants growing	6	2.9
Vegetable production	17	8.2
Beekeeping	19	9.1
Horticulture	1	0.5
Production of oils and squeezed fruits	1	0.5
Mixed agricultural production	3	1.4
Rural tourism	1	0.5
Complex cooperatives	4	1.9
Total	**207**	**100.0**

Source: MRW, 2023b.

Observing the dispersion of awarded cooperatives towards their field of main activity (*Table 5.*), the most of them are linked to primary production (72.0%), while significant share is involved in processing of agro-food products (25.6%). Besides, cooperatives involved in plant production and plant products processing (71.5%) dominate than those oriented to livestock production and livestock products processing (24.6%).

The process of public grants distribution is followed by well-balanced regional dispersion of available public assets, what clearly presents that survival and development of villages in every part of Serbia is of great national interest for policy makers (*Table 6.*).

Table 6. Territorial dispersion of awarded cooperatives

Territory	New cooperatives	Old cooperatives	Complex cooperatives	Total	Share
South Serbia	46	17	-	63	30.4
Central Serbia	61	18	2	81	39.1
Vojvodina	12	46	2	60	30.0
K&M	2	1	-	3	1.5
Total	**121**	**82**	**4**	**207**	**100.0**

Source: MRW, 2023b.

In same time, there come to some deviation in value of share of awarded cooperatives and total sum of assigned assets between certain regions (*Table 7.*), specifically South Serbia and Vojvodina.

Table 7. Territorial dispersion of assigned assets (in million RSD)

Territory	2017	2018	2019	2021	Total	Share
South Serbia	106.4	203.7	119.1	118.1	547.4	25.5
Central Serbia	42.2	318.6	237.6	205.2	803.6	37.4
Vojvodina	33.6	270.0	295.5	169.2	768.2	35.8
K&M	-	12.5	-	15.0	27.5	1.3
Total	**182.2**	**804.8**	**652.2**	**492.5**	**2.131.7**	**100.0**

Source: MRW, 2023b.

In long run, program realization has been initiated in great interest in establishment of cooperatives. So, while up to 2017. were shut down around 100 agricultural cooperatives annually, from the moment of program initiation till today over 1,100 new agricultural cooperatives have been started to operate in Serbia.

Conclusions with Recommendations

The social role and assigned responsibility of the newly established MRW in preserving and improving the position of village and rural population in Serbia is indisputable. It is highly affirmative that by the implemented measures and activities, MRW in previous period has successfully dealt with the most of issues that follow the progress of living and working conditions in rural areas. Proposed recommendations are directed both to public policy makers and end users of the assigned budgetary assets, i.e. agricultural cooperatives and indirectly to family farms.

In upcoming period, public policy makers could:

- to affect the more intensive involvement of scientific, educational and professional institutions and organizations within the mechanism of established measures' creation and implementation. Mentioned has to be in line to general benefits derived from the transfer of available knowledge, practices and skills, i.e. they would be in function of deeper analysis and additional fine-tuning of applied measures, as well as in finding new supporting alternatives;
- to create a model for the distribution of incentives that would slightly favors the cooperatives gathered around production lines with higher economic potential and social benefits, or specific ideas that preserve the culture and tradition of a certain rural community;
- to make stronger media pressure in order to popularize available measures and attract on that way potential donors;
- to try in conditions of re-escalation of global economic crisis, to fight for higher share of these measures during the distribution of national budget, as well as to allocate the larger individual grants to end users; etc.

In close future grant users (agricultural cooperatives) could:

- to have stronger believes in their business ideas, as to be more persistent in their attempts to approach available public grants;

- to better articulate their business ideas and potential contribution to the local rural community, i.e. to better justify the necessity of using the available incentives;
- to rely more stronger on the existing knowledge base, as to do not run away from the joint preparation of business ventures with reputable representatives of science and profession; etc.

As there have been passed more than five years since the initiation of the grants distribution to the appropriate representatives within the Serbia's cooperative sector, further research steps should be turned to deeper analysis of real economic, ecological and social impacts, as to general benefits achieved not only by the grant beneficiaries, but the rural communities in which they are located.

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Conflict of interests

The authors declare no conflict of interest.

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THE POSSIBILITY OF SUPPLYING THE DEFENSE SYSTEM WITH FOOD PRODUCTS IN CONDITIONS OF DISTURBANCE ON THE MARKET

Srboljub Nikolić[1], Milan Mihajlović[2], Radovan Damnjanović[3], Aleksandar Savić [4], Nebojša Mišić [5],

**Corresponding author E-mail: milan.mih83@gmail.com*

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ABSTRACT

Recently, as a result of COVID-19 and the war conflict in Ukraine, the supply system in the world has been very difficult. In addition to the above consequences, a number of other activities lead to disruptions in the market, which complicates the supply system at the global level. The defense system in the conditions of war conflicts is considered unique in defining regulations and procedures and has a special treatment in treating the supply process in such conditions. In this sense, this paper theoretically discusses the food supply system, the available market for food products with reference to the food industry and possible market disturbances and their effect on the supply system. The goal of the work is to find alternative solutions for the supply of food products to the defense system of the Republic of Serbia in conditions of disruptions in the market.

1 Srboljub Nikolić, Assistant Professor, University of Defence, Military Academy, Veljka Lukića Kurjaka 33, Belgrade, Serbia, Phone: +381692078252, E-mail: srboljub.nikolic@yahoo.com, ORCID ID (https://orcid.org/0000-0002-1941-5332)

2 Milan Mihajlović, Assistant Professor, Military Academy, University of Defence, Veljka Lukića Kurjaka 33, 11000 Belgrade, Serbia, E-mail: milan.mih83@gmail.com, ORCID ID (https://orcid.arg/0000-0002-4975-9742)

3 Radovan Damnjanović, Assistant Professor, Military Academy, University of Defence, Veljka Lukića Kurjaka 33, Belgrade, Republic of Serbia, e-mail: radovandam78@gmail.com, ORCID ID (https://orcid.org/0000-0002-4574-5546)

4 Aleksandar Savić, Assistant, Military Technical Institute, Ratka Resanovića 2, 11000 Belgrade, Serbia, E-mail: aleksandar22071993@gmail.com, ORCID ID (https://orcid.arg/0000-0002-9640-1583)

5 Nebojša Mišić, Assistant, Military Academy, University of Defence, Veljka Lukića Kurjaka 33, 11000 Belgrade, Serbia, E-mail: capljak4@gmail.com, ORCID ID (https://orcid.org/0000-0003-0830-1580)

Introduction

Food, in addition to air and water, is one of the essential bases for the maintenance of the human organism. As one of the physiological needs of man, food consists of chemical substances that give the organism the necessary energy and substances for its renewal, growth and development, for the performance of basic life functions and the development of the organism's defense capabilities. Nutrition directly affects the maintenance of health, work ability and psychophysical condition of a person. Insufficient, incomplete and often incorrect nutrition is the cause of the weakening of the human body's resistance to various diseases. Because of all this, it is necessary to take into account the quality of nutrition, that is, the quality of food products that should be in the function of the intellectual and material development of man, and therefore of the entire nation and society. Current events in the economic, i.e. economic sphere lead to major changes in the way and organization of business of all economic entities. The Serbian Army is not a commercial entity, but it is still forced to comply with the demands of a market-oriented economy. At the time of the Socialist Federal Republic of Yugoslavia, the army had priority in meeting its needs, which has not been the case for a long time in the conditions of a market economy, and there are even opposite tendencies, in the sense that certain manufacturers avoid doing business with the defense system. Supply, as one of the most important functions of logistics, certainly follows market trends and adapts to all changes that are almost daily. The main source of food supply for the defense system is the market of the Republic of Serbia. Hence the importance of its study and research, because the possibility of timely and sufficient supply of units and institutions of the defense system depends on the dynamics of the market. Effective execution of supply also saves financial resources, which is always of great importance with the defense system.

The problem of supply on the market and the possibility of supply on the same market in conditions of disruption is the subject of research in this paper. The paper discusses in detail the theories of the supply of food products, which are necessary to understand the specificity of food products in relation to other goods. Because of the specific character of these products, special conditions of circulation arise, which in turn condition the existence of an appropriate market organization. The basic elements of the market, supply and demand, are processed through the presentation of the production possibilities of food products and their consumption in the Republic of Serbia. Prices are formed in the face of supply and demand. Within the framework of the market, the conditions of purchase and sale on the world market were processed, and due to the possible eventual import of food products for the needs of the defense system. Certain market disturbances in the production and trade of food products in the world, which are currently reflected in the market of food products in the Republic of Serbia, and thus also in the supply of the defense system with food products, were considered.

Theoretical consideration of the supply of food products

Everything that can be bought on the market for consumption is classified as food products. Products of varying degrees of technological treatment are used for food, starting from unchanged agricultural products (milk, meat, fish, fresh fruits and vegetables, rice, honey, etc.), and ending with products that have undergone more or less complex technological processing (sugar, oil, biscuits, chocolate, ready meals, jams, some fruit juices, extracts and concentrates of spices, etc.). For these reasons, for the group definition of all these products, there are several related names such as food products, agricultural-food products, foodstuffs or food items. The term foodstuff has the broadest meaning and includes all consumer goods that are introduced into the human body to meet physiological needs, except for medicines that fall into a special category (Milanović et al., 2023). The term food products is usually used in commerce for those foods that can be bought on the market. It is synonymous with the term agricultural and food products. A more detailed definition of food products is that they are living foods of plant and animal origin. Based on the above, the term food products is a common or collective name for all products that are used as food, whether they are processed or unprocessed, as well as for raw materials and various additives used in their processing and processing. One of the specificities of food products is that many of them are used directly for food (fresh fruits and vegetables, etc.) or for the preparation of meals for consumers, so without special technological treatment in industrial or craft processing. This specificity resulted in the division of food products into (Issa et al., 2022):

- raw - unprocessed (agricultural products, hunting and fishing products that are used fresh) and
- industrial - food products.

According to the standard international trade classification (SITC), the product was classified. The most general classification of food products in the Serbian Army is given within the structure of food for daily meals. Seen from the point of view of food classification, all food products used in the diet in the defense system are divided into eight groups, as given in Table 1.

Table 1. Structure of food for military meals

Nu.	Food groups	Food subgroups
1	Cereals	Flour, pasta, rice
2	Vegetables	Dry - beans
		Fresh, canned and dried
3	Meat, fish and eggs	Fresh meat
		Meat products
		Fresh fish
		Fish products
		Fresh eggs
4	Milk and milk products	Fresh milk
		Dairy products

Nu.	Food groups	Food subgroups
5	Fats	Fat, oil, margarine and butter
6	Fruits	Fresh and dry fruits
7	Sugar and sugar-based products	Sugar and products
8	Other	Condiments and beverages

Source: Pravilnik o intendanturi („Službeni vojni list“ br. 31/21)

A more detailed classification of food products was made within the aforementioned 14 subgroups, which form the basis for the grouping of foods in nutrition plans.

The market as the main source of supply of food products in the Republic of Serbia

The market as a place where goods are bought and sold is closely related to trade. Trade affects market movements (formation of supply and demand) and it is connected with the market to such an extent that the problems of the market are also the problems of trade and vice versa (Cvjetković et al., 2021). A market is essentially a set of interrelated elements such as organization, buyers and sellers, space, time, supply and demand, prices and others. Depending on the organization of these elements, we have different markets where different forms of trade operate. This is how we distinguish trade adapted to wholesale trade, retail trade and purchase of goods. The market and the trade network perform their functions through organizational forms: wholesale (wholesalers), retail (retailers) and wholesale and retail (gross-retailers). In order for agricultural products to appear on sale after certain processing, it is necessary that the primary products be purchased from the producers (Krstić et al., 2022).

Table 2. Sale and purchase of agricultural, forestry and fishing products in the Republic of Serbia

Name	2019. (t)	2020. (t)	2021. (t)	2022. (t)
Wheat	1.136.549	1.338.757	1.601.286	1.359.404
Corn in the grain	2.907.065	3.058.364	1.783.471	1.349.793
Potato	34.436	50.361	52.434	33.282
Beans	94	121	92	145
Onion	13.767	15.923	13.135	18.084
Cabbage	16.809	18.695	15.852	15.991
Apples	172.516	146.764	172.132	134.040
Beef	35.755	39.154	37.494	31.294
Piglet	3.902	3.622	3.525	2.332
Fattened pigs	136.068	133.912	117.209	86.915
Lambs	1.832	2.355	4.639	4.571
Broiler chickens	53.514	43.301	17.892	22.809
Consumable eggs (thousand pcs.)	553.810	530.453	594.919	681.148
Cow’s milk (thousand lit.)	848.484	874.270	858.360	790.575
Freshwater fish	4.601	3.712	6.646	4.604

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

In the trade of agricultural products, the existence of a purchasing trade network is characteristic, due to the fact that in agriculture there is a large number of individual producers, scattered over a wide area. Accordingly, there is a large number of business entities that deal with purchases at their purchase stations and forward purchase departments (Lepojević & Samardžić, 2022). The following participate in the purchase of surplus agricultural production: specialized purchasing trade companies, agricultural cooperatives and food industry companies.

Wholesale trade is organized and carried out in the wholesale trade network. In the wholesale trade mechanism, a specialized buying trade network sells agricultural products to a wholesale trade network (wholesalers). These companies shape their product stocks according to the type and purpose of the goods, in order to distribute them to the appropriate sales markets (Nadoveza & Pešić, 2020). Retail trade (retailers) appears as the last participant in this turnover. The bearers of the first stage of product turnover on the way from the producer to the consumer are usually wholesale trade companies. In wholesale trade, in addition to institutional wholesale trade, other subjects are engaged, especially agricultural cooperatives and food industry companies. Agricultural producers are sometimes directly associated with the food industry, which in some cases is also owned by them, as well as with retail trade. The existence of a retail network owned by the manufacturer implies their regular supply with a wide range of products, which often exceeds the capabilities of the parent company. The involvement of other subjects in the trade did not eliminate the wholesale trade. It exists in circulation thanks primarily to the unification of the needs of retail trade, large consumers (e.g. the Serbian Army, health and social protection organizations, etc.) and processors (Jeločnik et al., 2022).

As the advantages of wholesale trade, its collection and assortment functions stand out. The wholesale trade supplies the retail trade to a greater extent than the manufacturing industry. This is especially pronounced with fruits and vegetables. When selling grain, it is aimed at the food industry, considering that it is the basic material for reproduction in the mentioned industry. Wholesale organizations generally purchase food products directly from producers or through purchases from individual agricultural producers (Žutinić & Zrakić Sušac, 2021). They are directed to a greater extent to the supply of retail trade than to the supply of the processing industry. Wholesale trade in the Republic of Serbia does not show sufficient readiness to develop its own retail network. On the other hand, we have a problem in the fragmented character of agricultural production, which came to the fore even more with the liquidation of large agricultural combines. In such conditions, it is normal to expect a large role of wholesale institutions, both in purchasing and in the domain of sorting, exporting, retail supply, etc. In order to modernize the wholesale trade in food products in the Republic of Serbia, it is necessary to build a large number of appropriate distribution centers, wholesale markets and stock exchanges. Trade in the Republic of Serbia needs a turn from its strictly distribution role to a true marketing role. The wholesale trade sector should experience the greatest degree of transformation. Large wholesale organizations with adequate distribution and storage capacities, which are marketing oriented, are necessary.

Agricultural production in the Republic of Serbia

Agriculture is of great importance in the development of any country. As an economic activity, it has specific features and importance in relation to other economic branches. The development of agriculture is characteristic because its share in the national product decreases from year to year with a simultaneous decrease in the agricultural population. This legality is also expressed in the agriculture of the Republic of Serbia. The share of agriculture in the creation of the social product is an indicator of the level of overall socio-economic development of each country. When it comes to the economy of the Republic of Serbia, this indicator shows a low level of development compared to highly developed market economies. The share of the agricultural population in the total population has so far been higher than the share of the social product of agriculture in the total social product (Ivanova & Ristić, 2020). A change in that ratio represents a relative increase in agricultural productivity. Agriculture of the Republic of Serbia makes a significant contribution to the positive effects in foreign trade exchange because it achieves a positive trade balance. The importance of agriculture is invaluable, primarily because of its role as a producer of human food. Apart from food, raw materials for some industrial branches are also produced in agriculture, and it is also a relevant market for numerous non-agricultural products of industrial origin (Klincov et al., 2022). The Republic of Serbia has about 3.8 million ha of agricultural land and is characterized by a significantly larger agricultural area per inhabitant (0.57 ha) than the European average (0.28 ha). A significant part of these areas falls on highly productive soils (chernozem and clay loam), which are located mainly in lowland areas. These areas are characterized by a relatively long vegetation period and a high number of hours of sunshine. Insufficient rainfall is a limiting factor in achieving high and stable yields in the most fertile agricultural regions. An adequate irrigation system has not yet been built in these regions. In hilly and mountainous areas, shallow and erodible soils prevail, with moderate to significant limitations for cultivation. From the perspective of the long-term strategy of agricultural development, it is necessary to take appropriate soil protection measures. In addition to negative phenomena, compared to most other countries, the Republic of Serbia is characterized by very favorable climatic, pedological and other natural conditions for the development of diverse, high-quality and highly productive agricultural production.

In an open market economy, a prerequisite for the adequate use of abundant land resources is the complete abandonment of extensive methods of production[6]. Otherwise, agriculture becomes a burden on the economy, instead of being one of the most important levers of the country's economic development (Vasić, 2022). Achieving progress in this area is conditioned by the elimination of limitations of a structural, technical-technological and organizational nature. Limitations include the large fragmentation of family farms, the low level of general and professional education of agricultural producers, insufficient development of the advisory service, solving the liquidation

6 Extensive production methods are characterized by high investment of labor, land, material inputs per product unit, i.e. high production costs.

procedures of former large agricultural combines, etc. Increasing the efficiency of the use of production factors must take precedence over forcing the growth of agricultural production (Zekić & Brajković, 2022). The Republic of Serbia as a whole, viewed through domestic production, meets its own needs for basic agricultural products: wheat, corn, sugar and fruit. In addition to such positive developments, the fact remains that the Republic of Serbia has more imports than exports for a large number of products (fresh vegetables, meat and meat products, fresh fish, milk and dairy products).

Wheat yields vary depending on natural conditions, primarily due to the small areas that are irrigated (Živković, 2022). In 2022, wheat production was realized on an area of about 630,000 ha with an average yield of 4.9 t per ha. The achieved production satisfies the total needs of the population, and a part remains for livestock feeding, reproduction (seeds) and for export. The current production of barley and oats meets the needs of the industry for the production of animal feed and the production of beer. The expansion of the production of the mentioned crops to hilly and mountainous areas filled the gap in demand that existed in the previous period. In 2022, barley was produced on an area of about 94,000 ha with an average yield of 4.8 t per ha, and oats on an area of about 14,500 ha with an average yield of 2.9 t per ha. In recent times, maize is the export product of the Republic of Serbia, and from an economic point of view, it is the most important grain product. About 35-40% of the total corn production is used for feeding livestock. Newly created high-yielding varieties created in our institutes can provide a stable and significantly higher production compared to the existing ones. In 2022, corn production was realized on an area of about 950,000 ha with an average yield of 4.5 t per ha.

Table 3. Grain production in the Republic of Serbia (thousand tons)

Year / A type of grain	2019.	2020.	2021.	2022.
Wheat	2534	2873	3442	3109
Rye	12,9	15,2	18,6	17,8
Barley	373	490	554	452
Oats	56,2	52,1	55,9	42,2
Corn	7344	7872	6027	4283
In total	10.320,1	11.302,3	10.097,5	7.904

*Source: I*nternet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Sugar production meets domestic needs, and in recent years, exports have also stabilized. From a country that was an importer in the past, today the Republic of Serbia is an exporter of sugar. Edible oil is also an export product in the Republic of Serbia. The production of sunflower, soybean and rapeseed as raw material for oil production has been stabilized for many years.

Table 4. Production of industrial plants in R. Serbia (thousand t)

Year / A type of herb	2019.	2020.	2021.	2022.
Sugar beet	2305	2018	2048	1667
Sunflower	729	636	607	643
Canola oil	84,3	73,6	73,5	87,8
Soy	700	751	540	398

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

When it comes to vegetables, the production of potatoes as one of the basic foodstuffs has been in decline for years and does not meet the needs of the population, so the solution was found in imports. The production of potatoes in Serbia is accompanied by a small number of warehouses and poor storage conditions that do not suit this crop. The production of beans does not meet the needs of the population, so the missing quantities are provided by imports. The situation with other types of vegetables for human consumption is the same or similar as with potatoes and beans, with the exception of onions and peppers where the amount of imported vegetables is negligible compared to the amounts exported.

Table 5. Production of vegetables in the Republic of Serbia (thousand tons)

Year / A type of vegetable	2019.	2020.	2021.	2022.
Potato	702	664	613	523
Beans	9,1	9,2	8,9	7,9
Peas	25,6	27,6	23,7	21,1
Onion	29,5	33,1	37,3	35,1
Cabbage and kale	178	179	185	165
Paprika	118	106	147	144
Tomato	111	103	135	148
Melons and watermelons	163	141	145	183

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

The areas under orchards are increasing every year, and yields and total production depend significantly on irrigation and the degree of application of agrotechnical and protection measures. The demand for these products is constantly increasing, both on the domestic and foreign markets, and with it the possibility of further increasing production.

Table 6. Production of fruit and grapes in the Republic of Serbia (thousand tons)

Year / A type of fruit	2019.	2020.	2021.	2022.
Apples	499	489	513	486
Pears	54,8	67,1	55,9	59,7
Quince	11,1	11,1	10,4	10,8
Plums	558	582	412	488
Cherries	17,1	14,9	15,8	22,9

Year / A type of fruit	2019.	2020.	2021.	2022.
Cherries	97	165	155	164
Apricots	40,9	30,5	31,3	44,3
Peaches	48,2	41,4	30,8	31,8
Nuts	8,8	8,4	7,6	11,8
Grapes	163	160	155	162

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

In recent years, livestock has stagnated or declined, which has a negative impact on meat production and imposes the need for imports. The stabilization of livestock and poultry production depends on the increase in the production of animal feed and the ratio of the price to the market price of live fattening livestock. Regarding the production of fresh fish, our country has favorable conditions for the profitable production of carp and trout, but additional investments in capacities are necessary in order to reduce dependence on imports. Mass production of poultry and pork is necessary to satisfy domestic consumption, and greater production of beef and mutton for export to foreign markets is necessary.

Table 7. Meat production in the Republic of Serbia (thousand tons)

Year / Kind of meat	2019.	2020.	2021.	2022.
Beef	71	75	77	79
Pork	298	299	307	299
Sheep	34	31	31	31
Poultry	114	115	111	116
In total	517	520	526	525

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Table 8. Production of crude fat in the Republic of Serbia (thousand t)

Year / A type of fat	2019.	2020.	2021.	2022.
Beef	2	2	2	2
Pork	27	27	28	24
In total	29	29	30	26

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Stable milk production is directly dependent on the purchase price and subsidies that the state will provide to individual agricultural producers. The fact is that the number of cows and heifers is decreasing year by year, which automatically affects milk production, so their number is three times lower today compared to 2002. Continuous purchase of milk at a price that ensures normal reproduction will encourage producers to increase the number of cows.

Table 9. Milk production in the Republic of Serbia (million l)

Year / Kind of milk	2019.	2020.	2021.	2022.
Cows	1509	1495	1473	1425
Sheep	11	9	10	9
In total	1520	1504	1483	1434

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Table 10. Production of chicken eggs (million pieces) and honey (t)

Year / Product type	2019.	2020.	2021.	2022.
A hen's egg	1775	1706	1711	1632
Honey	7600	6838	7438	14228

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

The food industry as part of the development of agricultural production in the Republic of Serbia

The food industry in modern economic conditions represents the basic strength of the development of primary agricultural production. The increase in market demand for processed agricultural products encourages the development of the food industry, so that today in developed countries it processes more than 70% of agricultural products (Cao et al., 2022). The food industry of the Republic of Serbia participates in the total industrial production with about 21%, and together with agricultural production, this sector participates in the formation of GDP with 10% to 13%, depending on the observed year. It is a pure food industry, without the production of animal feed and tobacco processing. The food industry, with some exceptions, relies on raw materials from domestic sources, and in exports compared to other branches, it achieves the highest net foreign exchange effect. This industry has modern processing capacities and infrastructure for receiving, storing and maintaining the quality of agricultural products and is a natural integrator of primary agricultural production (Friedman & Ormiston, 2022). Currently, after the realization of the privatization of agro-industrial combines and other production and processing capacities, the food industry is in the phase of technical-technological modernization and structural adjustment.

Today, the Republic of Serbia has significant capacities and storage space in the food industry, which are capable of processing almost all types of agricultural products. The food industry sector is labor-intensive and employs over 70,000 people in 3,907 economic entities. The share of building colors by individual processing activities in the total number of food industry facilities is proportional to the participation of individual basic agricultural branches in total primary production. The largest share is the capacity for meat and milk processing. Within the total number of buildings, there are also outdated ones with a small volume of production, but there are also modern large-scale industrial capacities, such as export slaughterhouses, sugar mills, oil mills,

dairies, cold stores, etc. The capacity of the food industry is unevenly equipped. In each group there are companies that are at the very top of technical and technological equipment and have highly educated staff of world quality, but there are also companies that are technologically far behind. Involvement in new market flows, which started with the processes of ownership transformation (privatization) at the beginning of this century, took place in two ways (Stranieri et al, 2021):

- Cooperative type of building relations between agricultural producers, processors and traders of agricultural products and
- Through the entrepreneurial type of rule from above, where entrepreneurs in the framework of trade and processing control all phases of production and turnover.

The cooperative type of agro-industry development is based on the influence of agricultural producers on the work and operations of the organization, due to the fact that they participated in the construction of processing capacities as a condition for the finalization of their products. In our country, however, the second type prevailed, where the main influence is exerted by companies of the processing industry, traders, specialized transport and other companies, where they act from the top down and in this way control all phases of work and fertilization of invested capital (Saberi et al., 2019). These are corporations and multinational companies that control the entire production, finalization, transportation and sale of agricultural and food products. In the current conditions of the ownership structure, the food industry and agriculture must connect with each other and find a form of organization and cooperation that will unite producers of small and medium-sized enterprises and cooperatives with large enterprises or unite them into cooperative-type organizations.

Table 11. Production of food products in the Republic of Serbia (t)

Year / Product type	2018.	2019.	2020.	2021.
Sausage products	68264	69838	66774	64470
Canned meat	18679	17739	17586	15477
Fruit and vegetable juices	178876	170830	147297	156946
Jams, jams and marmalades	3868	2932	2296	2918
Refined vegetable oils for food	173924	174741	157054	161695
Margarine and hydrogenated vegetable fats	33870	29826	29084	31790
Cheeses	37506	36996	36381	36870
Cocoa, chocolate, etc. products	41196	37311	35307	36429
Flour	490000	468000	466000	431000
Refined sugar	361000	246000	330000	329000
Food for breeding animals	1304000	1299000	1352000	1299000

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Table 12. Beverage production in the Republic of Serbia (thousand hl)

Year / Product type	2018.	2019.	2020.	2021.
A beer	5654	5715	5396	5556
Mineral waters	/	7362	6910	7450
Other soft drinks	/	7105	7023	8387

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Optimal level of consumption and price analysis of food products in the Republic of Serbia

Domestic demand for food products is influenced by several factors: demographic (population), economic (household income) and cultural and historical. Producers and retailers of food products face numerous challenges that occur as a result of demographic changes: the aging of the nation, the increase in the number of single parents and single-person households, the increase in the number of employed women (Liu & Li, 2020). Long working hours are fueling demand for prepared foods, a category that has seen significant growth since the 1980s. In the Republic of Serbia, as in other transition countries, the share of food costs in household income is high and amounts to 30 to 40%, in contrast to developed countries where this share is far less and amounts to 7 to 15%. With the increase in household income, expenses for food also increase in absolute terms, but their share in the family budget decreases. Cultural-historical factors refer to eating habits that are passed down from generation to generation. The economic crisis and all the events in the previous period (the COVID-19 pandemic, the armed conflict in Ukraine and inflation at the global level as a result) have undoubtedly changed the level and structure of consumption, reducing the consumption of quality foods, while in the coming period, assuming the normalization of political and economic circumstances, an increase in the consumption of more expensive products, predominantly of animal origin, can be expected (Biswas et al., 2022).

Table 13. Consumption of food products in the Republic of Serbia by household[7]

Year / Product type	2017.	2018.	2019.	2021.
Rice (kg)	9,7	9,6	9,8	9,8
Flour and products (kg)	86,7	84,7	86,3	86,1
Bread and pastries (kg)	204,5	187,4	178,5	163
Biscuit (kg)	19	18,1	18,6	18,9
Beef (kg)	13,9	16,2	16,8	21,3
Pork (kg)	45,4	47,2	49,6	49,9
Poultry meat (kg)	50	48,6	50,2	47,2
Cured meat products (kg)	38,9	38,6	37,4	38,1

7 The average number of household members in the Republic of Serbia is 2.65. The research for 2020 has not been done.

Year / Product type	2017.	2018.	2019.	2021.
fish (kg)	11,7	11,2	10,1	8,5
Milk (l)	116,2	102,6	97,4	90,8
Eggs (pc)	590	589	600	585
Edible oil (l)	32,9	31,2	32	29,2
fat (kg)	6,2	6,5	5,9	6,7
Citrus fruits (kg)	22	25,1	23,9	26,8
Bananas (kg)	24,8	27	25,9	25,2
Apples (kg)	32,6	29,2	31,4	30,5
Grapes (kg)	6,7	6,5	6,2	6,8
Potatoes (kg)	89,8	86,8	81,4	79,8
Cabbage (kg)	47,7	45,2	46,3	41,6
Tomatoes (kg)	38,9	37	38,3	31,7
Beans (kg)	12,5	12	11,6	11,2
Black and garlic (kg)	34,2	33,6	35,8	33,5
Sugar (kg)	30,6	29,9	29,3	25,3
honey (kg)	2,2	2,3	2,3	2,4
Chocolate (kg)	3,7	3,6	3,7	3,6
Fruit juice (l)	45,7	42,5	41,8	35,6

Source: Internet stranica Republičkog zavoda za statistiku: www.stat.gov.rs

Forms of price control during the past years and decades in the Republic of Serbia have been changed very often: from prescribing the highest level, determining the way of education, to liberalization and attempts to control with economic instruments. Even in the SFRY until 1986, the prices of sugar, cooking oil, flour and bread were under the strictest price control regime (prescribing the highest allowed level). Full price liberalization came into force only in 1989. In a market economy, prices are formed on the market based on supply and demand. Prices are the most important element of agricultural policy. The price policy should provide the basic parameters for the production orientation, on the one hand, and on the other hand, it is a significant factor affecting the living standard of the population. That is why price policy in agriculture is a serious concern of the state.

Due to the specificity of the agricultural and food products themselves, the state is often in a situation to intervene in the price policy sector in different ways and to different extents. The system and price policy of agricultural and food products is based on: the principle of free education of (market) prices according to market conditions, the regime of protective prices and the regime of indicative (indicative) prices. Protective (guaranteed) prices can be established for strategic agricultural and food products. They are applied in the event that producers cannot sell their products on the market at prices higher than the protective prices. It is a guarantee that the producer will be recognized for his investments, at least for ensuring simple reproduction and minimal profit. Protective prices are usually established for cereals, industrial crops, potatoes, beans, apples, plums, grapes, live cattle, pigs, sheep and milk. Products are sold at the price

that is formed on the market, and in the event of a sudden drop in prices due to higher supply, the Republic Directorate for Commodity Reserves buys certain quantities at a guaranteed price. It then delivers these products to the processing industry or gives them to mills, stores them in silos and other storage areas. In addition to protective prices, the state can, if necessary, determine maximum prices for certain basic food products (flour, oil, sugar, bread, meat, milk). These are the prices at which certain food products can be found in retail. The goal of determining these prices is to establish a rational relationship between the price of the primary product and the price of the final product on the market, in cases where this relationship is in great disharmony, due to the disorganized market, the existence of monopolies and many intermediaries that appear from producers to consumers.

Market disturbances and their impact on the supply of food products

The most significant drivers of food market disruption may vary depending on various factors, including region, economic situation and specific market conditions. However, some of the general factors that can affect food market disruption include (Behnke & Janssen, 2020):

- inflation, because high inflation can lead to a general increase in prices, including the prices of food products. This may be due to increased costs of food production, transportation and distribution.
- fluctuations in the prices of raw materials, because the prices of raw materials such as grains, sugar, oil and meat can be subject to fluctuations on the world market. Changes in these prices can affect the prices of food products, especially if these raw materials are used as basic ingredients.
- trade policies, including tariffs and quotas, as well as regulatory requirements and standards that may have an impact on the prices and availability of food products. Restrictions on imports or exports can affect food supply and lead to market disruptions.
- economic factors, and above all macroeconomic factors, such as high unemployment, low incomes of the population and a weak economic situation that can limit the purchasing power of consumers and affect the demand and prices of food products.
- weather conditions and natural disasters, where extreme weather conditions such as droughts, floods or storms can adversely affect agricultural production, damage crops and food storage infrastructure, leading to reduced supply and increased prices.

It is important to note that these factors may be interrelated and that their impact may differ in different time periods and geographical areas. The agricultural and food sector has extremely important dimensions, so its success in the fight against challenges such as high prices of food and raw materials (especially fertilizers) will be crucial, because

global food security, and thus political stability, is threatened. High energy prices increase the input costs of agricultural production, which reduces farmers' profits. The agri-food sector is also sensitive to various structural factors, from biological risks to climate change. Another can be seen, for example, by the great heat and consequent drought that have ruled various parts of the world (Horn of Africa, India, etc.) since the beginning of the year, as well as large fires (such as Mexico, USA,...). All the above-mentioned factors follow the contracting and procurement procedures of food products for the needs of the Serbian Armed Forces. This decade is characterized by a number of phenomena that had or still have a global impact on the production and trade of food products, and above all, the COVID-19 pandemic and the armed conflict in Ukraine, which is still ongoing and shows no signs of ending soon, stand out. As a consequence of the above-mentioned armed conflict, the first impulse that caused a disturbance in the market of food products, which also affected the supply of the Serbian Armed Forces, was reflected in the following (Azzi et al, 2019):

- difficult or sometimes completely impossible supply of raw materials for canning food products, and above all tin for making cans,
- the impossibility of importing raw materials for the production of cardboard packaging for packaging food products,
- the difficult and complicated process of importing raw materials for the food industry due to the huge costs of forwarding and the impossibility of organizing the safe movement of transport capacities along regular transport corridors until the outbreak of an armed conflict.

All of the above affects the final price of food products, for which in the previous period the holders of contracts for the needs of the Serbian Armed Forces received justified requests from suppliers with whom contracts were signed, to correct the prices of certain food items, all in accordance with Article 158 of the Law on Public Procurement, and there were also individual cases of contract termination. Every company that has participated in the public procurement process knows that its preparation and implementation take a long time, often even months for larger procurements. That is why the question arises as to how inflation and daily price changes in Serbia and the world affect bidders, but also job orderers, and whether both can protect their business from devaluation. All of this becomes even more important if one takes into account that framework agreements are concluded for a period of 2-3 years for many food products.

Alternative solutions for supplying the defense system with food products in conditions of market disruption

Bearing in mind the supply organization system in the Serbian Army, it can be concluded that the storage function is very important. In order to perform this function, it is necessary to have the appropriate storage space, which the Serbian Army has at its disposal. It is precisely these elements that represent the comparative advantage of the Serbian Armed Forces when supplying food products in conditions of disruptions on

the market. In conditions when there is not a sufficient amount of goods on the market, the Serbian Army is not forced to make purchases at the same time, because it can rely on its own reserves. Of course, this is not an adequate solution and is not applicable in the long term, because the procurement will still have to be carried out at some point. Procurement in such conditions will either not be possible or will be done at very high prices. The reason against strict reliance on the application of this solution is the storage costs, which are certainly not negligible. The existence of optimal quantities of food products at all levels in the Serbian Army is still a good form of protection against short-term market disturbances. In case of insufficient supply of some food products, the Serbian Army has the option of using the republic's commodity reserves, which was the case in the past, in the form of a loan. This item represents the most important link in the supply in the event that the capacities of the reserves of food items in the Serbian Army are exhausted.

The solution for supply in conditions of disruptions on the market can be the interventional import of food products that are missing on the domestic market. The state certainly resorts to this measure in order to stabilize market disturbances. The Serbian Army, as a state institution, has priority in such imports. This implies that it has the advantage of taking certain quantities of critical food products before they enter the market. All these measures, by which we mean reserves of food products in the Serbian Army, the use of the Republic's commodity reserves and eventual intervention imports, have been used in practice in the past and have proven to be good solutions. A higher degree of security in the supply of food products at the state level, including the Serbian Army as part of it, could be achieved by applying the so-called marketing concept. The marketing concept means purposeful production, i.e. the production of those goods for which there is a demand on the market. The general setting of the marketing concept is that both parties are satisfied, both the consumer (in this case the Serbian Army) and the producer, i.e. the trader.

In the conditions of market disturbances, the Serbian Army can consider several alternative solutions for the supply of food products. Here are some possibilities:

- reducing dependence on external sources: The army can increase its own food production through military farms or cooperate with local farms to provide part of the required food. This can reduce dependence on external sources and ensure continuous supply.
- creation of strategic food reserves: The military can establish strategic food reserves that are kept for emergency situations or periods of market disruption. These reserves can be canned or frozen to extend their shelf life.
- diversification of supply: Instead of relying on a single source of supply, the military can diversify its food suppliers. This may include establishing contracts with multiple suppliers to reduce the risk of supply disruptions.

- strengthening of logistics capacities: the Serbian Army can invest in logistics capacities and infrastructure in order to ensure an efficient supply of food products even in conditions of market disruption. This may include improving storage capacity, transportation networks, and information systems for inventory tracking.
- development of business continuity plans: The Serbian Army can develop business continuity plans that foresee scenarios of disruptions in the food market. These plans should include the identification of alternative sources of supply, procedures for managing food reserves, and mechanisms for monitoring and responding to changes in the market.

Conclusion

Bearing in mind the importance of the market in supplying the Serbian Army with food products and the influence of numerous factors on the imbalance of supply and demand, it was necessary to carry out appropriate market research and define the most influential factors. Apart from the market, the organization of supply in the Serbian Army is also of great importance.

The market is the main source for supplying the Serbian Army with food products. In the Republic of Serbia, it is unique, and prices are formed under the influence of supply and demand. The offer is represented by agricultural products that go into circulation unprocessed, as well as products of the food industry. The ratio of supply and demand, i.e. production and consumption, indicates self-sufficiency in most food products in the Republic of Serbia. Serbia. There is a bigger deficit only in rice, fish, vegetables and southern fruits. The state is the main regulator of the market and, in case of need, influences through the price system (protective and maximum prices), as well as by providing incentives for the cultivation of certain plant crops and types of livestock. Measures to protect the domestic market include the regulation of import quotas and levies. As far as the world market is concerned, there is an increased turnover of processed products compared to primary products.

The most influential factors that create market disturbances can be global or local in nature. The main influence is the economic crisis with all its causes and consequences, the decline in production, inflation that affects price growth, as well as the lack of investment in agriculture and the food industry. Disruptions are often artificially caused by the interests of big capital, but also sometimes by bad state economic policy measures, as well as low purchase prices of primary agricultural and food products in order to protect the living standards of the population. Solutions for supply under these conditions are primarily adequate reserves in the capacities of the Serbian Armed Forces, which can be used to intervene in the event of short-term disruptions. In those situations, the Serbian Army can use the republic's commodity reserves in the form of a loan, and there is also the possibility of the state resorting to interventional imports in case of need. For the supply of food products during a longer period of market

disruption, one of the solutions can be agricultural production within the military institutions, which operate as income institutions within the Ministry of Defense of the Republic of Serbia.

Conflict of interests

The authors declare no conflict of interest.

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Acknowledgements

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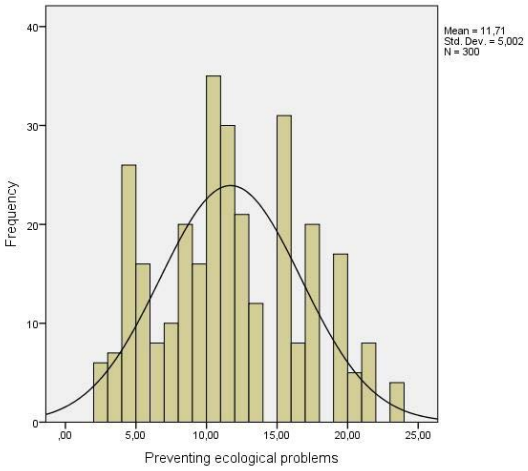
Table 1. The distribution cost of packaged goods from Subotica to retail-store objects

Indicators	Period			Total
	Month 1	Month 2	Month 3	
Distance crossed (km)	12.926	11.295	13.208	37.429
Fuel consumption (litre)	3.231	2.823	3.302	9.356
Value of fuel consumption (RSD)	242.378	211.790	247.653	701.821
Total time spend on touring (hour)	314	266	417	997
Value of total time spend on touring (RSD)	47.048	39.890	62.570	149.508
Number of tours	98	77	102	277
Toll value (RSD)	0	0	0	0
Number of pallets transported (piece)	1.179	976	1358	3.513
Total weight transported (kg)	602.600	429.225	711.116	1.742.941
Vehicle maintenance costs (RSD)	203.858	164.970	224.806	593.634
Lease costs (RSD)	480.938	454.214	565.784	1.500.936
Total sum (RSD)	974.222	870.864	1.100.813	2.945.899

Source: Petrović, 2012

All illustrations whether diagrams, photographs or charts are referred to as Figures. The name and number of figures should be centered on the line above a figure.

Figure 1. Agriculture, value added (% of GDP)



Source: Authors' calculations

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