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IDENTIFYING FACTORS THAT AFFECT CHEESE CONSUMPTION AS ESSENTIAL ELEMENTS FOR ADEQUATE PLACEMENT ON THE REGIONAL MARKET

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ABSTRACT

Cheese is a significant agri-food product for many people and the economy. Its manufacture has a long tradition, and its consumption varies according to the specifics of the cultures. Knowing consumers' needs, attitudes, and approaches to consumption is essential in any industry, including the agri-food industry. That is why the subject of this paper is consumer behavior (CB), defining the factors that influence attitudes and intentions in cheese consumption observed at the level of two regions from Southeast Europe: the Republic of Serbia and Montenegro. The CB-Cheese scale was created for research purposes, which proved appropriate for this agri-food product research. The research showed significant differences in the behavior of the consumers of these two markets and that the consumption of cheese increases with the level of income. Special attention is paid to the quality of the product and its compatibility with the price. The obtained data provide clear guidelines for adequate placement in the regional market.

Introduction

Commencing with its definition is crucial when debating cheese as a well-known and significant category of agri-food products in the human diet (Tendero, Bernabeu, 2005; Fox et al., 2015; Guine, Florenca, 2019; Ferreo, Guine, 2019; Šmugović et al., 2021; Ivanović et al., 2022). Cheese is a dairy product that is obtained through the process of coagulation and fermentation. The diversity in production technology is enormous, varying in the types of milk used, production operations and technologies, milk cultures, ripening time, as well as conditions, giving the final products a wide range of characteristics such as taste, texture, color, shape, and size (Fox et al., 2015; Guine, Florenca, 2019; Ferreo, Guine, 2019; Ivanović et al., 2022; Zheng et al., 2021; Najera et al., 2021; Skalkos et al., 2023; Stošić et al., 2023). The primary goal of cheese production is to preserve the main nutritional ingredients from milk while establishing certain sensory characteristics. Thanks to the progress of the food industry, cheese has managed to evolve, so that it has become a food of haute gastronomy, with an association with products of superior quality (Fox et al., 2015; Guine, Florenca, 2019; Ferreo, Guine, 2019). According to its characteristics, cheese belongs to a neutral group of foods that fully corresponds to the principles of proper nutrition (Dekker et al., 2019), and its properties make it almost indispensable to the human diet. In addition to belonging to the group of highly valuable foods that have an exceptional nutritional value, this group of agri-food products has exceptional economic importance for world trade (Guine, Florenca, 2019; Ferreo, Guine, 2019; Pantić et al., 2021).

Observing consumption in the context of consumer behavior (further BC) when it comes to this group of agri-food products, it is essential to emphasize that they are in households consumed by a large percentage of the population, with the fact that its consumption is frequent, but in small quantities, which results in low consumption per capita. The research showed that socio-economic and demographic factors greatly influence consumers' consumption of dairy products because the higher social classes in European countries consume more cheese than the lower classes (Prättälä et al., 2003). Given that recent research on this topic has not been done, the need for this research arises.

This paper explores the factors that have an impact on BC and consumer preferences, that is, intentions to consume cheese as an important agri-food product in the diet of the population and the dairy industry. The study was carried out in two Southeast European regions: the Republic of Serbia and Montenegro. The information gathered will help clarify cheese consumption and offer recommendations for how it should be offered in the local agri-food market in the researched regions.

The research task is to examine BC and the factors that influence their choice, with the aim of achieving successful placement within the selected localities.

Q_1: What is the agri-food market's profile of cheese consumption in both regions?

Q_2: Are there any differences in BC?

Q_3: Which factors influence BC, i.e., cheese procurement in both afri-food markets, and are there any differences?

Cheese consumption

A large amount of research on BC and cheese as an agri-food products consumption has not been done recently, except for some whose concepts and results are mentioned in the rest of this paper (Schmitt et al., 2016; Scozzafava et al., 2020; Maceín et al., 2019; Petković, Užar, 2020; Echeverría et al., 2021). What was a particular challenge was to research data on BC in terms of cheese consumption in the territory covered by this research (R. Serbia and Montenegro) because such data are very scarce (Paskaš et al., 2020), regardless that cheese belongs to agri-food products consumed by a large part of the population in their households (Tendero, Bernabeu, 2005). In addition to the large and economically significant production of industrial cheeses, the traditional production of cheeses, which makes them unique, carries with it a certain social significance, making them an important part of cultural heritage (Zheng et al., 2021; Najera et al., 2021; Šmugović et al., 2021; Ivanović et al., 2022; Skalkos et al., 2023).

The research conducted by Miloradovic et al. (2022) showed that consumers from different countries have different preferences for cheese depending on the type and different ways of consuming it. The highest consumption of cheese per capita is achieved in Europe. In 2022 alone, cheese consumption in European Union countries reached 20.96 kg per capita, which brought the USA and Canada to second and third place with

a consumption of about 17.8 and 14.85 kg. During 2022., about 9.4 million metric tons of cheese were consumed in the European Union, which far exceeded the consumption in other parts of the world, among which we should mention China, which has three times the number of inhabitants and whose consumption of cheese amounted to about 409 thousand metric tons (https://www.statista.com/statistics/527195/consumption-of-cheese-per-capita-worldwide-country/).

Profile of cheese consumer behavior and cheese consumption

The industries that produce cheese are trying to meet the consumer's needs and increase consumption, which is why frequent research is conducted to obtain highly valuable information to meet their demands (Tendero, Bernabeu, 2005). Investigating the profile of cheese consumers, it was found that among the dominant buyers of this group of dairy products are women (Perez et al., 2014), and these are women who manage larger households, who are university-educated, and are 40 years old and older (Davis et al., 2011; Sánchez-Villegas et al., 2003). The same profile of respondents is also related to the willingness to pay for different types of cheese (Scozzafava et al., 2020).

Research conducted by Pérez et al. (2014) showed that 35% of respondents consume cheese three times a week and that cheese consumption is related to the consumption of sandwiches. Statistics have shown that American consumers mostly use cheese (in grated form) in recipes such as pizza, quesadillas, and the well-known macaroni and cheese (https://www.statista.com/statistics/527195/).

Its acquisition or purchase is most often realized in supermarkets and hypermarkets (Tendero, Bernabeu, 2005**)**, even though a large number of specialized stores appear on the market that sell premium products (Calvo-Porral et al., 2017). The research has shown that the suggestion to serve cheese influences the purchase because there is a significant relationship between the decision to purchase and proper nutrition (Rebolla et al., 2016). Semi-hard and hard cheeses should be singled out here because they belong to the group consumed daily worldwide (Guine, Florenca, 2019; Ferreo, Guine, 2019).

In the territory of the Republic of Serbia, the focus was on the consumption of goat's milk cheese, where it was noted that the acceptability of dairy products was significantly lower compared to others, regardless of the fact that this type of cheese is seen as a product with unique health benefits (Paskaš et al., 2020). More detailed research was not done in the Republic of Serbia and Montenegro.

Consumer behaviour

Studies have shown that the main aspects consumers consider before purchasing are the brand (Calvo Porral et al., 2016) and the origin and price of cheese (Pérez et al., 2014). Moreover, Maceín et al. (2019) identified price as the most important criterion when buying cheese. However, the consumer's willingness to pay for cheese depends on factors such as income and prior knowledge of social sustainability, as stated by Echeverría et al. (Echeverría et al., 2021). This is where the protection of cheese labels comes into play because most consumers identify certified cheese with labels of origin and production

as better due to guaranteed stricter quality control (Tendero, Bernabeu, 2005). And consumers are willing to pay more for such cheese (Scozzafava et al., 2020). In the research conducted in Italy and France, in regions famous for producing and consuming cheese, the price is the most important factor that influences consumers' choices. Apart from price, combined quality labels influence consumers' choices, such as origin labels, organic labels, and mountain products (Menozzi et al., 2022). Tendero and Bernabeu (2005) point out that in the choice of cheese among regular consumers, the type of cheese is the most important factor, followed by the price, and finally, the certification, however, among consumers whose frequency of consumption is more sporadic, the guarantee of quality is more important than the price, as in regular consumers.

Protected labels of origin influence consumer purchasing decisions, even though they are premium-priced products (Braghieri et al., 2014). The research showed that consumers value the origin of the product more than the certified protected labels of origin, which is conditioned by the distance between the region of origin of the product and the residence of the consumer, which shows that the importance of certification for consumers increases with the increase of the distance from the region of origin of the cheese (Marcoz et al., 2016).

The place of origin can positively influence cheese selection (Braghieri et al., 2014). The research conducted by Miloradovic et al. (2022) confirmed that consumers appreciate homemade, artisan cheeses from industrial ones more because they deem them healthier and of higher quality. Consumers' willingness to buy traditional cheese is driven by price, suitability, and method of milk processing (pasteurized milk/unpasteurized milk), emphasizing the product's traditional and authentic character (Almli et al., 2011). In contrast, Schmitt et al. (2016) compared local and global cheese supply chains in Switzerland and Great Britain and found that although local cheese was better at creating added value, animal welfare, and biodiversity, global chains were more accessible to consumers and more efficient and had a better performance in environmental indicators (Schmitt et al., 2016), despite the fact that due to the specificity of agricultural production and its products, these products require complex transportation and storage as well as a greater number of intermediaries in their transportation from producer to consumer (Petković, Užar, 2020). Cheese consumers do not have exact opinions and trust in the health safety of cheese that is made by artisan manufacturers (Miloradović et al., 2022). Health awareness about cheeses is another major factor in selection and purchase (Bahety et al., 2022).

The design of cheese packaging is also an essential element, which, as with other products, contributes to improving the perception of the taste of cheese (Veflen et al., 2023). Miloradovic et al. (2022) believe that significant work should be done on improving the proper packaging, labeling, and branding of cheeses, as well as expanding the assortment and greater availability of this group of food products.

Materials and methods

Creation of a questionnaire survey

A questionnaire survey was created based on similar research worldwide (Tendero, Bernabeu, 2005; Mesías et al., 2003) with certain modifications adapted to the market. The questionnaire was structured into four distinct parts. The results of three parts were processed and displayed in this paper:

- The initial section of the survey gathered information on the respondents' age, gender, amount of education attained, and monthly income.
- The second section of the survey collected data on cheese consumption, such as frequency of consumption, quantities, type of consumption, and place of purchase.
- The third section of the survey had to collect data on consumer preferences, i.e., factors driving consumer decisions regarding cheese purchases. For the purposes of this part of the research, a dedicated CB-Cheese scale was created, which consisted of 10 factors whose influence was marked on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). These variables included product quality, product origin (imported or domestic), attractive packaging, clearly indicated expiration date, favorable price, purchase by recommendation, familiarity with the manufacturer, advertising of the product, appearance, and the best price-quality ratio.

Research and survey site

The research included two countries in Southeastern Europe (whose positions are shown in Figure 1), namely:

- the Republic of Serbia (Northern region of Vojvodina - South Bački Administrative District with 607.178 inhabitants) (https://popis2022.stat.gov.rs/) and
- Montenegro (Coastal region with 370.243 inhabitants) (https://www.monstat.org/).

The research was conducted from January 15th to April 15th, 2023. The survey was administered via email after obtaining respondents' consent, ensuring full respect for ethical standards. For research purposes, a survey was sent to 500 (300 in Serbia and 200 in Montenegro) email addresses. 411 were received, of which 370 were processed (226 from the Republic of Serbia and 144 from Montenegro). This number of respondents was considered adequate because it is proportional to the number of inhabitants of the investigated localities.

Statistical data processing

Data collected through questionnaires were organized and analyzed using statistical software R version 4.1.2. Descriptive statistical analysis and the Chi-square test of

independence were applied to the first and second parts of the questionnaire, which addressed the respondents' sociodemographic characteristics and cheese consumption patterns. To identify the factors influencing the decision to buy cheese, explanatory factor analysis (EFA) was performed, followed by confirmatory factor analysis (CFA) to validate the results obtained through EFA. A key assumption for conducting EFA is the presence of correlations between variables, with correlation coefficients above 0.3, which were assessed using the Kaiser-Meier-Olkin (KMO) measure and Bartlett's test of sphericity. Factorial rotation was applied using

Figure 1. Location of researched regions

Author: Đercan, 2023

Varimax rotation with Keiser normalization. The reliability of the study was evaluated using Cronbach's alpha, where a minimum value of 0.6 indicates that the data is suitable for analysis (Hair et al., 2006).

Subsequently, the average variance extracted (AVE) and the composite reliability coefficient (CR) were calculated. These metrics assess the quality of measurement, with AVE representing the proportion of variance explained by a construct in relation to measurement error (Fornell and Larcker, 1981). AVE specifically evaluates convergent validity, which measures the level of agreement between multiple indicators of the same construct. To establish convergent validity, item factor loadings, composite reliability, and AVE values were computed (Hair et al., 2014). Both AVE and CR values range from 0 to 1, with higher values indicating stronger confidence. Convergent validity is confirmed when AVE is greater than or equal to 0.5.

CFA was employed to test and evaluate multiple models of the underlying constructs represented by the questionnaire items, enabling the selection of the most appropriate measurement model (Bryant et al., 1999). Specifically, CFA assessed how well each observed variable aligns with the expected latent constructs. The evaluation also included assessing measurement reliability and validity by considering correlations and variances among the variables. To assess the overall fit of the model, the chi-square statistic (χ^2) was calculated. A significant chi-square value, relative to the degrees of freedom, indicates differences between the observed and expected matrices. To address chi-square sensitivity, the normalized chi-square (χ^2/df) was used, which highlights discrepancies between observed and estimated matrices. A χ^2/df ratio of 5.0 or lower is considered acceptable (Tabachnick et al., 2013).

The Comparative Fit Index (CFI) is a statistical metric used to evaluate the fit of an estimated model by comparing it to a null or independent model. Its values range from 0 to 1.0, where higher values indicate a better fit. CFI is particularly effective for model development methodologies involving small sample sizes (Leesatapornwongsa et al., 2023).

The model's fit is further assessed using the Root Mean Square Error of Approximation (RMSEA). A range of 0.05 to 0.08 is considered indicative of a close fit, while values below 0.05 suggest a strong alignment between the model and the degrees of freedom (Schumacker and Lomax, 2004).

After conducting the factor analysis, the method of multiple linear regression was applied to determine whether the identified factors have a statistically significant impact on GDP growth. Multiple linear regression involves examining the impact of one or more independent variables on a dependent variable. This statistical technique allows researchers to understand the relationship between the dependent variable and several independent variables simultaneously. By including multiple predictors in the model, it is possible to assess the relative contribution of each factor while controlling for the influence of other variables. This method provides a comprehensive analysis of how various factors collectively influence the dependent variable, in this case, GDP growth.

Results

Analysis of sociodemographic characteristics of respondents

The descriptive statistics (*Table 1*) show that 226 respondents from the Republic of Serbia participated in this questionnaire; 109 respondents were male, and 117 were female. The survey in Montenegro included 144 respondents, of which 64 were male, and 80 were female respondents. According to the age structure, the respondents were divided into five age groups where in the Republic of Serbia: the group from 21 to 30 years of age has the highest participation (23.5%), and the group under 20 years of age has the lowest participation (16.8%). Montenegro also had the highest participation of respondents aged 21 to 30 (48.6%) and the lowest participation over 51 years of age (4.9%).

Table 1. Sociodemographic characteristics of the respondents

			Serbia	Montenegro	
Variables	**Categories**	**n**	**Percentage**	**n**	**Percentage**
Sex	Male	109	48.2	64	44.4
	Female	117	51.8	80	55.6
Age	Up to 20 years old	38	16.8	11	7.6
	21-30	53	23.5	70	48.6
	31-40	45	19.9	42	29.2
	41-50	48	21.2	14	9.7
	51 and higher	42	18.6	7	4.9
Level of education	Elementary	9	4.0	1	0.7
	Secondary	77	34.1	50	34.7
	High/university	90	39.8	58	40.3
	Md/PhD	50	22.1	35	24.3
Monthly income	Up to 450 EUR	63	27.9	41	28.5
	451-750 EUR	98	43.4	70	48.6
	751-950 EUR	38	16.8	20	13.9
	More than 950 EUR	27	11.9	13	9.0

Source: Author's interpretation

According to the level of education, in both observed countries, the highest participation of respondents with completed higher school or university (39.8%; 40.3%), while the lowest participation is only 4.0%, i.e., 0.7% of those with completed elementary school. Slightly less than half of the respondents from the Republic of Serbia (43.4%) indicated that they had a monthly income of 451 to 750 euros, while only 11.9% of the respondents indicated that they had a monthly income of more than 950 euros. In Montenegro, the situation is similar as regards the monthly income of respondents: the highest participation (48.6%) of those who have a monthly income of 451 to 750 euros, and the smallest participation (9%) of respondents who have a monthly income above 950 euros.

Analysis of Cheese Consumption

The following examined the consumer characteristics of both regions (*Table 2*). In the Republic of Serbia, slightly more than half of respondents (51.8%) stated that they use cheese once a week, and only 10.2% of respondents stated that they use cheese less than 2-3 times a month. As for the consumption of cheese, the situation is somewhat different in Montenegro, i.e., the largest percentage of respondents (38.2%) declared that they use cheese every day, and the smallest percentage (14.6%) said that they use cheese two to three times a month.

Table 2. Cheese consumption

		Serbia		Montenegro	
Variables	**Categories**	**n**	**Percentage**	**n**	**Percentage**
Cheese Consumption	Every day	46	20.4	55	38.2
	Once a week	117	51.8	46	31.9
	2-3 times a month	40	17.7	21	14.6
	Less often	23	10.2	22	15.3
According to your estimate, how much cheese do you eat on a monthly basis	Up to 100g	19	8.4	12	8.3
	101-300g	50	22.1	26	18.1
	301-600g	76	33.6	33	22.9
	601-1000g	49	21.7	28	19.4
	More than 1001g	32	14.2	45	31.3
How do you eat cheese	As breakfast as a side dish	95	42.0	31	21.5
	As a part of savory dishes	84	37.2	85	59.0
	As a part of desserts	13	5.8	2	1.4
	On its own	18	8.0	24	16.7
	Other	16	7.1	2	1.4
Where do you mostly buy cheese	In supermarkets and shops	156	69.0	93	64.6
	In creameries	28	12.4	10	6.9
	On the market	33	14.6	41	28.5
	Other	9	4.0	0	0.0

Source: Author's interpretation

Regarding the consumption of cheese on a monthly level, respondents from Montenegro are ahead of respondents from the Republic of Serbia, i.e., the highest percentage of respondents from Montenegro (31.3%) stated that they consume more than a kilogram of cheese per month. In the Republic of Serbia, the largest percentage of respondents (42%) declared that they most often consume cheese as breakfast as a side dish. In contrast, in Montenegro, the largest percentage of respondents (59%) declared that they most often consume cheese as an integral part of savory dishes. When asked where they most often buy cheese, more than half of respondents from both countries (69%; 64.6%) stated that they most often buy cheese in supermarkets or stores.

Analysis of statistically significant differences

In the following, the Chi-square test was applied to analyze whether there are statistically significant differences regarding the age category of the respondents, the level of education of the respondents, and their monthly income regarding their monthly consumption of cheese, the way they consume cheese and the type of facility where they most often buy cheese (*Table 3*).

Table 3. The results of the Chi-Square test

	Serbia			Montenegro		
	Age	**Level of education**	**Monthly income**	**Age**	**Level of education**	**Monthly income**
Monthly consumption of cheese	22.224 (p=0.136)	18.178 (p=0.110)	26.726 (p=0.008)	19.418 (p=0.248)	13.906 (p=0.307)	28.204 (p=0.005)
Mode of cheese consumption	37.044 (p=0.002)	11.733 (p=0.467)	14.071 (p=0.296)	17.205 (p=0.372)	18.698 (p=0.096)	23.958 (p=0.021)
Type of facility where the cheese is purchased	6.870 (p=0.866)	13.700 (p=0.133)	7.518 (p=0.583)	12.376 (p=0.135)	9.894 (p=0.129)	6.051 (p=0.418)

Source: Author's interpretation

The Chi-square test results show a statistically significant difference between age categories and cheese consumption patterns in the Republic of Serbia ($p<0.05$). Specifically, respondents under 20 years of age most frequently consume cheese as a side dish for breakfast, while those aged 21 to 50 most often consume cheese as part of savory dishes. A statistically significant difference ($p<0.05$) among respondents in the Republic of Serbia was also noted in terms of monthly income and their monthly cheese consumption. As expected, respondents with higher incomes have higher monthly cheese consumption. Similarly, in Montenegro, a statistically significant difference ($p<0.05$) was observed in the monthly incomes of respondents and their monthly cheese consumption, i.e., respondents with higher incomes have higher monthly cheese consumption. The results from the previous table indicate a statistically significant difference between respondents' monthly incomes and their cheese consumption habits ($p<0.05$). Respondents with lower monthly incomes predominantly consume cheese as a side dish for breakfast or with savory meals, whereas those with higher monthly incomes are more likely to eat cheese on its own.

Factorial analysis - Serbia

Ten research questions were formulated to identify the key factors influencing cheese purchasing decisions (Table 4). The test results indicate that, upon applying principal component analysis to all variables, the total extracted variance was below 50% (46.071%), suggesting the absence of significant bias effects.

Table 4. Descriptive statistics of variables used in factor analysis (Republic of Serbia)

	Serbia	
Variable	**Mean**	**Standard deviation**
Product Quality	4.51	0.855
Origin of the product (imported or domestic)	3.82	1.256
Attractive packaging	3.27	1.249
Clearly stated expiration date	4.09	1.143
Affordable price	3.85	1.090
Recommendation	3.92	1.087
Familiar producer	3.46	1.310
Advertised product	3.21	1.377
Product is appealing	3.95	1.068
The best price and quality ratio	4.36	0.929

Source: Author's interpretation

Observing the variables related to the characteristics of the product on the basis of which respondents make a decision to buy cheese, respondents from the Republic of Serbia mostly agreed that quality is the decisive characteristic they consider when making a decision (Mean=4.513). In addition to quality, respondents expressed the highest degree of agreement with the statement that when making a purchase decision, they consider the best price-quality ratio of the product (Mean=4.367).

Respondents showed the lowest degree of agreement with the statement that when making a decision to buy cheese, they consider attractive packaging (Mean=3.278). and advertised products (Mean=3.217).

Before proceeding with factor analysis, the justification for its application was assessed through the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity (*Table 5*).

Table 5. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of justification of factor analysis (Republic of Serbia).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.874
Bartlett's Test of Sphericity	Approx. Chi-Square	1157.128
	Df	45
	p-value	0.000

Source: Author's interpretation

The Kaiser-Meyer-Olkin coefficient was calculated at 0.874, significantly surpassing the recommended threshold of 0.6 (Hair et al., 2006), indicating that factor analysis is suitable for this set of variables. This was further validated by Bartlett's test of sphericity ($p<0.05$), confirming a statistically significant correlation among the observed variables.

The principal components method was used to identify the factors found in the correlation matrix. After extracting the factors, Varimax rotation was applied, and the values for the two extracted factors were shown (*Table 6*).

Table 6. Total variance explained (Republic of Serbia)

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	5.128	51.277	51.277	5.128	51.277	51.277	3.337	33.372	33.372
2	1.197	11.969	63.245	1.197	11.969	63.245	2.987	29.837	63.245

Source: Author's interpretation

As shown in the previous table, two factors with eigenvalues greater than one were identified using the principal components method. Together, these factors account for 63.245% of the total variance.These two single factors explain 63.245 % of the total variation. In the continuation of the analysis, factor loadings were observed after rotation (*Table 7*). When presenting the results of the factor analysis, a factor was considered significant if it had a primary loading greater than 0.50.

Table 7. Factor loading after rotation (Republic of Serbia)

Variables	Component	
	1	2
Familiar producer	0.900	
The product is advertised	0.869	
Attractive packaging	0.789	
The product is appealing	0.618	
Origin of the product(imported or domestic)	0.526	
Product Quality		0.815
The best price-quality ratio		0.780
Recommendation		0.699
Clearly stated expiration date		0.671
Affordable price		0.524
Cronbach's Alpha	0.866	0.812
AVE	0.569	0.846
CR	0.517	0.829

Source: Author's interpretation

As shown in Table 7, the first factor exhibits the highest factor loading values for the first five statements, which can collectively be categorized under the name Market factor. The second factor is defined through five statements; when analyzing this factor, it can be called the Production and Economic Factor.

The obtained data also indicate that the factor loadings of the statements vary across different factors. Based on their values, the statements with the greatest influence on each factor can be identified. The highest factor loading of the Market factor has the statement that implies that the respondent's purchase decision is influenced by whether they know

the manufacturer (0.900), and the lowest is the statement that the respondents look at the origin of the product when making a purchase decision (0.526). The second factor mostly fulfills the statement that the product quality (0.815) influences respondents' purchase decisions, while the statement that the respondents make decisions about purchasing a product based on its affordable price satisfies the least (0.524). From previous table it can also be seen that AVE and CR values in this case are relatively low, but CFA will be conducted to determine the accuracy of this analysis.

Reliability and validity are essential measures of scale quality (Ning et al., 2024). Following the application of EFA, the model requires validation, with the next step involving an assessment of its reliability and validity through CFA (Table 8).

Table 8. CFA results (Republic of Serbia)

Factor	Variable	Loadings	AVE	CR	Cronbach's Alpha	p-value
Market	Familiar producer	0.880	0.582	0.872	0,856	0.000
	The product is advertised	0.845				0.000
	Attractive packaging	0.768				0.000
	The product is appealing	0.716				0.000
	Origin of the product(imported or domestic)	0.567				0.000
Production and Economic	Product Quality	0.656	0.567	0.822	0,810	0.000
	The best price-quality ratio	0.821				0.000
	Recommendation	0.674				0.000
	Clearly stated expiration date	0.577				0.000
	Affordable price	0.728				0.000
df=34; χ^2=84.695; CFI=0.971; RMSE=0.056						

Source: Author's interpretation

The CFA model demonstrates sufficient goodness-of-fit indices to validate the structure. Specifically, the model has 34 degrees of freedom, a CFI of 0.971 (above the acceptable threshold of 0.90), and an RMSEA of 0.056. All fit indices fall within acceptable ranges. The results in the previous table indicate that the model's factor loadings exceed 0.5, reflecting a strong relationship between the observed and latent variables. The average variance extracted (AVE) for both factors is above 0.5, confirming good validity, while the composite reliability (CR) exceeds 0.7, meeting the standard criterion. Cronbach's alpha values for both factors are above 0.8, demonstrating strong internal consistency and aligning with established norms. Notably, based on the factor loadings, the Market factor is the most explanatory. Similar to the EFA results, the statement with the highest influence on purchasing decisions is whether the manufacturer is known (0.880).In the case of the Production and Economic factors, the situation is somewhat different; this factor is mostly explained by the statement that the price-quality ratio is the most important for them when deciding on a purchase (0.821), while the statement that the respondents make a decision about purchasing a product based on clearly stated expiration date (0.577).

After the factor analysis, multiple linear regression analysis was conducted to determine whether the obtained factors significantly impact GDP growth *(Table 9).*

Table 9. Regression analysis results (Republic of Serbia)

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
Constant	3.169	0.182		17.407	0.000
Market	0.207	0.240	0.076	0.863	0.389
Production and Economic	-0.173	0.253	-0.060	-0.685	0.494

Source: Author's interpretation

The results of the regression analysis indicate that none of the identified factors had a statistically significant effect on GDP growth ($p>0.05$).

Factorial analysis - Montenegro

To identify the key factors influencing the decision to buy cheese, the same ten research questions were posed to respondents in Montenegro (Table 10). Harman's single-factor test was applied to check for potential bias in the results (Podsakoff et al., 2003). The test findings indicate that, using principal component analysis, the total extracted variance was below 50% (47.414%), suggesting no significant bias effects.

Table 10. Descriptive statistics of variables used in factorial analysis (Montenegro)

	Montenegro	
Variable	**Mean**	**Standard deviation**
Product Quality	3.56	1.432
Origin of the product (imported or domestic)	3.31	1.265
Attractive package	2.95	1.371
Clearly stated expiration date	3.72	1.186
Affordable price	3.42	1.227
Recommendation	3.46	1.194
Familiar producer	2.97	1.327
Advertised product	2.97	1.327
Appealing product	3.17	1.308
The best price-quality ratio	3.68	1.227

Source: Author's interpretation

Observing the variables related to the product characteristics on the basis of which the respondents make a decision about buying cheese, the respondents mostly agreed with the fact that the best ratio of price and quality is the crucial characteristic they consider when making a decision (Mean=3.681). In addition to this characteristic, the respondents expressed the highest degree of agreement with the statement that when making a purchase decision, they consider the quality of the product (Mean=3.569). Respondents showed the lowest degree of agreement with the statement that when

making a decision to buy cheese, they consider attractive packages (Mean=2.951). and advertised products (Mean=2.972). As in the previous instance, the validity of factor analysis was evaluated prior to its application using the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity. (*Table 11)*.

Table 11. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of justification of factor analysis (Montenegro)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.903
Bartlett's Test of Sphericity	Approx. Chi-Square	1149.413
	Df	45
	p-value	0.000

Source: Author's interpretation

The Kaiser-Meyer-Olkin coefficient was calculated at 0.903, significantly exceeding the recommended threshold of 0.6 (Hair et al., 2006), confirming the suitability of factor analysis for this set of variables. Bartlett's test of sphericity ($p<0.05$) further verified the presence of statistically significant correlations among the observed variables. The principal components method was employed to identify factors within the correlation matrix. After factor extraction, Varimax rotation was applied, and the values for the two extracted factors were presented (*Table 12*).

Table 12. Total variance explained (Montenegro)

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	7.061	70.612	70.612	7.061	70.612	70.612	4.196	41.958	41.958
2	1.098	10.982	81.593	1.098	10.982	81.593	3.964	39.635	81.593

Source: Author's interpretation

As presented in Table 13, the first factor exhibits the highest factor loadings for the initial six statements, allowing it to be categorized as Production and Economic Factors. The second factor is characterized by four statements. When analyzed, this factor can be defined as the Market factor.

Table 13. Factor loading after rotation (Montenegro)

Variables	Component	
	1	2
Product Quality	0.883	
Clearly stated expiration date	0.859	
The best price-quality ratio	0.783	
Affordable price	0.772	

Variables	Component	
	1	2
Recommendation	0.684	
Origin of the product (imported or domestic)	0.675	
Attractive package		0.909
Product is appealing		0.883
Advertised product		0.872
Familiar manufacturer		0.754
Cronbach's Alpha	0.935	0.948
AVE	0.608	0.734
CR	0.902	0.916

Source: Author's interpretation

It is also evident that the factor loadings of the statements vary across different factors. Within the Production-Economic factor, the highest loading is associated with the statement indicating that respondents' purchasing decisions are influenced by product quality (0.883), while the lowest is linked to the statement that respondents consider the product's origin during their decision-making process (0.675). The second factor is most satisfied by the statement that the respondents' decision to buy a product is influenced by attractive packaging (0.909), and the least by the statement that respondents make a decision to buy a product based on whether they know the manufacturer (0.754). The results of the CFA model for Montenegro are presented in the next table *(Table 14).*

Table 14. CFA results (Montenegro)

Factor	Variable	Loadings	AVE	CR	Cronbach's Alpha	p-value
Production-Economic	Product Quality	0.799	0.711	0.872	0.933	0.000
	Clearly stated expiration date	0.852				0.000
	The best price-quality ratio	0.859				0.000
	Affordable price	0.903				0.000
	Recommendation	0.820				0.000
	Origin of the product (imported or domestic)	0.824	0.823	0.949	0,949	0.000
Market	Attractive package	0.899				0.000
	Product is appealing	0.914				0.000
	Advertised product	0.948				0.000
	Familiar manufacturer	0.866				0.000
df=34; χ^2=82.359; CFI=0.974; RMSE=0.047						

Source: Author's interpretation

The results of the CFA model indicate that the structure is valid, supported by goodness-of-fit indices. The model includes 34 degrees of freedom, a CFI of 0.974 (greater than 0.90), and an RMSEA of 0.047. All model fit index values were acceptable. The results shown in the previous table suggest that the factor loadings of the model exceed the threshold of 0.5, which implies a high correspondence between the observed and latent

variables. The average variance (AVE) of both factors is at the level of over 0.7 (>0.5), which implies good validity; the results of the composite reliability (CR) of the model exceed 0.7, fulfilling the standard criterion. Cronbach's alpha was used to assess the scale's internal consistency, and the values for both factors were above 0.9, which is in accordance with established standards. Based on the results of the CFA, it can be seen that the first Production-Economic factor is most explained by the statement that implies that when purchasing a product, affordable prices are important to customers (0.903), and the least by the statement that implies that the quality of the product is important to them (0.799). The second factor, the Market factor, is best explained by the statement that when purchasing a product, the most important thing for customers is that it is advertised (0.948), and the least important is that they know the manufacturer (0.866).

And in the case of the sample from Montenegro, after conducting the factor analysis, the method of multiple linear regression was applied to determine whether the identified factors have a statistically significant impact on GDP growth *(Table 15).*

Table 15. Regression analysis results (Montenegro)

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
Constant	2.845	0.817		3.484	0.001
Production-Economic	0.181	0.812	0.019	0.222	0.824
Market	-0.413	0.815	-0.043	-0.507	0.613

Source: Author's interpretation

According to the regression analysis, none of the identified factors were found to have a statistically significant influence on GDP growth (p>0.05).

Discussion

The first research question was (Q_1): What is the agri-food market's profile of cheese consumption in both regions? The research obtained statistical data on cheese consumption and consumer preferences. It revealed that in the Republic of Serbia, more than half of the respondents consume cheese once a week, while in Montenegro, the largest percentage of respondents declared that they consume cheese every day, which is more often than the ones included in the research of Perez et al. (2014).

Considering the monthly cheese consumption, Montenegrin consumers are ahead of respondents from the Republic of Serbia, as the highest percentage of respondents consume more than a kilogram of cheese per month. The research showed that in the Republic of Serbia, the most significant percentage of respondents most often consume cheese with breakfast as a side dish, while in Montenegro, cheese is most often consumed as an integral part of a large number of savory dishes. More than half of the respondents from both regions stated that they most often buy cheese in supermarkets or stores, which also coincides with research conducted by Tendero and Bernabeu (2005).

The second research question was designed to answer the following question: (Q_2): Are there any differences in BC? The research has shown that in both regions, respondents who have higher incomes have higher monthly cheese consumption, which was also confirmed by other research worldwide (Prättälä et al., 2003). The research also showed that respondents with lower monthly incomes most often consume cheese as a side dish with breakfast or with salty dishes, while respondents with higher monthly incomes more often consume cheese on its own, hedonic.

After that, the third research question had the task of finding an answer (Q_3): Which factors influence BC, i.e., cheese procurement in both afri-food markets, and are there any differences? For consumers from the Republic of Serbia, quality is the decisive characteristic they consider when making a purchase decision. In addition to quality, when making a purchase decision, they consider the best price-quality ratio of the product. The least important is the attractive packaging and whether the product is advertised, although some studies prove their exceptional importance (Vaflen et al., 2023), and often conditioned by the personalities who advertise those products (Calvo-Porral et al., 2021). Similarly, Montenegrin consumers agreed that the best price-quality ratio is the decisive feature they consider when making a decision. In addition to this feature, consumers consider product quality when making a purchase decision. Consumers least consider the attractiveness of the packaging and whether the product is advertised, contrary to some research (Calvo-Porral et al., 2017).

The set research CB-Cheese scale proved to be appropriate because the research defined significant factors that influence consumer preferences when choosing cheese: Market factors and Production-economic factors.

Conclusions

Cheese is an important agri-food product, and understanding BC and their preferences is essential to its proper and successful marketing on the regional market. The research conducted led us to the conclusion that cheese is a significant agri-food item in the daily diets of consumers from Southeast Europe, and that these consumers' preferences vary amongst themselves due to cultural, demographic, and geographic factors. Research has demonstrated that one of the most important factors in consumption and selection is income level. The important point to note is that there is a clear preference differentiation between various Market elements and Production-economic factors. The acquired data will offer precise recommendations for the placement of cheeses on the domestic market and for agri-food marketing. Based on the obtained data, entrepreneurs can improve their sales approaches, focusing on new consumer demands (Maceín et al., 2019). Based on the data obtained on the increasing attention to cheese consumer preferences, this research can help increase profitability (Bir et al., 2020).

Theoretical and practical contribution of research

The theoretical contribution of this research lies in the integration of information gathered from a review of contemporary literature on the topic, combined with data

collected from consumer research conducted in the studied localities.The practical contribution of the conducted research is reflected in the methodological approach (further application of the created CB-Cheese scale), data collection, and processing, but mostly in the information that provides insight into the behavior of consumers and their preferences when consuming cheese, which gives clear instructions for the placement of cheese in the investigated areas. The results of this research can be used in order to improve access and positioning of cheeses in the market of Serbia and Montenegro, but also beyond.

Recommendations for further research

The established research could be upgraded through the data collection on the types of cheese and the characteristics that have the highest consumption. The emphasis could be placed on domestic types of cheese (locally produced) but also on international cheeses that are consumed more. By following the global model of individual research, significant data might be gathered by establishing a connection between the health status and body mass of dairy product users and their intake (Alegría-Lertxundi et al., 2014). Additional research could be directed at measuring agri-food marketing effects.

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FORECASTING MAIZE PRODUCTION IN REPUBLIC OF SERBIA USING ARIMA MODEL

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ABSTRACT

Considering the importance of maize in the Republic of Serbia, the aim of the paper is to select an appropriate econometric model that describes and predicts the future trends of maize production in the Republic of Serbia. In order to forecast the future trends of maize production from 2023 to 2027, a time series of annual data from 1990 to 2022 was analyzed using the autoregressive integrated moving average model. The model shows that maize production in 2023 will be 49.34% higher than in 2022. According to the forecast, the growth trend in maize production will continue until 2025, after which a decline in production is predicted. This paper also found that the autoregressive integrated moving average model for the selected time series of maize production provides approximate and more reliable forecast results than the extrapolation of the average annual rate of change.

Introduction

Agricultural production has multiple significance for the socio-economic development of the Republic of Serbia, which is reflected in food production, production of raw materials for other sectors of the economy, foreign trade and various social aspects. For this reason, in the Smart Specialisation Strategy of the Republic of Serbia for the period from 2020 to 2027, agriculture and food production are presented as one of the priority sectors, assuming that investments in the technological development of agriculture would improve the technological and economic development of Serbia (Semenčenko et al., 2021).

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In Serbia, plant production has a dominant share in the structure of agricultural production (70%). Within plant production, field crop and vegetable production is the most represented and accounts for more than 50% of total plant production (Đoković et al, 2018). Since field crop production is the basis of all agriculture, the results achieved in this production have a significant impact on the overall balance of agricultural production (Munćan and Živković, 2014). Arable land in Serbia has traditionally been used to grow the most grain, with maize accounting for the largest share of both total arable land and total grain production.

In terms of area under cultivation and its importance for the economy of the Republic of Serbia, maize is the most important crop alongside wheat. In 2021, maize occupies the largest area of the total utilised arable land (1,770,188 ha) with an area of 1,020,337 ha (SORS, 2021). The second most common crop is wheat with an area of 598,735 ha. Due to their strategic importance and the favourable agro-ecological conditions for cultivation, wheat and maize together account for 91.46% of the total area, i.e. 92.51% of the total production of the grain.

Due to the expansion of the area under maize cultivation areas and the increase in average yields, global production of maize has grown at an annual growth rate of 3.45% over the last two decades, from 592 million tons in 2000 to 1,210 million tons in 2021 (FAO, 2021). The main factors contributing to the increase in maize production are: the development of technology and the seed industry, the increase in agrotechnical efficiency, innovations in the development of a wide range of food and technical products from maize and, in particular, innovations in the production of bioethanol and the increase in its use as an alternative fuel (Bekrić and Radosavljević, 2008).

The largest maize producer in the world is the United States of America with 31.70% of global production, followed by China with 22.58% and Brazil with 7.31% (FAO, 2021). Together, these countries account for more than half of global maize production, and it is characteristic of them that they have highly developed livestock farming, for which maize is a necessary raw material (Vlahović, 2015). Important world producers are Argentina, India, Mexico, Indonesia and South Africa, while the largest European producers are Ukraine and France. According to the 2021 ranking, Serbia ranks 20th in the world with a maize production of about 6 million tons (USDA, 2021), while it ranks 7th according to the ranking of producers in the European Union (Eurostat, 2021).

The importance of maize results from its use for human nutrition, for domestic animals and for industrial processing. The particular economic and commercial importance of maize results from the fact that almost all parts of the plant can be used for processing (Simić et al., 2008). Maize also occupies an important place in the structure of agricultural exports, where it is the most represented export product in Serbia next to raspberries. According to the realized export of corn in 2021, Serbia ranked 13th in the world, and 5th compared to the exporters of the European Union. The export of corn from Serbia amounts to 2.3 million tons, which corresponds to a value of about 600 million dollars.

Considering the fact that maize occupies a dominant place in the structure of the total arable land, that it is one of the most important export products of the Republic of Serbia, as well as its importance for immediate nutrition and the processing industry, the aim of the paper is the analysis of time series, as well as the selection of an appropriate econometric model with which the future trends of maize production in the Republic of Serbia can be described and predicted.

Forecasts are the basis of planning because they provide information that enables planning decisions to be made. In this way, forecasting aims to reduce uncertainty and risk in the future. The importance of forecasts in agriculture is reflected in the adoption of agricultural policy measures designed to mitigate negative trends and steer the development of the agricultural sector in the desired direction. Monitoring, analyzing and forecasting data on agricultural production and considering the factors that influence it can help ensure stable food production and increase food exports. In addition, predicting trends in agricultural production can help producers choose a production structure that can achieve the best economic results.

In order to obtain information about possible trends in the future, it is necessary to examine data from the past and the present. For this reason, in order to predict future trends in maize production in the Republic of Serbia from 2023 to 2027, a time series of annual data from 1990 to 2022 was analyzed using ARIMA modeling. Although various quantitative methods and models can be used for prediction, ARIMA modeling is used in this paper because it is the predominant statistical method in predictions based on regression analysis, especially when analyzing phenomena whose current value is largely determined by past values (Wihartiko et al., 2021).

The choice of the most appropriate forecasting method is a very complex task, as no study has conclusively correlated the characteristics that determine the choice of a particular forecasting method (Petropoulos et al., 2014). For this reason, the accuracy of each method has been tested in scientific studies (Da Veiga et al., 2014). Ahmad et al. (2017) point out that ARIMA as a univariate model has several advantages over its multivariate alternatives, namely suitability also for non-stationary time series, statistical strength for reliable forecasts from small data sets and requirement of data only for the time series to be forecast, but not for its determinants. Jadhav et al. (2017) emphasize that the strength of the ARIMA model lies in the fact that the method is suitable for any time series with any pattern of change and the forecaster does not have to choose a priori values for a parameter. Dasyam et al. (2015) found that the ARIMA model is better suited for forecasting the development of wheat production in India than Parametric regression and Exponential smoothing models. Choudhury & Jones (2014) compared the prediction of maize yields using different models such as Simple Exponential Smoothing, Double Exponential Smoothing, Damped-Trend Linear Exponential Smoothing and ARMA and found that the ARMA model is preferable to the other models. When forecasting rice production in Bangladesh, Hamjah (2014) found that the ARIMA model also performs well for forecasts based on short-term time series. In fact, there are a large number of scientific papers that justify the choice of the ARIMA model when forecasting future trends in agriculture based on time series data.

In the Republic of Serbia, Đokovic et al. (2019) predicted maize yields in 2017 and 2018 using the ARIMA model and concluded that the time series model cannot predict exact yield quantities, but that it is useful for predicting future trends in maize yields. Based on the ARIMA (1,1,1,2) model chosen to predict maize production from 2015 to 2017, Ilić et al. (2016) found a stagnation of the trend over the years and predicted a decrease in total maize production in the Republic of Serbia by about 20% from 2015 to 2017. In addition to predicting the future trends of area, yield and production of maize, the authors also predicted the future trends of these production indicators of other agricultural crops. By analyzing time series using ARIMA modeling, Mutavdžić and Novković (2016) predicted the production parameters of cabbage in the Republic of Serbia for the period from 2015 to 2020, and Novković et al. (2010) predicted the production of the three most common vegetable crops in Vojvodina - potatoes, beans and tomatoes - for the period from 2006 to 2010.

Changes in the price of agricultural products have an impact on farmers' incomes and food security. For this reason, many authors have predicted the future changes in agricultural prices and their parities. In the Republic of Serbia, the authors mainly use the ARIMA model to forecast the prices of agricultural products. Novković et al. (2019) predicted the development of wheat and maize prices in the period from 2018 to 2022, while Mutavdžič et al. (2016) predicted the development of maize-wheat price parity and deflated wheat and maize prices from 2015 to 2020. Ivanišević et al. (2015) analyzed the changes and predicted the future development of the tomato price from 2011 to 2015 with the aim of forecasting the real, absolute and relative (parity with wheat) price of tomatoes, i.e. predicting the economic conditions for production.

The alleged importance of maize is not only in our country but also at the global level, which is why many authors in the world have dealt with the prediction of maize production using various methods. Yadav et al (2022) forecast maize production in South Asian countries using state space models and ARIMA models, where the research results show that there is a trend of increasing maize production in all selected South Asian countries from 2020 to 2027. Based on the application of the ARIMA model, Suleman & Sarpong (2012) predicted an increasing trend in the production and consumption of maize in Ghana from 2012 to 2021, while Badmus & Ariyo (2011) predicted an increase in maize area and production in Nigeria from 2006 to 2020.

However, it should be borne in mind that absolute reliability of forecasts cannot be guaranteed, especially when it comes to agriculture. The limits of forecasting agricultural production result from its particular characteristics, which are mainly:

- the dependence of overall agricultural production on natural factors;
- the instability of markets and prices;
- a lengthy production process and the impossibility of changing production in the short term.

Materials and methods

The database of the Statistical Office of the Republic of Serbia (SORS), but also the statistical databases of the United Nations (UN Comtrade Database and USDA) and the Food and Agriculture Organization (FAOstat) were used for the preparation of this paper. The collected data was analyzed using the EViews software package.

Statistical methods of one-dimensional analysis of time series were applied in the data analysis, i.e. the Box-Jenkins modeling strategy. The Box-Jenkins modeling strategy is applied to select the appropriate model that describes the movement of the data set of the selected time series - maize production from 1990 to 2022 (annual data) - and predicts future values.

In 1976, Box and Jenkins proposed a strategy for modeling time series that consists of three phases:

1. model identification;
2. estimation of model parameters; and
3. verification of model adequacy.

The model identification phase involves the selection of a narrow class of ARIMA models that can be considered as generators for a given data set. However, in order to perform the model selection, it must first be determined whether the time series is stationary, since this modeling strategy assumes that the time series is stationary. The stationarity of the time series is examined with the help of a graphical representation of the given series, the ordinary and partial autocorrelation functions and the unit root tests. If the time series is not stationary, it must be transformed in order to obtain a time series that has a symmetrical and normal distribution as well as a stable level and stable variability. To achieve a symmetric and normal distribution, the Box-Cox transformation is most commonly used, which is reduced to the logarithmization of the initial data, while to stabilize the level of the time series, the transformation is performed by differentiating the data (Mladenović and Nojković, 2021).

When choosing a model, it is necessary to aim for the number of AR and MA components in the model to be optimal, that is, to choose the simplest ARIMA model that well explains the movement of the time series. Information criteria are used for this purpose: Akaike Information Criterion (AIC), Schwartz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQC), whereby the model with the lowest value of these criteria is selected.

In the next phase of the Box-Jenkins methodology, the model parameters identified in the previous phase are evaluated, that is, the mean value, variance and coefficients in the model are evaluated. The method of ordinary least squares is used to estimate the parameters of the AR model, while the method of nonlinear least squares is used to estimate the parameters of the MA and ARMA models (Mladenović and Nojković, 2021).

Checking the adequacy of the model, within the third phase of the Box-Jenkins methodology, involves checking the residuals, that is, the difference between the actual values and those predicted by the model. In order for the model to be considered adequate, it is necessary that the residuals are normally distributed and not autocorrelated, whereby the Jarque–Bera test is used to test the hypothesis that the residuals are normally distributed, while the Box-Pierce statistic is used to test the hypothesis that there is no autocorrelation in the residuals, that is, for smaller samples, corrected Box-Pierce statistics, whose authors are Box and Ljung.

If it turns out that the selected model is suitable, it can be used to predict the future development of the time series. Within the Box-Jenkinson method, the backward prediction method is used, which is based on the reversal of the temporal sequence by starting the evaluation procedure from the last to the first observation (Kovačić, 1995).

If, in the third phase of the Box-Jenkinson method, it is determined that the model is not appropriate, one must return to the model identification phase and try to find a better model. This leads to the conclusion that the Box-Jenkins modeling strategy is an iterative process that ends when a suitable model has been found in accordance with the general principles of modeling.

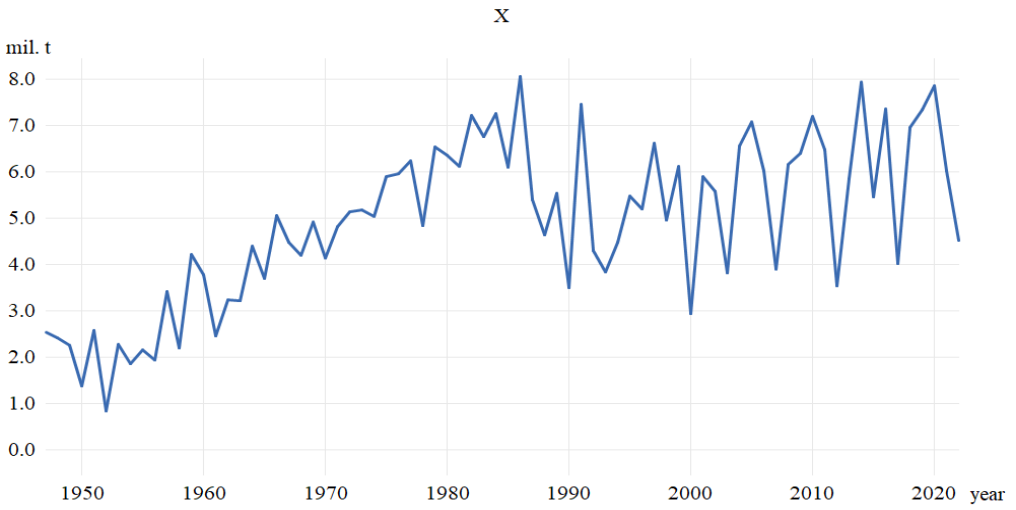
Results

Time series analysis is the subject of research in various scientific fields such as meteorology, demography, economics, medicine and agriculture. In this paper, the time series in agriculture was analyzed, i.e. the development of maize production was observed.

The aim of the graphical representation of a time series is to visually inspect it in order to determine whether the series shows a trend, a seasonal variation, a structural break or an unstable variance. The time series presented covers the values of maize production from 1947 to 2022, with a total number of observations of 76 (*Figure 1*). The data are given in tons. A visual inspection of the initial series suggests that the series showed a clear upward trend until the 1980s, while a slight upward trend can be observed from the early 1990s onwards. Similar observations were made in other studies (Đoković et al., 2019; Ilić et al., 2016), whereby it is assumed that a break in the structure of the time series took place in the 1980s. For this reason, the time series of maize production in the period from 1990 to 2022 is analyzed in this paper.

In the period from 1980 to 1990, there was a significant consumption of mineral fertilizers in Serbia, with the highest consumption recorded in 1986 (Bogdanović, 2010), which had an impact on the volume of maize production, which peaked at 8,062,020 tons. The uncontrolled use of mineral fertilizers was soon abolished by the introduction of the system for controlling soil fertility and fertilizer use as a control system of plant production factors, which significantly reduced the consumption of mineral fertilizers.

Figure 1. Maize production in the period 1947-2022, in the Republic of Serbia (t)

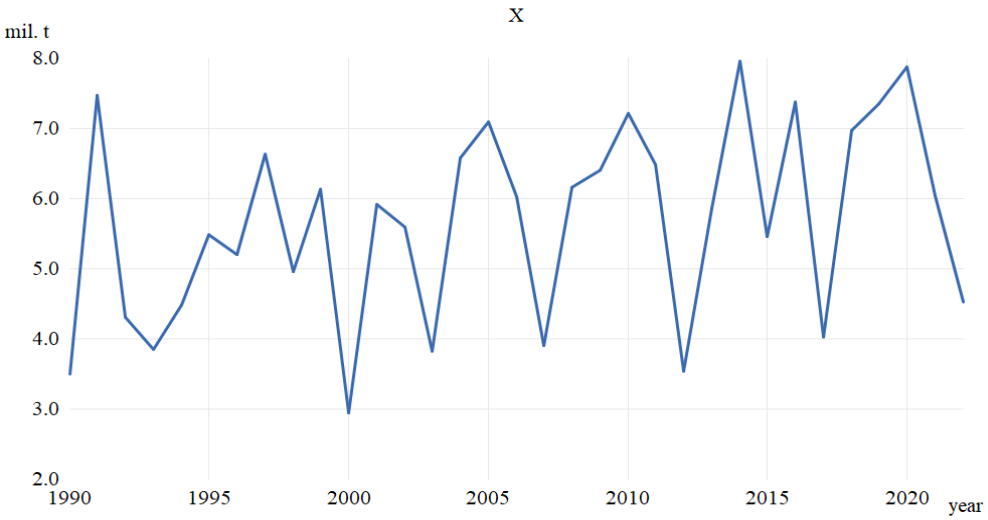


Source: Created by the author based on data analysis in EViews

In the period from 1947 to 1990, the average area under maize cultivation was 1,329,348 ha, while the average yield was 3.25 t/ha. In the second observation period, from 1990 to 2022, the average area under maize cultivation was 1,116,558 ha and the average maize yield was 5.20 t/ha. Although the area under maize declined from 1990 to 2022, the average yield increased (especially since 2005), resulting in a higher average production volume during this period. The increase in maize yields is the result of constant progress in breeding and the creation of more fertile hybrids, but also the improvement of cultivation methods under the influence of the development of the agricultural machinery industry, the mineral fertilizer and pesticide industry (Starčević and Latković, 2006). However, since in the period after the 1990s significant climatic disturbances occurred worldwide, which also affected the territory of the Republic of Serbia, the volume of maize production is characterized by fluctuations from year to year due to unfavorable weather conditions (droughts, floods, etc.).

The time series in the period from 1990 to 2022 with 33 observed values oscillates around a mean value that is not zero (*Figure 2*). It is a stationary series, which is confirmed by the analysis of the ordinary and partial autocorrelation functions and the results of the unit root test.

Figure 2. Maize production in the period 1990-2022, in the Republic of Serbia (t)



Source: Created by the author based on data analysis in EViews

When analyzing a time series, it is necessary to look at its correlation structure, which is achieved with the help of the autocorrelation function, which is a series of autocorrelation coefficients with respect to time. Autocorrelation coefficients are statistically significant at the 95% significance level if their estimated value is outside the interval [-0.341, 0.341]. Since the assessment of the ordinary autocorrelation coefficients for the first ten lags is within the interval (*Table 1*), the null hypothesis that there is no significant autocorrelation in the maize production time series is accepted. Since the partial autocorrelation coefficients for the analyzed maize production time series are also within the confidence interval, it is concluded that they are not statistically significant for any of the observed lags. The estimation of the ordinary and partial autocorrelation function of maize production indicates the stationary nature of the series.

Table 1. The sample and partial autocorrelation functions for the annual maize production series in the period 1990-2022

lags	1	2	3	4	5	6	7	8	9	10
AC	-0,071	-0,054	-0,069	0,111	0,250	0,092	-0,079	-0,024	0,050	0,247
PAC	-0,071	-0,059	-0,078	0,098	0,263	0,157	-0,014	-0,007	-0,007	0,169

Source: Created by the author based on data analysis in EViews

In order to obtain reliable conclusions about the stationarity of the series, unit root tests must be carried out. To test for the presence of a unit root in the maize production time series, the Dickey-Fuller test was applied using the τ_{μ} statistic.

Therefore, the null hypothesis that the time series of maize production has at least one unit root ($H_0: \varphi = 0$) was compared with the alternative hypothesis that the

time series of maize production is stationary around a non-zero mean $(H_1: \varphi < 0)$. The least squares method was used to evaluate the parameters of the model $\Delta X_t = \beta_0 + \varphi X_{t-1} + e_t$ and the value of the DF test statistic was determined: τ_μ =-6,08 ($\tau_\mu = \hat{\varphi} / s(\hat{\varphi})$).

Since the calculated value of the DF τ_μ test statistic is below the critical value -2,96[4] ($-6{,}08 < -2{,}96$), the null hypothesis of the existence of a unit root is rejected and it is concluded that the time series of maize production from 1990 to 2022 is stationary around a non-zero mean value.

Once the time series is determined to be stationary, the next step in the Box-Jenkins approach is to determine the autoregressive (p) and moving average components of the model (q). The determination of the value of p and q is based on the analysis of the sample and partial autocorrelation function of the series transformed as a function of the number of roots, where the order of the autoregressive component (p) is determined based on the partial autocorrelation function, while the order of the moving average component is determined based on the sample autocorrelation function (q).

In order to find the best possible model, several models with different combinations of AR and MA components were examined in the study of the maize production time series, and it was found that the optimal model is the reduced ARMA(5,1). First, it was found that both components of the model, AR(5) and MA(1), were statistically significant and had lower values of the information criteria (AIC, SC, HQC) and regression standard errors compared to other models, which is why this model was chosen for predicting future values (*Table 2*).

For the model to be considered appropriate, it must fit the data, which is checked using a series of residuals. The residuals must not be autocorrelated and must be normally distributed. The presence of an autocorrelation of the residuals on all lags up to K was tested using the Box-Ljung Q test statistic and the corresponding p-value. At a significance level of 5%, it is determined that there is no autocorrelation in the series of residuals Q(10)=2.78 (p=0.95). The normality of the residuals was tested with the Jarque-Bera (JB) test statistic. The calculated value of the JB test statistic is 0.32, which is below the critical value, which is about 4.74 for this sample size at a significance level of 5% (Patterson, 2000 in Mladenović and Nojković, 2021), which is why it is concluded that the distribution of the residual series of maize production is normal.

4 The critical value at the significance level of 5 % is calculated using the following formula: $\tau_\mu^k = -2{,}8621 - \frac{2{,}738}{T} - \frac{8{,}36}{T^2}$.

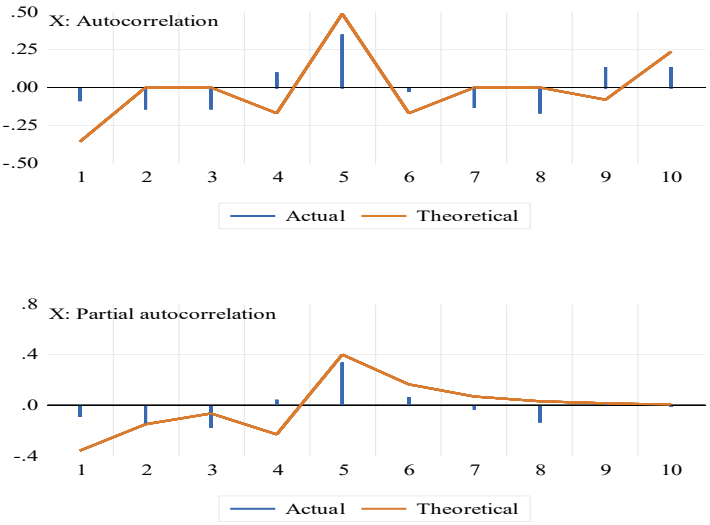
Table 2. Estimate of the level of annual maize production in the period 1990-2022

Variable	Coefficient	t – statistic
Constant	6147693	18,13
AR(5)	0,4823	2,71
MA(1)	-0,4267	-2,31
Q(10)=2,78 (0,95) JB=0,32 (0,85) AIC=31,0147 SC=31,1575 HQC=31,0584		

Source: Created by the author based on data analysis in EViews

The selected specification of the reduced model ARMA (5,1) describes the correlation structure of the data relatively accurately, i.e. the degree of agreement between the actual and the model-predicted values of the ordinary and partial autocorrelation coefficients (*Figure 3*).

Figure 3. Estimated and model-predicted value of the sample and partial autocorrelation function in the time series of maize production in the period 1990-2022



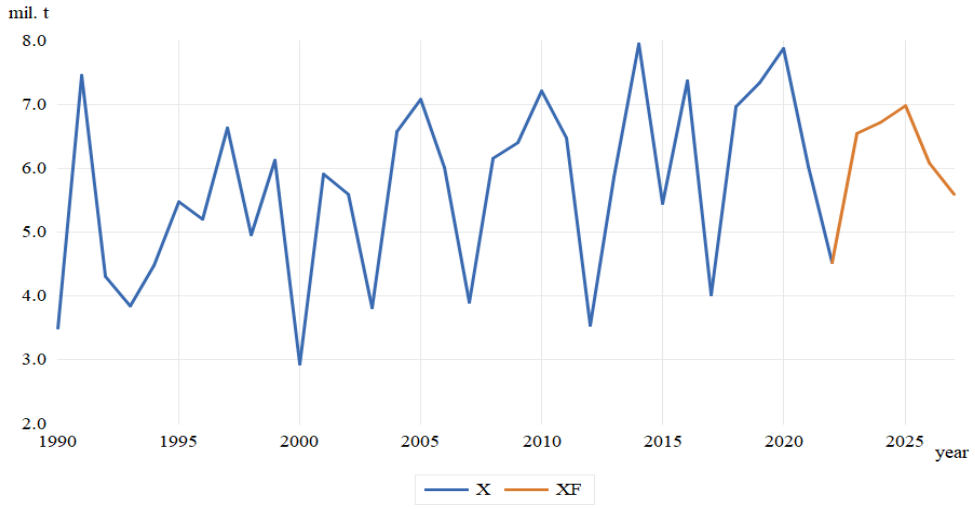
Source: Created by the author based on data analysis in EViews

Based on the selected ARMA(5,1) model, the development of maize production is predicted from 2023 to 2027. A comparison of the maize production predicted by the model (5,000,686 tons) and the actual production (4,523,043 tons) in 2022 shows that the model prediction indicates a decline, which is, however, slightly lower than the actual production. The weather conditions, particularly the high temperatures and lack of precipitation contributed to a significant decline in maize production in 2022.

Compared to maize production in 2022 (4.52 million tons), maize production in 2023 will be 49.34% (6.75 million tons) higher, as the results show. The forecast maize production has an upward trend until 2025, after which a decline in production is predicted (Figure 4). Compared to the average maize production (6.34 million tons) of the last ten years (2013 to 2022), the average of the forecast maize production values for the period from 2023 to 2027 (6.38 million tons) remains roughly the same.

Although Serbia has favorable conditions for maize cultivation, in some years there are periods of drought or excessive rainfall, which leads to a decline in production and the quality of maize grains. To mitigate the effects of climate change on maize production, the most important adaptation measures are earlier sowing, the introduction of irrigation and the selection of tolerant hybrids (Bekavac, 2010).

Figure 4. Forecast of future maize production in the period 2023-2027 in the Republic of Serbia



Source: Created by the author based on data analysis in EViews

To confirm the appropriateness of the chosen ARIMA model, the prediction of the development of maize production for the year 2022 was also carried out using the average annual rate of change used in the work of Novković et al. (2022) for the prediction of maize production parameters from 2021 to 2023. The year 2022 was chosen because the Statistical Office of the Republic of Serbia has published data on actual maize production, which allows a comparison of the predicted production with the actual production.

Based on the time series of data from 1990 to 2021, extrapolation of the average annual rate of change results in a projected maize production of 6,134,315 tons in 2022. The predicted value is not only not close to the actual production, but also indicates an opposite trend in maize production in 2022 compared to the previous period. The difference between the maize production predicted by the ARIMA model and the actual maize production in 2022 is about 10%, while the difference between the predicted maize production using the average annual rate of change and the actual maize production is about 26%. This confirms that the selected ARIMA model is more reliable for predicting future values in the used time series of maize production from 1990 to 2021 than the extrapolation of the average annual rate of change.

However, it should be noted that even ARIMA models are not completely accurate and have their limitations when modeling time series. The limitations of ARIMA models

are that it is difficult to model non-linear relationships between variables and the assumption that there is a constant standard deviation in errors in these models (Siami-Namini et al., 2018).

In order to achieve the greatest possible accuracy in predicting future trends in agriculture, it is necessary to continuously research methods and models that can be used for this purpose. As the importance of using artificial intelligence methods for predicting future trends in agriculture, especially methods based on neural networks, is increasingly emphasised, their application and comparison with ARIMA models should be the subject of future research.

Conclusions

The Republic of Serbia is an important maize producer in Europe and the world. For this reason, the time series of maize production in the Republic of Serbia from 1990 to 2022 was analyzed. In order to analyze the mentioned time series and to find a suitable econometric model that can predict the trends of future values, the Box-Jenkins modeling strategy was applied.

Regarding the time series of maize production from 1990 to 2022, the model with satisfactory properties is the reduced ARMA(5,1), which is used to predict future trends in maize production from 2023 to 2027. The year 2022 is also included in the forecast to allow a comparison between the maize production predicted by the model and the actual maize production. Comparing the maize production predicted by the model (5,000,686 tons) with the actual maize production (4,523,043 tons) in 2022 shows that the model prediction shows a decrease, but slightly below the actual production. According to the forecast values, maize production in 2023 will be 49.34% higher than in 2022. The growth trend in maize production is likely to continue until 2025, after which production is expected to decline. In order to increase maize production in the future, production techniques must be adapted to climatic conditions, appropriate land reclamation and conservation measures and other environmental factors.

Although it was found in this paper that the ARIMA model provides more accurate and reliable prediction results for the selected time series of corn production from 1990 to 2021 than the extrapolation of the average annual rate of change, the ARIMA model also has its limitations and cannot predict completely accurate data. For this reason, it is necessary to continuously compare methods and models to further improve the accuracy of predictions in agriculture.

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Conflict of interests

The authors declare no conflict of interest.

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RURAL POLICY OF SERBIA AND THE NETHERLANDS: COMPARATIVE ANALYSIS

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ABSTRACT

The global trend of rural depopulation is a new challenge of the 21st century. As people migrate from rural areas to cities, the potential for growth in these areas diminishes. As the global population increases, the demand for food production relies heavily on agriculture, which is primarily carried out in rural areas. Serbia and the Netherlands share a common issue, but the circumstances surrounding it vary. The research methodology involves comparing data, followed by analysis and synthesis to draw meaningful conclusions. The criteria for comparison include demographic indicators, indicators of social well-being, and indicators of economic structure and performance. The results indicate that the Netherlands has more practical solutions for issues, a more content rural population, and better conditions for implementing rural policies. Regarding Serbia, the policy for rural areas is currently in the developmental phase.

Introduction

Rural areas in the Republic of Serbia are encountering numerous challenges. These challenges may result from the isolation of rural areas due to poor infrastructure, and certain regions may have fewer natural resources than other parts of the country, making them less of a priority for investment. Population aging and devastation are no longer just a problem for peripheral rural areas. These changes are now a challenge for all European countries and imply specific social distortions (Bogdanov, 2007). Serbia, along with other countries in transition, is confronted with similar challenges.

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After years of mistreatment of rural and agricultural resources, the objective now is to guarantee their sustainability. The rural areas of Europe are very diverse in their socio-economic conditions, physical features, and therefore also in the way we have to treat their problems and development (Baldock & Institute For European Environmental Policy, 2001). Because of this, rural development policy cannot single out one, universal problem to focus on. Until the 1970s, the problem of rural areas was identified as rural development, that is, to improve agriculture so that it raises the standard of rural areas (Baldock & Institute For European Environmental Policy, 2001). However, the approach has changed. Agricultural structures policy began to be shifted away from enhancing productivity to improvements in the quality of, and establishing new markets for, agricultural products (Baldock & Institute For European Environmental Policy, 2001). In the 1970s, the European Union acknowledged this issue by introducing LFA (Less Favored Areas) into its agricultural policy (Papić, 2021). The LFA policy initially aimed to address social issues in rural areas. LFAs are areas where agriculture is hampered by permanent natural handicaps (Schouten et al., 2008). The major objectives were to ensure the continuation of farming, thereby maintaining a minimum population level and preserving scenic landscapes and environmentally valuable habitats (Schouten et al., 2008; Šobić et al., 2023). In the Netherlands, the LFA measure is used as an additional payment, to compensate farmers for negative economic effects due to the conservation of these natural handicaps (Schouten et al., 2008). It was not implemented as a stand-alone policy, but is linked to measures aiming at active nature and landscape conservation management LFAs refer to areas where agriculture is hindered by permanent natural limitations (Schouten et al., 2008). The primary objectives of LFAs are to maintain the continuity of farming, preserve scenic landscapes, and protect environmentally valuable habitats, all while ensuring that the minimum population level is maintained. In the Netherlands, the LFA measure is utilized as an additional payment to compensate farmers for the negative economic effects caused by natural handicaps. This measure is not implemented as a standalone policy but is instead linked to other measures aimed at promoting active nature and landscape conservation management. After the year 2000, the focus of this policy shifted towards achieving environmental and sustainable development goals (Papić, 2021; Pantić et al., 2022; Luković et al., 2023). These policies aim to establish mechanisms for coordinating agriculture and other activities in rural areas, to enhance living standards for the rural population. (Bogdanov, 2007; Pantić & Milojević, 2023). The question that needs to be addressed is whether it would be appropriate to simply adopt the EU's policies in Serbia. Implementing rural policy in Serbia requires consideration of historical and cultural heritage, social structure, and level of development. Good practices can help improve the current situation. Rural policy in Serbia has fallen behind over the past three decades, leading to new problems such as the need for agricultural reform and reliance on other sources of income besides agriculture. It is crucial to prioritize the economic and social security of small rural households in the country as an inadequate choice of rural policy can jeopardize their survival. The objective should be to position such households as relevant economic subjects.

This paper aims to compare the rural policies of Serbia and the Netherlands, with a focus on identifying good practices that Serbia, as a candidate country for joining the European Union, can learn from the Netherlands.

Rural policies of the Netherlands and Serbia

The Netherlands has a national rural development strategy that is aligned with the common policy of the European Union. The focus of the national rural strategy of the Netherlands is on sustainability and competitiveness. In our work, we will cover the period from 2014 to 2022. The Ministry of Agriculture, Environmental Protection and Food Quality is in charge of financing, implementation, and supervision of rural policies, with the fact that every decision must be in accordance with the common policy of the European Union (OECD, 2020). The Ministry of Internal Affairs is responsible for the financing, implementation, and supervision of rural policies, as well as those policies whose focus is on population decline (OECD, 2020). At the sub-national level, rural policy is implemented by the provinces, 12 of them, and the Regiebureau POP (department in charge of rural development) (OECD, 2020).

In Table 1, we can see the indicative public support for the Dutch Rural Development Programme.

Table 1. The indicative public support for the Dutch Rural Development Programme

Target	Measure	€ Total public	%
Priority1: Knowledge transfer and innovation[4]			
1A: Fostering innovation, coop, knowledge base 10.11% RDP expenditure	01 knowledge		
	16 cooperation		
1B: Strengthening links (with research etc.) 355 cooperation operations	16 cooperation		
1C: Training 30 000 training participants	01 knowledge		
Priority 2: Competitiveness		498 333 000	23.75%
2A: Farm performance 5.12% farms with RDP support	01 knowledge	52 759 000	2.50%
	03 quality schemes	22 818 000	1.08%
	04 investments	266 507 000	12.60%
	16 cooperation	156 249 000	7.39%

4 No financial allocation shown for Priority 1 as the expenditure is distributed across other focus areas

Target	Measure	€ Total public	%
Priority 3: promoting food chain organisation, including processing and marketing of agricultural products, animal welfare and risk management in agriculture		103 280 000	4.88 %
3B: farm risk prevention and management 4.15% farms with RDP support	17 Risk Management	103 280 000	4.88 %
Priority 4: Ecosystems management[5]		1 334 377 667	63.11 %
4A Biodiversity: 5.87% utilised agricultural area under contract 4B Water management: 5.87% utilised agricultural area under contract 4C Soil erosion and management: 0.48% utilised agricultural areas under contract	04 investments 10 AEC	693 154 000 641 223 667	32.78 % 30.33%
Priority 6: Social inclusion and local development		123 144 339	5.82 %
6B LEADER: 64.86% rural population in local development strategy 250 jobs created (LEADER)	19 LEADER and CLLD	123 144 339	5.82 %
Technical Assistance		55 331 389	2.62 %
Total public expenditure €		2 114 466 395	100 %

Source: Factsheet on the 2014-2022 Rural Development Programme for the Netherlands, 2023.

To enhance the competitiveness of rural areas, these programs rely on innovation to improve production with a focus on small farms. The policy also includes weather insurance, policy will cover 4.15% of all farmers (Factsheet on the 2014-2022 Rural Development Programme for the Netherlands, 2023). Within this program, 30,000 farmers will undergo some form of training, while the ministry (The Ministry of Agriculture, Environmental Protection and Food Quality) will co-finance 365 projects. The goal is to create 250 types of new jobs, which would cover about 65% of the rural

5 Expenditure under Priority 4 is programmed for the priority as a whole, not for individual focus areas

population. Incomes in the agricultural sector are 40% lower than in other sectors, within the framework of the rural policy this problem would be solved by farmers receiving higher subsidies for the first 40 hectares (European Commission, 2023). The Netherlands has high agricultural production, but it has led to a drastic decrease in bird numbers. To improve the situation, the country is adopting an agricultural land management system that could potentially increase bird numbers in agricultural areas. As part of a rural development program, farmers will receive support for sustainable agricultural practices, including reducing pesticide and fertilizer runoff, better soil management, and adapting to a specialized market. The program will also invest 174 million euros in peatlands to combat climate change. (European Commission, 2023). Rural policy aims to promote social inclusion and local development of rural areas, creating new jobs through business, innovation, and cooperation. It aims to connect villages and cities while improving the living conditions of the rural population. The Rural Development Strategy recognizes the difficulties of starting a new farm and therefore offers subsidies to new and young farmers. The goal is to attract 3,000 new, young farmers with this strategy. In addition, each farmer will receive a voucher of 1,750 euros for further education and training.

In the early 2010s, Serbia's rural policy was in its infancy. The initial phase of collectivization under Yugoslav communist rule, from 1945 to 1953, stifled the transition from small-scale commodity production to a capitalist model. Funding was primarily directed toward the social sector, leaving agriculture and rural regions under-resourced, which impeded overall agricultural development. Although Serbia is striving to align its rural policy with EU standards, significant discrepancies in execution remain. Unfavorable circumstances such as rural-urban migration, lack of interest in agricultural work among youth, and inability to compete in the market have led to the rise of elderly households in rural areas (Supić, 2012). The trajectory of the newly admitted member states, formerly socialist nations, serves as a reference point for Serbia, given their ongoing transitional journey, which to varying degrees, Serbia will likely traverse in the foreseeable future (Zekic et al., 2017).

The difference between Serbia and the EU in terms of agricultural and rural development policy is reflected in the following:

1. Socio-economic structure: In the EU, 18% of the population lives in rural areas, where agriculture is not the sole source of income. However, in Serbia, agriculture is frequently the only source of income;

2. Rural infrastructure: EU countries have well-developed rural infrastructure. In Serbia, rural infrastructure is both underdeveloped and unsustainable, limiting the capacity for rapid integration;

3. Economic structure: In the EU the economy is diversified;

4. Agricultural production: Large-scale investments in agricultural production in rural areas of the European Union. Rural areas of Serbia lack investments in agriculture;

5. Human capital: In the EU, rural and agricultural populations have higher education levels compared to Serbia, where residents of rural areas have a lower level of education, especially compared to the rural regions of the EU.;

6. State of the environment: The EU's intensive agriculture caused significant pollution, while Serbia's less intensive agriculture resulted in less pollution. However, environmental awareness is low among Serbia's rural population, and state support for environmental initiatives is still nascent.;

7. Funds and financial resources: In the EU, funds are clearly defined, while in Serbia they are still very modest;

8. Local self-government: Clearly defined decentralization within EU member states, while in Serbia local self-government has little autonomy;

9. Production connectivity: Serbia has a high level of market monopolization compared to the EU countries, where competition-based market chains are prevalent.

In 2014, the Government of the Republic of Serbia adopted the Agricultural and Rural Development Strategy for the period 2014-2024. This document establishes six strategic development goals (Vlada Republike Srbije, 2014):

1. Production growth and producer income stability;

2. Growth of competitiveness with adaptation to the requirements of the domestic and foreign markets and technical-technological improvement of the agricultural sector;

3. Sustainable resource management and environmental protection;

4. Improving the quality of life in rural areas and reducing poverty;

5. Effective management of public policies and improvement of the institutional framework for the development of agriculture and rural areas;

6. Modernization of bodies and organizations and adaptation of agricultural policy to the EU Common Agricultural Policy model.

The Agricultural and Rural Development Strategy for Serbia (2014-2024) outlines 14 priority areas for agricultural policy, including stable income for farmers, infrastructure improvement, knowledge transfer and development, climate change adaptation, market chain development, environmental conservation, social structure improvement, and more. Serbia will be able to utilize EU subsidies for agriculture and rural development under the Instrument for Pre-Accession in Rural Development (IPARD) as a candidate for EU membership. The main aim of IPARD is to raise the competitiveness of rural areas in Serbia. Zekić and Matkovski (2015) point out that further economic decline can be avoided by further diversification of economic activities in rural areas. Diversifying income can improve rural households' standard of living. A national rural strategy aligned with EU policy is necessary. IPARD funds can provide substantial support for this reform.. Matkovski and Kleut (2015) present the importance of the IPARD program

in raising the competitiveness of rural areas, either by investing in the production or marketing of agricultural products. Table 2 shows the budget by measures after the Fifth Amendment of the IPARD II program:

Table 2. The budget by measures after the Fifth Amendment of the IPARD II program

Measure	Contributions EU, EUR(%)							
	2014	2015	2016	2017	2018	2019	2020	2014-2020
Measure 1	-	7.535.248 (50,23%)	9.900.325 (49,50%)	9.663.583,04 (45,36%)	12.199.743 (40,67%)	18.902.434 (47,26%)	37.812.500 (84,03%	96.013.833,04
Measure 3	-	7.464.752 (49,77%)	10.099.67550,50%	7.952.129,63 (37,33%)	9.162.757 (30,54%	13.910.066 (34,78%)		48.589.379,63
Measure 4	-	-	-	-	-	-	-	0,00
Measure 5	-	-	-	-	-	-	-	0,00
Measure 7	-	-	-	3.687.500 (17,31%)	8.637.500 (28,79%)	7.187.500 (17,97%)	6.687.500 (14,86%)	26,200,000
Measure 9	-	-	-	-	-	-	500.000 (1,11%)	500.00
Total	-	15.000.000	20.000.000	21.303.212,67	30.000.000	40.000.000	45.000.000	171.303.212,67

Source: Republika Srbija, Ministarstvo poljoprivrede, šumarstva i vodoprivrede, 2023, p63.

Key measures for rural development through the IPARD II program include investments in agricultural holdings (Measure 1), processing and marketing of agricultural and fishery products (Measure 3), farm diversification and business development (Measure 7), technical assistance (Measure 9), agricultural, environmental, climate, and organic production (Measure 4), and local development strategies through the LEADER approach (Measure 5). By the end of 2022, 3,179 requests were submitted across 14 calls: 2,260 for Measure 1, 313 for Measure 3, 605 for Measure 7, and one for Measure 9. The total public support requested was 490.7 million EUR: 218.7 million EUR for Measure 1, 96.7 million EUR for Measure 3, 175.3 million EUR for Measure 7, and 6,300 EUR for Measure 9 (Republika Srbija, Ministarstvo poljoprivrede, šumarstva i vodoprivrede, 2023).

Research methodology

Our work involved careful analysis and synthesis of relevant theoretical materials and previous research. We compared different approaches to sustainable rural development using the method of comparison and analogy. We also provided a detailed explanation of important facts using the method of description.

Results of research and discussion

Our assessment of rural policies will be based on four criteria: agricultural production, environmental protection, quality of life for rural residents, and land use conservation. We will analyze several development indicators to determine policy effectiveness, including demographic, social welfare, and economic performance indicators.

In terms of the first category, which is agricultural production, the goals are similar for both the Netherlands and Serbia. They both aim to improve their agriculture sector through the use of technological innovations while also taking care of the environment. However, there is a difference in the supply chain. The rural policy of the Netherlands is already aligned with that of the EU (European Commission, 2023), but Serbia, being a candidate country, still needs to align its policy with the EU's standards and regulations to increase and regulate competitiveness. One area where both countries share the same strategy is crop insurance against extreme weather events. Both the Dutch and the Serbian policies include this provision. Both the Serbian and Dutch rural development strategies aim to conserve biodiversity and resources in agriculture, forestry, and water. However, the Serbian strategy focuses on agrobiodiversity and forests, while the Dutch strategy prioritizes the conservation of underground and surface water (European Commission, 2023). These priorities are in line with each country's national strategies. The Netherlands, with its high levels of production and chemical usage, has a significant impact on water endangerment (European Commission, 2023), while Serbia faces different challenges related to agrobiodiversity and forests. Unfortunately, agrobiodiversity in Serbia has been on a decline since the 1950s, with highly productive varieties of plants and animals replacing indigenous varieties. Additionally, the forest cover in Serbia (29.1%) is close to the world level (30%) and much below the European level (estimated at 46%), (JP Srbijašume,2023). Serbia's strategy lacks a focus on soil protection, while the Netherlands has dedicated funding for it in their strategy. Both Serbia and the Netherlands have rural development strategies that aim to improve rural life by diversifying jobs, improving technology, and encouraging youth to return to the countryside. However, the Dutch strategy prioritizes training young farmers, while Serbia focuses on infrastructure. Both strategies aim to connect villages and cities, but Serbia faces challenges in achieving its goals.

In this section of the project, we will evaluate the effectiveness of two strategies, Serbian and Dutch rural development strategy. We will begin by examining the demographic indicators. According to Humanitarian Data Exchange (2023), about 1.3 million people reside in rural areas of the Netherlands, which accounts for only a small portion of the total population of 17.53 million as reported by The World Bank (2023). Conversely, in Serbia, the percentage of people living in rural areas is higher, with 43.12% of the total population residing in such areas as reported by Trading Economics (2023). The population density in the Netherlands is comparatively high with 520 inhabitants per square kilometer, while Serbia has an average population density of 81 inhabitants per square kilometer (Trading Economics, 2023). In Serbia, the population density is lowest in the Bor region with 35.88 inhabitants per square kilometer, while the highest density is in the Danube region with 160.4 inhabitants per square kilometer (Josipović, 2019). The age structure of Serbia's rural population is cause for concern due to negative natural growth and emigration, leading to an increasingly pronounced rural exodus. The rural areas in both countries are dominated by an elderly population, resulting in an unfavorable aging index (Thissen & Droogleever Fortuijn, 2020). The demographic composition of the rural population in Serbia is a

cause for concern, especially the age structure. In the Vojvodina region, for every 100 inhabitants under the age of 14, there are 120 inhabitants over the age of 60. Similarly, the Šumadija and Western Serbia regions have 125 older inhabitants for every 100 young inhabitants, while the Southern and Eastern Serbia regions have an even higher ratio of 140 older inhabitants for every 100 young inhabitants. Only two rural areas, Pčinj and Raška, have an aging index below 100. Between the 2002 and 2011 censuses, there was a decrease in young people's participation and an increase in the elderly's participation, indicating an unfavorable trend (Josipović, 2019). Only two rural areas, Juznobačka and Raška Oblast, reported population growth between the two censuses. The Netherlands also recorded the same trend with about a 2% decrease in the number of rural inhabitants (The Global Economy, 2023). Rural areas with structural issues related to labor market performance are Pomoravska, Rasinska, Borska, Braničevska, Zaječarska, and Pirotska area. All labor market indicators (rates of dependent population, rates of social importance of the young population, rates of population rejuvenation, substitution rates of the able-bodied contingent, demographic index of the labor market (Josipović, 2019)) in these rural areas are worse than the national average. These regions have a higher proportion of dependent population, a lower proportion of population rejuvenation, and a lower rate of labor replacement, indicating a worse social importance for the young population. The unemployment rate in rural areas of the Netherlands has decreased due to the shift from villages to cities, indicating economic development.There are approximately 80 employees per 1000 inhabitants in rural areas, and this ratio has remained unchanged since 2011. As of 2017, wages in the agricultural sector are the lowest of the four sectors (construction, industry, and services) (European Commission, 2021).

Lastly, we will deal with indicators of social well-being. Indicators of social well-being include the availability of public services, which dictate the quality of life. We will exclude natural amenities from our analysis. Most districts are at the level of the national average, but Borski, Zaječarski, Pirotski, and Toplički are above the national average. The main problem is the lack of infrastructure. According to data from 2019, 500 villages do not have a shop in the village, 1000 do not have asphalt or an access road (RTS, 2019), 2,000 villages do not have a post office, and 73% of villages do not have a cultural center or a library (Statistical office of the Republic of Serbia, 2023). In 230 villages there is no primary school, in 2760 villages there is no kindergarten, in two-thirds, there is no hospital, and in 200 villages there are no inhabitants under the age of 20 (Statistical office of the Republic of Serbia, 2023). On the other hand, rural populations in the Netherlands rate the availability of public services highly, with only 12% of respondents dissatisfied (Felix Johan Pot et al., 2023). It is interesting to note that the greatest dissatisfaction was expressed in road availability for private cars, while intercity transport showed the highest degree of satisfaction. In the rural areas of the Republic of Serbia, rural schools often have only one pupil, while the reform implemented in the Netherlands in 1994 enables the adaptation of the school to the environment in which it is located. In the case of the Netherlands, this means that schools in rural areas have between 62-101 students (OECD, 2021)

Conclusion

Rural populations are declining globally, impacting agriculture. Governments are focusing on rural development, including in Serbia where aligning policies with EU standards is a priority. Strategies include improving infrastructure and alternative job opportunities. IPA funds, particularly through IPARD, are vital for rural development, supporting projects like supply chain optimization and manufacturing. Integrating environmental sustainability into Serbia's rural policies is crucial for sustainable resource management.

Our objective was to compare two countries with different policies, outcomes, and conditions. As per our analysis, we have reached the following conclusions:

1. Rural development policies have a longer history in EU countries compared to Serbia. Due to its communist legacy, the upheavals of the 1990s, and the political instability of the early 2000s, Serbia only began to focus on rural policy in earnest around 2010;

2. In the Netherlands, rural-to-urban migration is often driven by career opportunities. In contrast, in Serbia, the exodus from rural areas is primarily a matter of survival.;

3. The Netherlands has a more robust system for monitoring rural development goals, with a strategy that includes specific objectives and actionable plans. In contrast, Serbia's strategy largely consists of listed goals without clear mechanisms for implementation and monitoring;

4. The Netherlands has a well-informed public, while Serbia lacks a national public information system to promote rural life improvement.

Future research in rural development should focus on enhancing local knowledge, boosting workforce productivity, fostering entrepreneurship, and improving information exchange among businesses to support small-scale enterprises and strengthen local communities.

Conflict of interests

The authors declare no conflict of interest.

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CULTURE SYSTEM IN NAAMA OASES (SOUTHWESTERN ALGERIA)

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ABSTRACT

The present study contributes to the identification of cropping systems applied to traditional argosystems in Naama region (southwest of Algeria). A series of farm surveys were conducted for 30 oases farmers using a semi-structured questionnaire on aspects related to systemic typology crops practiced in Moghrar and Tiout oases in Naama region. The obtained results showed a diversification of crops grown intensively in these oases. They are characterized by the practice of mixed food crops cultivation in underlying strata, associated with family-type livestock farming. Truly, the presence of 35 different crops: date palm cultivar, 5 forage crops, 16 market gardens and 13 fruit trees has been recorded. This oasis system represents an ancestral oasis heritage built and maintained by the local population owing to a careful management of natural resources.

Introduction

Saharian agriculture has undergone a profound evolution during the different agriculture policies adopted from the independence period to nowadays (Mihi et al., 2019 ; Amichi et al., 2020; Hadeid et al., 2021; Senoussi et Huguenin, 2021). During the period of

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reforms and novelty in agriculture, such as the transfer of agriculture outside the oasis, the use of plastic tunnels of market gardens, new irrigation techniques, and above all the evolution of land tenure, decisive changes have taken place in both agrarian systems and attitudes (Hafiza, 2013; Saidani, 2022; Hamamouche, 2018; Saadi and Djeddi, 2024).

The study of production systems, namely cropping systems in the palm groves of southwestern Algeria allows us to examine the evolution of the oasis cropping system and to try to understand the behavior of the oasis farmers. The characterization of these cropping systems and farming practices adopted by farmers in the oases of southwestern Algeria revealed the richness of the local know-how of the southern people in order to ensure agricultural production and to preserve the sustainability of the systems and the surrounding environment.

The objective of this study consists in :

- Characterization of oasis production systems in southern Naama

- Identification of the degree of oasis farmers structuring and functioning

- Understanding the dynamics of oasis production systems,

- Assessment of the sustainability of oasis agrosystems via an agroecological and socio-economic diagnosis

Materials and methods

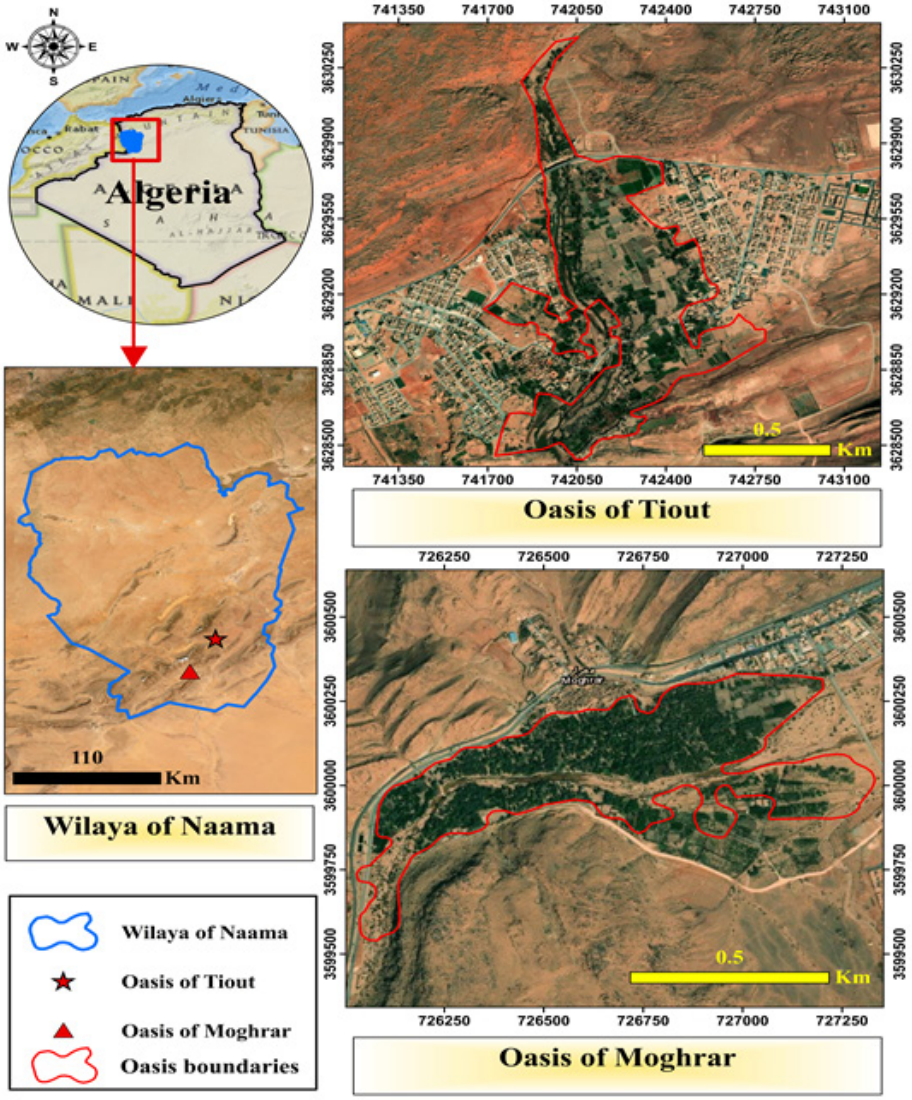
1. Geographical location

Tiout and Moghrar oases are located in an arid zone in Naama province (southwestern Algeria), (Figure 1).

Tiout oasis is located 10 km east of Ain Sefra city, the most important city in the province of Naama, in extension of the National Road No. 47. It is located between the geographical coordinate's 32°47' N altitude and 0°24'W longitude. It rises to an altitude of 1025 m. It is located between Djebel Aissa in the north-west, Djebels Djara and Mekter in the south. It is located in the bed of the Wadi Tiourtelt, which drains the waters of the Djebel Souiga and is part of Tiout municipal, within the daïra of Ain Sefra (Hadidi et al., 2018; Boucherit, 2018; Benaradj et al., 2021; Hadidi, 2019; Ait Saadi and Remini, 2020; Remini, 2019).

Moghrar oasis is located 50 km south of Ain Sefra on National Road 6. It is geographically located between 32° 30' of the North altitude and 0° 35' of longitude and with 937m of altitude. It is bounded to the north by the Djebel Bou Amoud (1.692 m) and the Djebel Cheracher (1.726 m); to the east by the Djebel Boulerhad (1.690 m) and to the south-east by the Djebel (Hadidi et al., 2018; Boucherit, 2018; Remini, 2019; Hadidi, 2019; Benaradj et al., 2021).

Figure 1. Geographical location of study oases



Methodological Approach

Agricultural censuses of agricultural statistical bulletins demonstrate the importance of agricultural production across different agro-ecological regions at local and regional levels (D.B.P.M., 2023). These surveys across a wide range of variables that enable the analysis of both the structuring of agricultural space - including major crops and permanent grasslands - and the structure of farms (FAO, 2018; Junquera et al., 2022; Klebl et al., 2024). These censuses aim to understand the organization of farming and measure its evolution over time: to track the evolution of agricultural production and

the agricultural population. The selection of statistical variables and the analytical approach are crucial for the relevance of the results.

The search for a typology of a production system requires a study focusing on socio-economic and technical aspects. The study of the typology of oasis agro-systems can be designed according to different criteria: cultivation system; agro-climatic situation and production system itself (Zenkhri, 2017; Faci, 2019; Benaradj et al., 2020; Sahli, 2020; Mihi, 2022; Addoun and Hadeid , 2022; Addoun, 2022; Errayhany et al., 2022; Ahrabous et al., 2023; Houssni et al., 2023; Chahid et al., 2024; Amrani, 2024).

The survey was conducted for 30 oases farmers in order to collect information used in the inventory and analysis of agricultural practices applied by farmers in both oases studies (Moghrar and Tiout) during the period of February and June 2018. The number of farms surveyed was not fixed in advance, but it was imposed by our investigation in the field, based on the availability of farmers, the ease of accessibility to the operation and the admissibility of the people visited. The farm visits were carried out with the collaboration with Directorate of Agricultural Services of Naama (DAS) and the representative of farmers from the oases.

The approach followed for developing the typology is based on the following steps:

- Presentation of the study area as a unit of analysis led by key informants and supported by specific documentation.

-Prospecting of study oases and inventory of plant species (date palms, fruit trees, market gardening and fodder crops). It will allow the characterization of the different production factors (surface area of farms, types of farms) and the parameters for measuring plant agrodiversity (specific richness, varietal richness).

- Semi-directed informal exploratory surveys carried out with oasis farmers in traditional agroecosystems and using a participatory approach. The oasis prospecting survey aims to evaluate and identify cultural diversity (phoenicicultural, fruit and herbaceous), describe the different production factors based on socio-economic and agricultural descriptors. These respondents were interviewed by farmers with visual observations of farms to obtain answers regarding the traditional knowledge, which was the subject of our study.

The survey conducted for farmers is structured by a questionnaire, which guides the interviews administered as a quantitative research tool to collect information on aspects relating to the typology of agricultural holdings (Identification relating to the holding: size, method of asserting, structural means, mode of production and management: irrigation, fertilization, crops grown, cultural stratification, plant species cultivated: phoenicicole, fruit and herbaceous) in connection with socio-economic aspects (Identification of the operator: Age, sex, academic level) .

- Development of the thematic survey guide for farms and formal surveys of farms and creation of a typology of farms to better understand the different types of cultivation practiced by the oases

- Data analysis makes it possible to inventory the cultures in a synthetic manner at the level of the two studied oases. Descriptive analysis was used to calculate percentages and frequencies of variables. The graphs and tables were extracted using Excel software based on data from surveys and visual observation of the oases.

Results and Discussion

1. Analysis of biophysical data from the study area (oases)

1.2. Socio-economic framework of oases

The oasis of Tiout has a population of 7,231 inhabitants, spread across an area of 789.5 km² at a density of 6.6 inhabitants / km². Indeed, the oasis of Moghrar, which has a population of 4,707 inhabitants spread across an area of 1,792.5 km² at a density of 1.97 inhabitants per km² (*Table 1*.).

Table 1. Evolution of population (number of inhabitants) in the study oases

Years	O. Tiout	O. Moghrar	Total/ inhabitants
1998	5,014	3,275	8,289
2008	6,532	4,348	10,880
2018	7,231	4,707	11,938
2020	7,296	4,791	12,087

Source: D.B.P.M. Naama, 2021

According to *Table 1*, we have observed an evolution in the population over the last two decades; it increased from 8,289 to 12,087 between 1998 and 2020.

1.2. Climatic characteristics of agro-systems

The region is characterized by a dry and very continental Saharan climate, with cold and humid winter and warm and dry summer. The wet period lasts only three months, and the dry period spreads over the rest of the year; indicating a water deficit. The average annual rainfall is 213 mm. The average annual temperature is 15.9 °C, with a maximum of 36°C in the warmest month and a minimum of -0.5°C, in the coldest month. The average annual relative humidity is 43.33% with the average daily amplitude of 2.14% in November, December and January. White frost occurs on average to 24 days per year, extending over the colder months from December to February. The winds blow most frequently from southwest to northeast (Boucherit, 2018; Benaradj et al., 2021).

1.3. Geological characteristics

The Tiout region is geologically characterized by a flat-bottomed syncline, which locally exposes the Barrémien, Aptian, and Albian lithostratigraphic subdivisions. As to Moghrar region, it is characterized by the presence of Upper Jurassic dolomitic limestones and sandstone with interbedded clay layers (Benaradj, 2017; Boucherit, 2018; Hadidi, 2019).

1.4. Soil characteristics

In Naama region, soils are generally shallow with low organic matter content and they occupy the accumulation zones, including the spreading zones, offer the best potential for agricultural development. The different types of soils are distributed according to geomorphological characteristics and mainly consist of materials produced by the weathering of the abundant sandstone bedrock or limestones from the surrounding massifs (Boucherit, 2018).

1.5. Hydrological characteristics

The particular hydrography is characterized by the conditions of surface water concentration, which is almost planar, and by the existence of groundwater ressources. The oases needs in water are provided by the rational use of the foggaras system. The water sources are springs and wells that tap the groundwater, which, by accumulating, replenish the reserves of vast deep and shallow aquifers. Groundwater is an important part of the water resource. They have the advantage of their regularity, their low mobilization costs, and their good spatial distribution (Derdour et al., 2022). Deep aquifers are exploited by boreholes and shallow wells, the depth of which generally varies between 4 and 30 meters (Benaradj et al., 2015).

2. Typology of the oasis agro-ecosystems

The two oases; Moghrar and Tiout are characterized by an oasis-type system which, since antiquity, has been an association of three vegetation cover strata: palm trees, fruit trees, and annual crops (cereals, forage and market gardening). This oasis agro-system is essentially located in the form of oases along the wadis, in the vicinity of water sources, and in places where groundwater levels are shallow.

The farming system features an intensive and diversified cultivation approach based on the natural use of water, and is practiced by the inhabitants of Ksour, in gardens established near water sources, captured by Foggaras system.

Agricultural production in the oasis is an important source of food and income for its inhabitants, and for many it is the primary or second means of ensuring their livelihood. The majority of the oasis's agricultural production is destined for the self-consumption of families, and due to the quantity produced and its quality, it ensures their families' food security (Boumadda, 2019; Benaradj et al., 2020).

Table 2. Distribution of agricultural strata (Ha) in Oases study

Cultures	O. Tiout	O. Moghrar	Total
Number of Date Palm Trees	3,800	31,800	35,600
Arboriculture (Ha)	368	179	547
Herbaceous crops (Ha)	711	100	811

Source: D.B.P.M. Naama, 2021

According to the *table 2*, the number of date palms is increased in Moghrar oasis (with 31,800 palms) by addition in Tiout oasis. On the other hand, the area reserved

for arboriculture is significant in the oasis of Tiout compared to Moghrar oasis. This development is due to the rise in land ownership costs and the promotion of investment in the sector.

The production and irrigation systems of the oases, as well as the crops practiced, vary according to the location of the oases, in relation to their environment.

The oasis system is based on the integrated association of vegetables, fruit trees, and date palms in combination with small livestock. This system is sustainable and adapted to the constraints of the arid climate. Water management is optimized. This cultivation system is practiced with two or three strata depending on the availability of irrigation water, and can be reduced to two types of cropping system: extensive and intensive.

2. Typology of oases production systems

2.1. Socio-demographics of respondents and analyses of agricultural features

Table 3. General profile of surveyed

Parameters		Number	Percentage (%)
Age (years)	20-40	2	6,67
	41-60	12	40
	Over 60 years old	15	50
	Total	30	100%
Sex	Woman	2	6,67
	Man	28	93,33
	Total	30	100%
School level	Illiterate	20	66,67
	Primary	6	20,00
	Medium	3	10,00
	Secondary	1	3,33
	Academics	0	0%
	Total	30	100%

Source: Survey study

2.1.1. Age of respondents

In the sample studied, the age of the farmers surveyed varies between 20 years (minimum age) and 85 years (maximum age). So, we found that 57.5% of elderly farmers were between 40 and 60 years old and predominated in the region with the largest proportion , 32.5% of farmers under 40 years old and 10% for the category of old farmers over 60 years old and young people whose age is between 20 and 40 years old. The majority of operators in the region belong to elderly people who have popular know-how. For older people, this sector has become an integral part of their lives. Furthermore, for young people this reflects the disinterest of young people in this activity which appears too difficult to them and they turn towards other less difficult and more remunerative activities, which pose the problem of the future of these oasis farms.

1.2.2. Level of education of respondents

In terms of educational level, the majority of respondents are illiterate; i.e. 20 farmers, the rest have acquired a modest level (primary or medium), the know-how inherited from their parents constitutes the main reservoir of agricultural practices in this oasis agro-system of the study region.

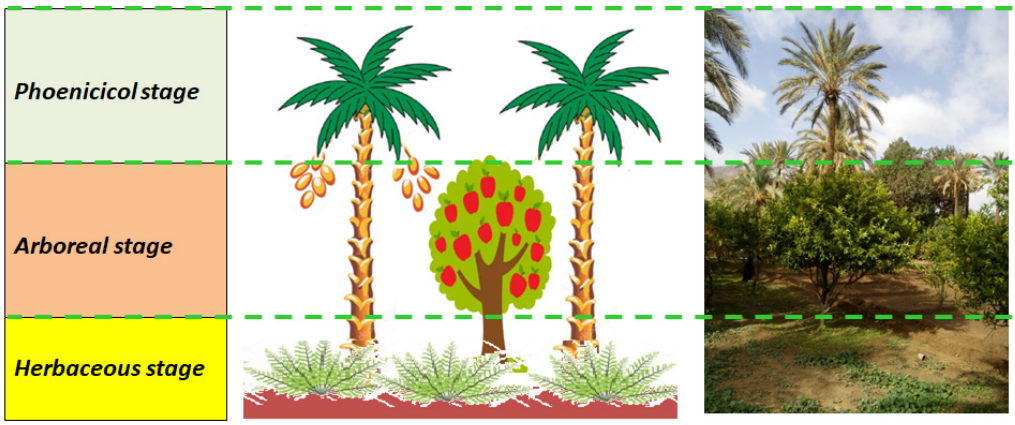
1.2.3. Area of farms

The size or surface area of farms is between 0.5 and 5 ha. The surface areas of the farms surveyed in the study oases are small; 75% of farms have an area of 0.5 ha or less. The surface area of each plot rarely exceeds 0.5 ha; the palm trees are planted on the very surface of the water table. Also, the results showed that only 25% of farms had a size greater than 1 ha. The results highlight the predominance of the surface area of less than 1 hectare, which is qualified as a small farm. Which indicates fragmentation is very important in the study oases. Indeed, the problem of fragmentation is much accentuated, this largely explained by the impossibility of extending farms and the rules of inheritance. According to this fragmentation of production units (0.5 to 1 ha/farmer), the family nature of land exploitation, agricultural intensification remains very modest. The small size of farms hinders the development of agricultural production which will be oriented mainly towards self-consumption; this is "subsistence agriculture". Similar results are noted like Algerian oases and the oases of North Africa (Otmane and Bendjelid , 2018, Ben Khalfallah, 2019; Otmane , 2019, Boumadda, 2019; Adair et al, 2022; FAO , 2021; Benaradj et al, 2020; Gharbi et Elloumi , 2023; Amrani and Senoussi, 2023) .

2.2. Cultivation system

In these studied oases, the cultivation system practiced has three stages:

Figure 2. Cultivation system in oases



2.2.1. First stratum with "phoenicicol" system (date palm)

The date palm (*Phoenix dactylifera*) is the main component of the oasis production systems. It is an intensive system that plays a role of sheltering the oases from desert influences and creating a microclimate favorable for the development of neighboring crops.

The primary activity in the oases is date palm cultivation (phoeniculture). The date palm grove consists of numerous varieties, each with varying economic importance (e.g., Feggous and Aghrass).

The date palms constitute a woody canipy that shade the underlying crops.

Efforts have been made to support small-scale farmers in the oases study, the through date palms planting programs. As a result, the potential date palm area has reached around 527 ha. This has led to a modest but significant date production of close to 7,130 quintals in 2020 (D.B.P.M., 2021).

2.2.2. Second stratum to Fruit Tree System

Fruit tree cultivation is practiced on a very small scale as an intensive system, mainly for home consumption. The fruit orchard includes a variety of species, such as almond (*Prunus dulcis*), lemon (*Citrus limon*), orange tree (*Citrus sinensis*), grape vine (*Vitis vinifera*), quince tree (*Cydonia oblonga*), fig (*Ficus carica*), orange (*Citrus sinensis*), pomegranate (*Punica granatum*), apricot (*Prunus armeniaca*) and olive (*Olea europaea*). These fruit trees are adapted to the local pedoclimatic conditions and are scattered among the date palms at a low density of around four trees per hectare.

Figure 2. Fruit trees under date palms (a. *Vitis vinifera*, b. *Citrus sinensis* , c. *Cydonia oblonga*)

2.2.3. Third Stratum to Herbaceous System

The favorable microclimate created by the date palm canopy supports a polyculture of food crops, including vegetables, fodder, and cereals, as well as livestock, primarily goats and sheep, in a traditional family-based system.

Herbaceous crops in the study oases are characterized by a diversification of species, with 447 ha of Market gardening, 251 Ha of winter cereals and 325 Ha of artificial fodder (D.B.P.M., 2021).

2.2.3.1. Market gardening crops

This system is based on two systems of culture:

- Crops grown under greenhouses between October and March include tomato (*Solanum lycopersicum*), pumpkin (*Cucurbita pepo*), potato (*Solanum tuberosum*), beet (*Beta vulgaris*), turnip (*Brassica rapa*), bell peppers (*Capsicum annuum*), and other crops. These tunnel plots are located in palm groves and belong to local growers.

- Winter field crops mainly consist of feva bean (*Vicia Faba*), onion (*Allium cepa*) and garlic (*Allium sativum*). The winter and spring seasons are followed by summer crops, promarily melon (*Cucumis melo*) and watermelon (*Citrullus lanatus*).

Figure 3. Market garden crops under date palms *(*a. *Vicia Faba,* b. *Cucurbita pepo ,* c. *Allium cepa,* d. *Capsicum annuum)*

2.2.3.2. The Forage Crops System

Forage crops grown under palm trees, although still poorly controlled and subject to multiple constraints, are still practiced. They include alfalfa (*Medicago sativa*), barley (*Hordeum vulgare*) and maize (*Zea mays*). These forage crop can improve the soil ferility via the addition of organic matter and nitrogen fixation by the legumes.

Figure 4. Forage crops under date palms (a. *Avena sativa*, b. *Zea mays*, c. *Medicago sativa*)

These forage crops occupy small patches between palm trees and sometimes even occur around palm trees, dispersed here and there in the form of bouquets (Benaradj et al., 2020; Boucherit et al., 2020).Therefore, forage crops are of great interest in oasis farming systems. The role of forage crops is largely linked to the role of livestock farming (Sraïri et al., 2019, Laribi et al., 2023).

The results of the study showed that in the oases cultivate more than 35 plant species are cultivated: several date palm cultivars (Feggous, Aghras, Takerboucht, Tafghola, Tighazrin…), 13 fruit species, 5 forage species (cereals and alfalfa) and 16 species market gardening species. This diversity in cultivation and production systems has ensured the sustainability of the oasis agro-ecosystem for several centuries.

According to Benaradj et al., 2020, the oasis agrosystem also offers a favorable environment for carrying out polyculture of food crops in underlying strata, associated with family-type livestock farming. The oasis agrosystem presents a high performance of the cultivation systems practiced which can be the key to ensuring food self-sufficiency for the local population (Mihi et al., 2019).

In North Africa, oasis agriculture is essentially based on the association of the date palm with other crops such as fruit growing, market gardening and forage crops. This ensemble forms a three-story oasis agro-ecosystem which is characterized by its specific crops not only through their cultivation methods but also by their genetic potential (Faci , 2019; Salhi , 2020; Houssni et al., 2020; Aljane et al., 2020 ; Loumerem et al., 2020; Benmoussa et al., 2022 ; Amrani, 2023 ; Afify et al., 2023 ; Loucif, 2023).

The results allowed us to refine our work hypotheses and to start studying the ancient oasis system, which represents an agro-ecosystem developed and maintained by local population of Ksar, based on the efficient management of natural resources. This organization is predicated on the effective use of drainage water and the diversification of cropping systems, associated with date palm cultivation with herbaceous crops and small livestock.

Conclusions

The typology carried out at the pre-saharian oases level of southern Naama shows that the dominant production system is a mountain oasis agro-system practiced for centuries. This intensive three-stage cultivation system: phoeniciculture, fruit growing and generalization of market gardening and fodder systems.

Saharian agriculture in Naama oases is diverse and multilayered. The date palm dominates the tree layer as the primary crop, accompanied by fruit trees in the shrub layer, and numerous annual herbaceous crops in the ground layer, resulting in a highly diversified system.

This oasis system represents an arid agro-ecosystem which has been constructed and maintained by local population through a careful management of natural resources. It contributes to the soil fertility enhancement by means of incorporation of compost and crop residues, and legumes-based crop rotations.

In conclusion, the production system in the study area is traditional and based on polyculture, with different cultivation methods adapted to local conditions. The aim of this system overarching logic is producing for subsistence.

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Conflict of interests

The authors declare no conflict of interest.

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DYNAMICS OF CONSUMER PRICES AND VOLUME OF TURNOVER IN RETAIL TRADE OF FOOD PRODUCTS

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ABSTRACT

This paper analyses the dynamics of consumer prices and the volume of turnover in the retail sale of food products in the Republic of Serbia in the period from 2006 to 2022. The focus of the research is on the impact of inflation and unemployment rates on the real volume of turnover of these products using multi-factor regression. The results show that inflation does not have a statistically significant impact on the real volume of turnover of most food products, while the unemployment rate has a significant negative impact. However, the exceptions are sugar-based and chocolate-based products, where price increases have a significant positive impact on turnover. This analysis provides insights into the key macroeconomic factors influencing consumer habits and market dynamics in the face of inflation and unemployment. The results of the research can serve as a basis for creating policies and strategies that will help retailers effectively manage their business in conditions of economic uncertainty.

Introduction

The subject of this paper is the analysis of the dynamics of consumer prices and the volume of turnover in the retail sale of food products in the Republic of Serbia in the period from 2006 to 2022. The aim of the research is to examine how inflation and unemployment affect the real volume of turnover of these products. Using multi-factor regression, the research aims to identify the key factors that shape consumer habits and market

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dynamics in conditions of inflation. The relevance of this subject is indisputable, given that periods of high inflation are often accompanied by significant economic challenges, both for consumers and businesses. An increase in the price of basic foodstuffs can have far-reaching consequences on the purchasing power of consumers, and therefore on overall economic activity. In the Republic of Serbia, inflation and unemployment are significant challenges affecting the stability and growth of the retail sector. Analyzing these factors can provide important insights into how consumers react to changes in prices and unemployment, as well as how retailers can adapt to these changes. The expected results of the research include the identification of the relationship between inflation, unemployment and the real volume of food turnover. Particular attention will be paid to the analysis of different product groups to determine whether all products respond to the same macroeconomic pressures in a similar way. The results of this research can serve as a basis for creating policies and strategies that will help retailers effectively manage their business in the face of inflation and unemployment.

Literature review

Inflation is a macroeconomic occurrence characterized by a widespread rise in the overall price level of products and services within an economy over a specific duration (Bordeaux & Orphanides, 2013). Inflation leads to a loss in the purchasing power of a currency, resulting in the ability to acquire fewer products or services with the same amount of money (Samuelson, 2008). Inflation is the rate at which the prices of goods and services increase during a specific time period, often a year (Branch, 2004; Brachinger, 2008). Therefore, the cost of living is determined by the prices of everyday things and their respective allocation within the overall budget. Countries compile a list of commonly purchased products and services and monitor the cumulative cost of purchasing those items over a period of time in order to determine the average cost of living. Simultaneous and quick increases in a significant number of prices indicate severe inflation, which signifies a decrease in the value of money and its reduced purchasing power. This scenario contrasts with situations where the price of only a limited number of items increases, as in such cases, their worth only fluctuates in relation to other items (Andrade et al., 2023).

High inflation brings a variety of problems to market participants. Businesses face difficulties when the cost of materials and labor they need to make products rises. This encourages them to find ways to increase the prices of their products while remaining competitive in the market. For investors, high inflation means more uncertainty, which can force them to ask for a higher guarantee or premium because of the risk they are taking. This can increase the cost of borrowing money for firms, so they can delay investments and miss out on growth opportunities (Dutt & Padmanabhan, 2011).

Consumers are affected by the fact that their incomes do not keep up with the rise in prices, so over time they can afford less and less products. In other words, their real purchasing power is decreasing. To adjust, consumers may postpone the purchase of some more expensive items, spend more on basic products instead of luxury items,

choose cheaper products or brands, or shop at places with higher discounts instead of regular stores (Richard, 2022).

Inflation poses a significant challenge for both the government and state authorities as it carries the risk of perpetuating a cycle where rising prices are consistently matched by increases in personal wages. This, in turn, can exacerbate issues related to wealth distribution within the country. Some employees may have the ability to align their earnings with inflation, while others may not, resulting in inequality. Central banks are frequently compelled to implement stricter monetary policies in response to high inflation, resulting in increased borrowing expenses for businesses (Kalish & Wolf, 2022). This can compel corporations to decrease or delay their investments, thus impeding economic growth. This phenomenon is most noticeable in nations like Australia, New Zealand, and the United Kingdom, where it is usual for mortgage rates to fluctuate. When the central bank increases interest rates, it directly affects the rising costs of mortgages. This results in increased monthly expenditures for individuals paying their mortgages, which can have a substantial impact on their spending patterns and further impede economic growth.

Inflation can be monitored using many indicators. Authorized state entities calculate and publish "official" inflation numbers, particularly during periods of high inflation. Additionally, individual households must consider the actual expenses they incur for their daily living, as well as their personal anticipations for future inflation. The official inflation data, such as the Consumer Price Index published by the Statistical Office of the Republic of Serbia, provide information on the average cost of living. This data examines the changes in prices of commonly purchased goods and services over time (RZS, 2024). Subsequently, these modifications are used to articulate the comprehensive inflation rate, sometimes denoted as a yearly variation.

Several studies have found significant disparities in inflation forecasts across various societal groups (Bonfrer et al., 2022). This can be partially attributed to the fact that various households purchase distinct items and services, resulting in differential exposure to fluctuations in prices. Furthermore, this variance can be ascribed to variations in prior encounters with inflation, disparities in consumers' cognitive capacities, and demographic attributes such as gender, age, and ethnicity.

Based on the above evidence, it is evident that inflation is not a straightforward or consistent phenomenon. It can be comprehended on various levels, ranging from a broad perspective to specific homes, and can be quantified through both actual fluctuations in prices and subjective judgments and anticipations.

When it comes to marketing research on the effects of inflation so far, they are quite modest and limited. Thus, research can be singled out where inflation is viewed as a limiting factor (Golder et al. 2013) or inflation is introduced as a control variable (Deleersnyder et al. 2009; Mela et al. 1997). Thus, by looking at the research that analyzes the basic implications of the increase in the inflation rate, we can single out research that analyzes the impact on consumer knowledge about prices, the perception

of price fairness and price sensitivity. Other research provides indirect insights into how inflation can affect consumers.

Research shows that high inflation can be perceived as a threat to consumer welfare, which can be an incentive to monitor and understand price information more closely, thereby improving consumer knowledge of prices (Jacoby & Olson, 1977). However, economic research has shown a positive correlation between inflation rates and price variation in markets (Parks, 1978), which can hinder consumers' ability to use price information accurately. Therefore, consumer knowledge of prices suffers in an inflationary environment (Estelami et al., 2001).

When it comes to price sensitivity, there are several studies on how inflation affects consumers. On the one hand, it is thought that because consumers' knowledge of prices is lower during periods of higher inflation (Estelami et al., 2001), consumers become more inclined to pay any price, leading to less elastic demand. On the other hand, the high inflation rate, as well as media attention paid to prices, can make consumers more aware and sensitive to price changes.

Research on economic recessions, currency crises, or rising gasoline costs might provide valuable information on how inflation impacts consumers. The results of these studies suggest that a reduction in disposable income frequently results in a decline in consumption, not only in the long run but also across various channels, categories, and brands. These changes typically exhibit asymmetry, occurring rapidly but gradually dissipating, and are partially enduring. Furthermore, a reduction in nationwide promotional campaigns and advancements in product development can intensify certain consumer responses. It is crucial to highlight that the cause of the decline in revenue has a substantial influence, whether it is due to business-cyclical fluctuations or individual changes in category-specific prices, such as gasoline.

According to business cycle research (Lamey et al., 2007; Lamey, 2014), inflation has led to an immediate decline in revenues, leading consumers to shift to private label products and more affordable outlets, such as discount stores. Recent research shows that in developed economies, especially in Western Europe, consumers are more likely than in the US to react to price increases by switching to cheaper products (Europanel, 2023). Within the EU, significant differences have been observed between countries, which may be due to variations in producer behavior, market structure or institutional context of the country.

With these facts in mind, retailers are starting to use a variety of strategies to meet the challenges of inflation, with cost controls and various consumer-focused support measures being the most used. However, in addition to these conventional strategies, there are also smaller ethical practices such as „shrinking", „skimpflation", and „greedflation" (Kamakura & Du, 2012). These strategies involve reducing the quantity or quality of products without informing the consumer, or increasing prices unfairly, which can significantly undermine consumer confidence and damage the retailer's reputation.

One of the strategies used by retailers is to control and manage costs. Various cost components in the food supply chain, including raw materials, ingredients, packaging, energy, transportation, and labor, have experienced significant inflation. To maintain profitability, many retailers have taken steps to reduce internal costs or pass on increased costs to consumers or other participants in the supply chain. For example, retailers such as Amazon, which has delayed or canceled the opening of several distribution centers, the British Co-op, which plans to cut jobs, and Target, which is facing excess inventory, are taking steps to reduce internal costs. Also, Austria's SPAR reduces energy consumption, while Japan's FamilyMart uses robots to work in cold stores to save on labor costs (Edge by Ascential 2022).

On the other hand, some retailers try to pass on the costs to consumers. For example, Walmart's Sema Club is raising annual membership fees, Amazon is increasing its subscription to Prime services, and Britain's Sainsbury's is increasing the price of its delivery services. While consumers often accept reasonable price increases to reflect rising costs, they may become wary if competitors do not follow the same policy. Increases that are made in a less transparent way, such as reducing the quantity of products without lowering the price, can cause negative reactions, especially during periods when consumer budgets are already under pressure. It would be useful for retailers to transparently disclose the reasons for price increases and to avoid being the first to increase prices in their industry, and to offer new benefits in addition to price increases, such as faster delivery or additional content, in order to reduce negative reactions from consumers.

Rather than transferring the additional expenses to their customers, which may potentially harm their ability to compete, several merchants have attempted to transfer the responsibility to their suppliers. As an illustration, Amazon has implemented fuel and inflation charges for third-party vendors, Allegro has raised commissions for sellers on its platforms, and Tesco has escalated expenses for suppliers utilizing its main distribution service. Based on a recent survey conducted by the Supply Chain Institute (IPLC, 2022), it was found that 70% of suppliers have attempted to negotiate higher wholesale prices. However, over 50% of these suppliers have faced demands to reduce costs instead. Within such a context, the process of pricing discussions becomes increasingly intricate, leading to a higher occurrence of conflicts.

To gain more control over the costs of their brands and reduce supply chain risks, some retailers have opted for vertical integration. For example, Ahold Delhaize has opened the largest bottling plant in the Benelux, while Lidl is planning a new water treatment plant in the UK. Vertical integration allows for direct cost reductions through the elimination of intermediaries and provides indirect benefits such as a better understanding of the justification of suppliers' requests for price increases (Neerman, 2022).

One of the strategies to address the challenges of inflation is to reorganize loyalty programs, where they are tied to brand offerings. For example, the French supermarket Intermarché has offered price reductions on 1,800 branded products, but only for holders

of its loyalty cards, while its competitor E. Leclerc has introduced an "anti-inflation shield", where price inflation on 120 best-selling products is automatically reimbursed at checkout, but only for loyalty card holders. These strategies allow retailers to differentiate themselves from the competition and potentially increase customer loyalty by adding additional benefits, such as additional price reductions (Edge by Ascential 2022).

Other retailers have tried to make their loyalty programs more appealing by adding new features. For example, Instacart has relaunched its loyalty program as Instacart+, enabling family accounts and exclusive benefits for Chase members. Coop Sweden has partnered with an electricity provider to offer lower electricity prices to its members. There is a tendency among retailers to join loyalty programs that involve multiple vendors or to highlight their role in such programs.

Research methodology, hypotheses and data

Since inflation represents a general increase in prices, the research question arises as to how the increase in product prices affects consumption, i.e. the volume of sales, and therefore the turnover of those same products. The focus of our research is on the prices of food products and non-alcoholic beverages and the volume of their retail turnover in the Republic of Serbia. It is quite logical that an increase in the price of food products leads to a higher volume of turnover in this type of product. However, the question arises as to whether there is a real increase in the volume of sales of this type of product.

For this reason, we set up a research null and alternative hypothesis:

H0: The increase in prices of food products and non-alcoholic beverages does not have a statistically significant impact on the real volume of sales of this type of product.

H1: The increase in prices of food products and non-alcoholic beverages has a statistically significant impact on the real volume of sales of this type of product.

In order to find an answer to this research question, and thus to prove hypotheses, we need to establish indicators by which we monitor the increase in prices and the volume of turnover for certain types of products. The increase in prices of a certain type of product is monitored by the movement of the price index for a specific type of product, while on the other hand, the volume of turnover is monitored by the turnover index for that same type of product. However, the growth of turnover, in addition to the real increase in the volume of turnover, also includes an increase that is under the influence of inflation, i.e. an increase in the price of a certain type of product. For this reason, in order to monitor the increase in real turnover, we will use index of real volume of turnover for a specific type of product, which excludes the impact of inflation and sees whether there has actually been an changing in real consumption in a certain type of product. [4]

4 Real Turnover Index=(Price Index/Nominal Turnover Index)×100 and it is calculated by authors using official statistic data

In accordance with the methodological requirements defined in this way, and based on official statistical data, we have recalculated the price index of food products and non-alcoholic beverages, then the index of real turnover of food products and non-alcoholic beverages in retail sale in Serbia. The observation period was from 2006 to 2022. During this period, there were two global inflationary waves, which were caused by the influence of various factors. The first, during the 2008 financial crisis, when the US and EU monetary authorities bailed out their financial institutions, and the second during the war in Ukraine, when supply chains were disrupted, and energy prices soared. More precisely, when inflation occurred due to an increase in aggregate demand because of 'pumping' money into saving the financial sector, and cost-push inflation appeared, when the prices of key inputs, fuel, and strategic agricultural products significantly increased.

To monitor the impact of inflation on the real volume of food turnover, we will use the statistical method of multifactorial regression. Multifactor regression is a method of statistical analysis used to examine the relationship between a single dependent variable and multiple independent variables. This method makes it possible to estimate the effect of each of the independent variables on the dependent variable, by controlling the effects of other independent variables. By using multifactorial regression, it is possible to identify which factors contribute most to changes in the dependent variable and how these factors relate to each other. In this research, the dependent variable will be the index of real volume of turnover of food products and non-alcoholic beverages. It represents the real change in the quantity of these types of products that end consumers purchased in retail. While the dependent variable will be the price index of the same type of product. As a control, the second dependent variable, we will use the unemployment rate. This is because the unemployment rate, along with inflation, is one of the most important real macroeconomic variables, with the difference that it, unlike inflation, bears the epithet of a real variable.

Research results and discussion

Data on the movement of the price index and the real index of turnover of food products and non-alcoholic beverages in retail sale, as well as the unemployment rate in the Republic of Serbia are presented in Table 1.

Table 1. The changing of the price index, index of real volume of turnover of food products, non-alcoholic beverages, and the unemployment rate in the Republic of Serbia.

Year	Price index of food products and non-alcoholic beverages[5] (Base index 2006 = 100)	Index of real volume of turnover of food products and non-alcoholic beverages (Base index 2006 = 100)	Unemployment rate (%)
2006	100,0	100,0	15,4%
2007	119,7	113,1	14,8%
2008	136,2	118,4	14,4%
2009	137,3	100,2	16,9%

5 Base year 2006

Year	Price index of food products and non-alcoholic beverages[5] (Base index 2006 = 100)	Index of real volume of turnover of food products and non-alcoholic beverages (Base index 2006 = 100)	Unemployment rate (%)
2010	152,0	100,5	20,0%
2011	161,8	102,4	23,3%
2012	186,6	89,8	24,6%
2013	181,9	93,2	23,0%
2014	186,0	96,8	19,7%
2015	185,8	99,9	18,2%
2016	186,7	106,1	15,9%
2017	194,4	109,3	14,1%
2018	199,6	110,8	13,3%
2019	203,6	121,6	10,9%
2020	207,4	130,7	9,5%
2021	232,3	129,3	11,5%
2022	286,7	128,3	9,80%

Source: Calculated on the basis of https://data.stat.gov.rs/

The results of multivariate regression, in which the dependent variable is the index of real volume of turnover of food products and non-alcoholic beverages, and the independent variables are the price index of that type of product and the unemployment rate in the Republic of Serbia are shown in Table 2.

Table 2. Results of multifactorial regression

Argument	Coefficient	Standard Error	T-value	P-value	95% confidence interval
Interception (constant)	135.6409	9.712	13.967	0.000	[114.811, 156.471]
Price index	0.0544	0.035	1.563	0.140	[-0.020, 0.129]
Unemployment rate	-2.2588	0.327	-6.918	0.000	[-2.959, -1.559]

Source: Authors' calculations by using statistical software STATA 12

The results of multivariate regression show that 83% of the variability in the real volume of food and non-alcoholic beverage turnover can be explained by changes in the price index and unemployment rate (R-squared = 0.830). The interception (constant) is statistically significant ($P < 0.001$), with a coefficient of 135.6409, indicating the baseline level of real traffic volume when the independent variables are at zero. The price index has a coefficient of 0.0544, but this result is not statistically significant ($P = 0.140$). This suggests that, when other factors are considered, changes in the price index do not have a significant impact on the real volume of turnover. The unemployment rate shows a significant negative impact on the real volume of turnover, with a coefficient of -2.2588 ($P < 0.001$). This means that for every percentage point increase in the

unemployment rate, the real volume of turnover decreases by about 2.26 units.

These results indicate that the unemployment rate is a key factor that negatively affects the real volume of retail trade in food and non-alcoholic beverages, while the price index does not have a statistically significant impact when other factors are controlled. This analysis shows that the hypothesis about the impact of price changes on the real volume of turnover is not valid in the case of a complete group of food products and non-alcoholic beverages in retail sale in Serbia. This unexpected result can be attributed to the fact that the group of food products and non-alcoholic beverages is not homogenous. Different types of food and beverages have varying levels of demand elasticity in response to price changes. Essential food items typically have inelastic demand, meaning that even with price increases, consumers continue to purchase them in relatively stable quantities. On the other hand, non-essential or less frequently consumed products within the same group may exhibit more elastic demand, where consumers are more responsive to price fluctuations. This diversity within the group can obscure the overall impact of price changes on the real volume of turnover, making it difficult to draw uniform conclusions. For this reason, we have broken down the analysis into special groups of food products kept by official statistics in Serbia. According to official statistics in the Republic of Serbia, there are seven groups of food products. The first group consists of: bread, cereals, pasta, and bakery products. The second group consists of: meat and fish. The third group consists of: milk, dairy products, and eggs. The fourth group consists of: oils and fats. The fifth group consists of: fruits and vegetables. The sixth group consists of: sugar, chocolate, and sugar-based products, and the seventh group consists of: non-alcoholic beverages.

Interestingly, the results of multivariate regression, showed similar results in the case of six groups of food products. More precisely, the level of price change did not have a statistically significant impact on the real sales volume of the first, second, third, fourth, fifth, and seventh groups of food products. This means that the change in price levels did not have a statistically significant impact on the real sales volume of bread, cereals, pasta, bakery products, meat, fish, milk, dairy products, eggs, oils, fats, fruits, vegetables, and non-alcoholic beverages. This leads to the conclusion that, for these food products, the case of inelastic demand in relation to price increases applies. On the other hand, for this group of products, in the conducted regression analysis, the level of unemployment, as a control determinant of demand for these products, has a statistically significant impact (Table 2). This could open up some other research questions.

The exception is the sixth group of food products, namely sugar, chocolate and sugar-based products. Data for the sixth group of food products are presented in Table 3.

Table 3. The price index of the sixth group of products (sugar, chocolate and sugar-based products)

Year	Price index for sugar, jam, honey, chocolate (Base index 2006 = 100)	Index of real volume of turnover of sugar, chocolate and sugar-based products (Base index 2006 = 100)	Unemployment rate in %
2006	100,0	100,0	15,4%
2007	102,5	116,4	14,8%
2008	111,9	123,3	14,4%
2009	120,5	110,9	16,9%
2010	134,7	97,7	20,0%
2011	156,6	106,3	23,3%
2012	159,4	106,2	24,6%
2013	154,8	114,1	23,0%
2014	146,1	130,5	19,7%
2015	159,3	133,4	18,2%
2016	169,1	136,1	15,9%
2017	167,8	141,9	14,1%
2018	163,3	146,9	13,3%
2019	170,3	156,6	10,9%
2020	172,3	169,0	9,5%
2021	186,4	166,9	11,5%
2022	215,4	180,5	9,8%

Source: Calculated on the basis of https://data.stat.gov.rs/

The results of multi-factor regression in which the dependent variable is the index of real volume of turnover of sugar, chocolate and sugar-based products in retail, and the independent variables are the price index of that type of product and the unemployment rate in the Republic of Serbia are shown in Table 4.

Table 4. Results of multifactorial regression

Argument	Coefficient	Standard Error	T-value	P-value	95% confidence interval
Interception (constant)	117.9717	16.436	7.178	0.000	[82.161, 153.782]
Price index	0.4600	0.078	5.898	0.000	[0.290, 0.630]
Unemployment rate	-3.4548	0.393	-8.781	0.000	[-4.312, -2.597]

Source: Authors' calculations by using statistical software STATA 12

The results of the multifactorial regression show that the model explains 94.3% of the variability in the real volume of turnover of sugar, jam, honey and chocolate (R-squared = 0.943). This indicates a high degree of predictive power of the model, which means that most of the variability in the dependent variable can be explained by changes in the

independent variables. The intercept (constant) is statistically significant ($P < 0.001$), with a coefficient of 117.9717, indicating the baseline level of real sales volume when the independent variables are zero. The price index has a coefficient of 0.4600, which is statistically significant ($P < 0.001$). This means that with each increase in the price index by one unit, the real volume of turnover increases by 0.460 units, which indicates a positive relationship between the price growth and the real turnover of sugar, jam, honey and chocolate. The unemployment rate shows a significant negative impact on the real volume of turnover, with a coefficient of -3.4548 ($P < 0.001$). This means that for every increase in the unemployment rate by one percentage point, the real volume of turnover decreases by 3.4548 units.

These results suggest that the growth of the price index, from the point of view of statistics, has a positive effect on the real volume of trade in sugar, jam, honey and chocolate, while the increase in the unemployment rate has a negative impact. The model shows a high degree of explanation, which implies that the analyzed variables are key factors in determining the real turnover of these products.

Based on the results obtained, it can be concluded that the change in prices is a statistically significant variable for the real volume of turnover in the case of this group of products, and the same applies to the unemployment rate. The results obtained are particularly significant because products based on sugar and chocolate can have the epithet of luxury products and the increase in prices has a statistically significant impact on the growth of demand. In addition, the impact of increased unemployment further reduces the demand for these products more intensely than in the case of basic foodstuffs whose real volume of turnover carries the epithet of price inelasticity, from the point of view of statistical significance. In this way, the alternative hypothesis that the change in prices has a statistically significant impact on the real level of sales of food products is considered valid only in the case of the real volume of retail turnover for products such as sugar, chocolate and sugar-based products.

Conclusions

The analysis showed that the hypothesis about the impact of price changes on the real level of sales of food products in retail has a statistically significant impact only in the case of real turnover for products such as sugar, chocolate and sugar-based products. In the case of basic foodstuffs, the price level cannot be considered a statistically significant determinant for the real volume of turnover of this type of product in retail in Serbia. The results of the analysis have opened another important research question, which is that real macroeconomic factors, such as the unemployment rate, have a permanently statistically significant impact on the real turnover of food products in retail in Serbia. More precisely, for each product group individually, the increase in unemployment has a statistically significant negative impact on the real volume of turnover for each product group. In addition, in the case of basic foodstuffs, this negative impact is statistically significant, but milder, while in the case of products bearing the epithet of luxury products, this negative impact is more pronounced. This shows that in the case

of the analysis of the real turnover of food products in Serbia, inflation as a monetary macroeconomic phenomenon has a statistically important, but not as strong impact as the unemployment rate, which is a real macroeconomic phenomenon.

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Conflict of interests

The authors declare no conflict of interest.

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SEASONALITY AND RURALITY – SECOND HOMES AND TOURISM IN RURAL AREAS OF SERBIA

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ABSTRACT

The study investigates the growing phenomenon of second homes in rural Serbia and its implications for tourism development. By analyzing the geographical distribution of second homes and their relationship to the territorial capital, the study contributes to the understanding of rural tourism dynamics. The research identifies regions with high concentrations of second homes, often overlapping with attractive natural areas and renowned tourist centers. This overlap with peak tourist seasons intensifies environmental and social pressures on already fragile rural areas. To mitigate these pressures and promote sustainable tourism development, the study advocates for region-specific policies, improved infrastructure and the implementation of sustainable tourism practices. By leveraging second homes as potential rural tourism accommodations, policymakers can support local communities, lesser the environmental disturbance and promote responsible tourism.

Introduction

The trends of abandoning rural spaces and extreme population concentration in urban areas have been experienced worldwide. Throughout Europe, particularly in Southeast Europe, rural problems are numerous and notably severe due to unfavorable socio-economic trends (Chambers, 2006; Errington, 1994; Lipton, 1980; Whitby & Willis, 2017; White, 2012; Petrevska, Terzić, 2020; Ruiz-Real et al., 2020). Here, strong negative migratory trends lead to an aging population and the exodus of young people, resulting in the depopulation and abandonment of rural areas (Ruiz-Real et al., 2020).

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To survive, rural areas must adopt a model of integrated and sustainable development that leverages local resources and creates economic incentives. This approach should capitalize on decentralization trends and emerging sectors, such as leisure and tourism, which are increasingly in demand (Butler Flora & Flora, 2018; Ruiz-Real et al., 2020).

Seasonal migratory flows driven by the vacation and recreational needs of the urban population, direct a significant number of people towards rural areas. This shift has prompted the exploration of rural tourism as a fast-growing economic activity that employs a bottom-up development approach to re-integrate rural areas into the regional economic system (Baoren, 2011; Ferrari et al., 2018; Ruiz-Real et al., 2020), initiating a diversification process in these regions (Petrevska & Terzić, 2020). The overlooked benefits of rural living have regained attention, largely driven by the digital technology revolution. The COVID-19 pandemic accelerated this shift, fundamentally altering how people live, work, and communicate. Many regions in Europe are experiencing a re-population of rural areas, particularly through a "retirement transition," where senior age groups (both pre- and post-retirement) seek higher quality of life in scenic rural areas, either as permanent or seasonal residents (Stockdale, 2006). This trend has opened new opportunities for rural areas, enhancing their appeal as desirable living spaces (e.g., second homes) and as economic assets through rural tourism (rural tourist households), which is experiencing growing demand.

Since the 1970s, the importance of studying the spatial distribution of second homes (vacation homes) for spatial planning has been well recognized. Research has highlighted the significance of geographic, social, and environmental factors in explaining the regional concentration of vacation homes (Bell, 1977; Ragatz, 1970; Popović, 1999). This study examines the transformation of rural areas in Serbia in relation to tourism development, focusing on the distribution patterns of second homes primarily used for recreation and vacations. Its objective is to assess the development of territorial capital in attractive Serbian rural areas with a high concentration of second homes and to evaluate their tourism development perspectives. The paper explores the factors driving this trend and its effects on rural areas, analyzing the key patterns and influences at a macro level.

Literature review

Second homes are traditionally defined as households without permanent residents, often located in rural areas (Åkerlund et al., 2015; Slätmo et al., 2019). These properties, motivated by leisure and recreation, provide a home in a natural environment. The trend of second-home (residential) tourism involves people purchasing or renting properties in destinations that are attractive to tourists to spend extended periods there (Nazlı, 2019). Importantly, second-home users and owners are typically urban residents seeking to enhance their quality of life through recreational tourism, choosing less densely populated, yet developed, areas with greater access to nature (Strandell and Hall, 2015; Qviström et al., 2016).

Second home use reflects a desire for a temporary (seasonal) shift from an urban to a rural lifestyle (Adamiak et al., 2017; Elingsen, 2016; Müller, Hoogendoorn, 2013; Åkerlund et al., 2015). In some instances, a second home is associated with long-term intentions regarding leisure, retirement, or lifestyle migration, but can also be linked to a family property or a region of origin (Åkerlund et al., 2015). The primary motivations for second home expansion include the need for social bonding with family and friends, escaping stressful urban life, accessing nature and recreational activities, but also investment opportunities in tourism (Ellingsen, 2016; Hoogendoorn, Marjavaara, 2018; Hall, Müller, 2018). Its proliferation is typically associated with the natural geographic attractiveness and cultural models of a society, highly influenced by social and economic development.

Temporary populations, such as second home users, play a crucial role in tourism planning. In areas with low numbers of permanent inhabitants and a high number of second homes, the temporary population helps maintain the social fabric and demand for services, cultural, and economic activities that might otherwise vanish (Hall, Muller, 2018). Additionally, second home users often provide much-needed accommodation in rural areas, which generally lack hotels and other tourist facilities. Tourism activities have significant potential to mitigate negative migration trends and support rural development by generating income through tourism services (Perić et al., 2020). Assessing and evaluating both the internal and external capital of a tourism destination is a crucial first step in effective tourism planning (Dimitrov et al., 2020; Petrevska, Terzić, 2020; Terzić et al., 2019). Rural tourism is largely driven by small family businesses and entrepreneurship, and is closely related to the expansion of second homes (Terzić et al., 2020).

Rural diversification and rural tourism – the case of Serbia

Serbia, geographically, is characterized by large rural areas, which constitute approximately 70% of the country's land. Due to historical and developmental processes that encouraged mass migration, these areas have become less inhabited and less preferable for living, resulting in around 58% of Serbia's population being urbanized as of 2020. In this context, rural tourism can be observed as a vital driver of socio-economic development (Cvijanović, Ružić, 2017). With its extensive rural landscapes and attractive natural and cultural resources, rural tourism offers significant opportunities for diversifying rural economies and revitalizing small rural communities. Among the relatively small number of true rural tourists in Serbia, there is a considerable number of seasonal travelers and second-homeowners who continuously use their rural households for personal needs and often open their doors to family, friends, and tourists. The transformation of rural households into rural tourism households is further encouraged by national subsidies aimed at promoting rural diversification. These subsidies come from both national sources and EU funds, such as the IPARD (Instrument for Pre-accession Assistance in Rural Development) program, specifically through Measure 7.

Rural tourism in Serbia is recognized as a significant contributor to rural development by increasing employment, providing alternative income sources, diversifying the rural economy, and revitalizing various economic sectors (Demirović et al., 2017; Gajić et al., 2018, 2020; Terzić et al., 2020). Terzić et al. (2020) indicate that the spill-over effect[4]of tourism activities and small-tourism businesses initiated by second homeowners strongly impacts the diversification levels in rural areas through their direct engagement in providing tourist services. Positive spill-over effects of rural tourism and second-home expansion include job creation, increased incomes, infrastructure development, knowledge diffusion, and tourism promotion. The link between rural diversification and tourism, especially with the growth of second homes, has been also confirmed by Terzić et al. (2020). The authors argue that the greater diversification of the rural economy enhances the attractiveness of villages for both seasonal and permanent living, contributing to the revitalization and long-term vitality of traditional peripheral communities. However, over-tourism can lead to negative consequences, such as resource depletion (over-exploitation and degradation of natural resources), gentrification, increased pollution, and an over-reliance on the service industry. This focus on tourism often results in the abandonment of traditional agriculture, making rural areas more vulnerable to economic shifts.

Rural tourism destinations in Serbia have recorded consistent growth in tourist demand, with rural tourism seen as an important factor stimulating the diversification of agricultural economic activities on rural households. However, non-agricultural profitable activities are present in only 12.4% of total rural households, and the share of rural tourism in such activities across villages in Serbia is only 0.66%. A relatively low share of rural households is involved in tourism with over a quarter of these concentrated in the Zlatibor district (Bogdanov, Babović, 2014). Popović (1999; 2005) notes that leisure and recreation settlements are particularly concentrated and dispersed across lower mountainous regions, near spa centers, lakes, and especially along the Danube area. For example, in the Grocka-Kladovo section of the Danube, there are 49 settlements specifically developed for holidays and recreation, most of which have access to water (Popović, 2005). Numerous studies have examined second homes and seasonal settlements with leisure and recreational functions in the context of tourism development, though most were conducted as case studies. More recently, new technologies have enabled the combination of statistical and geospatial data, providing deeper insights into various factors influencing the rural tourism development process.

Tourist-like activities are especially noticeable in areas with a high concentration of second homes, many of which are not officially designated as tourist accommodations but are common in rural parts of Serbia. This pattern reflects strong seasonal migration

4 Spill-over effects in rural economies occur when economic activities or development in one sector have unintended (positive or negative) consequences on other sectors, playing often a significant role in shaping the overall economic landscape of rural areas, allowing design of policies and strategies that maximize the benefits of economic growth while minimizing potential negative impacts (OECD, 2017).

toward these attractive rural areas. A study of the geographical distribution of second homes shows a considerable overlap with the most attractive tourist zones and protected areas (Fig. 1). This overlap indicates considerable physical pressure on these spatially limited rural areas, which experience distinct seasonal fluctuations. As a result, both the functional and visual characteristics of these destinations are altered, threatening the natural environment and social structure that are vital for high-quality tourism. This situation endangers the sustainability of these already fragile rural areas.

Research methodology

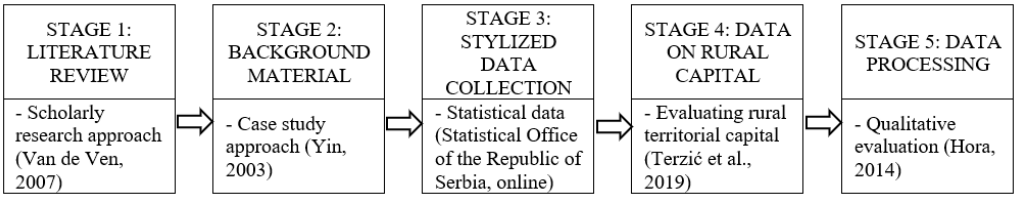
This research addresses the following research questions (RQs):

RQ_1: What is the level of development of rural territorial capital of the regions?

RQ_2: What is the geographical distribution of second homes in the context of rural tourism potentials?

The regional aspect in Serbia, concerning the rural areas, includes the following regions: Belgrade, Vojvodina, West Serbia and Šumadija, South and East Serbia and Kosovo and Metohija[5]. To meet the RQs, a combined methodological approach (Sharpley, 2014) is applied (Fig. 1).

Figure 1. Research methodology



Source: Authors

The first stage integrates theoretical and practical knowledge, drawing from the scholarly research approach (Van de Ven, 2007). This stage involves a literature review on the concepts of second homes, rural tourism, and tourism activities impacting the development of rural areas. The second stage employs a case study approach (Yin, 2003) to provide background material on rural diversification and rural tourism in Serbia. In the third stage, stylized data on rural tourism are collected from secondary sources. The analysis predominantly utilizes data from the national censuses of 2012 and 2022, as well as statistical yearbooks available on the Statistical Office of the Republic of Serbia's website (https://www.stat.gov.rs) applying data visualization using QGIS 3.12 software. The evaluation method of rural territorial capital was also

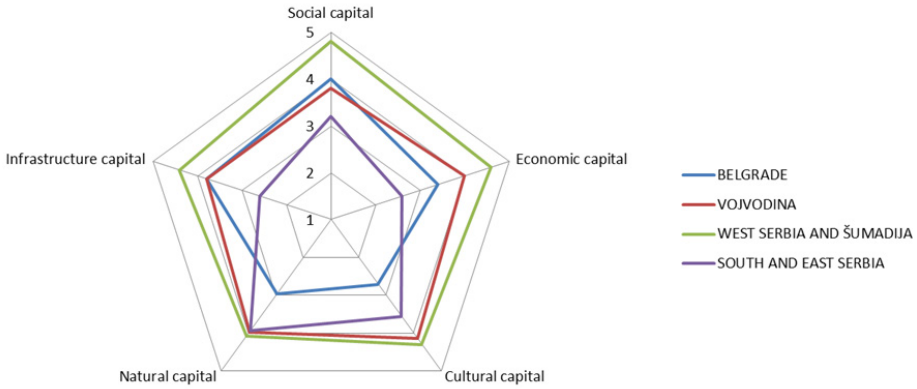
5 Kosovo and Metohija region has a specific status which is observed without prejudice in line with United Nations Security Council 1244/1999 Resolution. Due to long-lasting unfavorable political situation statistical data on the population and dwellings in this region are lacking. Therefore, this region was excluded from the study.

applied (Terzić et al., 2019). The final stage involves qualitative data processing based on expert judgment which faclitates empirical generalization and summarization of the findings. The focus is placed on the analysis of geographical distribution of second homes for tourism and recreation purposes, as well as the number of accommodation units classified as "rural tourism households." The data obtained were analyzed, and suggestions for the multifunctional use of rural areas with proposition for conversion of the second homes into tourist accomodation units.

Assessment of territorial capital development

Rural territorial capital is a holistic concept that includes both the tangible and intangible assets that support the development and resilience of rural areas by examining the complex interplay of natural, social, cultural, economic, and infrastructural (institutional) resources (Camagni, 2006). In this line, natural capital refers to the physical environment, including land, water, biodiversity, and climate. Social capital involves the networks of relationships and cooperation within rural communities. Cultural capital consists of cultural heritage, shared values, and traditions that shape a rural community's identity. Human capital relates to the skills, knowledge, and education of the rural population, which are essential for economic growth, innovation, and adaptability. Finally, infrastructural (institutional) capital encompasses the physical infrastructure, formal and informal institutions, governance structures, and community action groups that underpin the social and economic base of rural areas.

Figure 2. Rural territorial capital in Serbia, regional aspect



Source: Authors

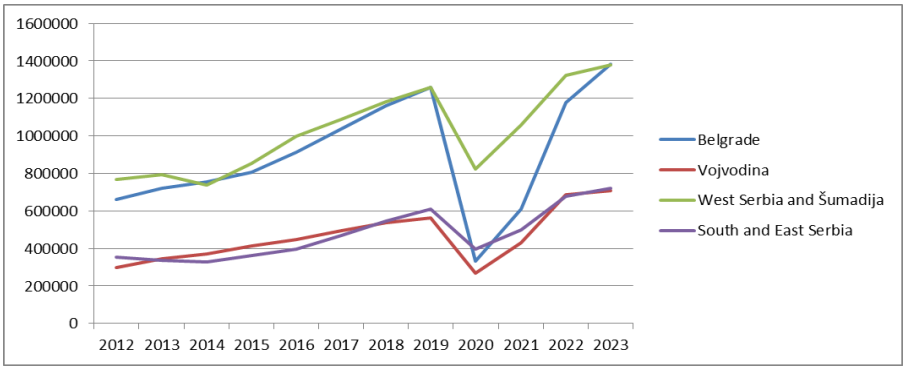
Figure 2 presents the results of investigating the development levels of social, economic, cultural, natural, and infrastructure capital in the context of rural areas. The data indicate that regions in Serbia, including Belgrade, Vojvodina, West Serbia and Šumadija, and South and East Serbia, exhibit varying levels of territorial capital development. Bogdanov and Janković (2013) investigated the levels of tourism

development in different regions of Serbia through the lens of territorial capital and identified significant disparities. In the Belgrade region, rural areas lack natural and cultural capital, but this is compensated by strong social and economic capital. High entrepreneurial potential has led to the creation of popular suburban weekend zones in areas like Barajevo, Ripanj, Vrčin, Ralja, Grocka, and Pančevo, which feature a variety of tourist facilities. The Vojvodina region, known for its highly productive agriculture and strong economy, has sufficient natural and cultural capital to become an attractive rural tourism destination. However, aside from a few attractive areas (such as Fruška Gora Mt., Delibato Sand, the Danube area, Palić Lake, and Vršac Mt.), the region suffers from inadequate infrastructure and low interest in tourism development among local communities. In contrast, the South and East Serbia region boasts abundant, relatively undisturbed natural and cultural resources, but lacks the social capital, infrastructure, and investment needed to fully develop its tourism potential.

In this line, West Serbia and Šumadija region emerged as the leading rural tourism destination, largely due to its social, economic, and cultural capital, coupled with relatively good infrastructure and proximity to Belgrade. However, the high concentration of tourism facilities in this region has severe impact on the quality of the natural environment. In some cases, like in Zlatibor district, this has led to extremely intensive and unplanned urban development. The already intensive construction activity in the weekend zones of Divčibare, Tara, Zlatibor, and Zlatar Mts. significantly increased following the opening of the "Miloš Veliki" (A2) highway, which connects Belgrade and Čačak, reducing travel time to these destinations.

The latter indicates the need for different policies to develop rural tourism in each region.

Figure 3. Tourist arrivals in Serbia, regional distribution 2012-2022.



Source: Statistical office of Republic of Serbia, 2024. (https://data.stat.gov.rs/)

As seen in Figure 3, the concentration of tourists in Serbia is primarily focused on urban *zones*, with Belgrade accounting for one-third of all tourist visits (33%). Western Serbia and Šumadija collectively attract another third (32.9%), with the Zlatibor district alone drawing over 12.5% of tourist arrivals and approximately 40% of the total nights spent in Serbia. In these areas, rural tourism plays a more prominent role, though it

remains a highly seasonal activity, peaking in spring and summer (May-August), which significantly impacts rural environments.

The most common accommodation types used in rural tourism are rural households, apartments, and guest houses, with the highest concentration of these facilities found in western Serbia (Borović et al., 2022). A rural tourism household is typically a private residence or farm that provides accommodations and other services to tourists seeking authentic experiences in a rural setting (Albacete-Saez et al., 2007).

According to the Statistical Office of Serbia, in 2020, there were 631 rural tourist households with a total of 1,500 beds. These accommodations were predominantly located in mountain destinations (243), other tourist destinations/towns (312), spas (20), and other locations (56). In 2020, such facilities accommodated 11,355 domestic and 318 foreign tourists. Over the years, the number of rural tourist households and tourists evidented in rural areas has steadily increased. By 2022, there was a significant growth in rural tourist households, with 712 households offering 2,101 accommodation units and 4,857 beds. This represents an increase of 112 new rural facilities and a tripling of available beds within two years. In 2022, these accommodations hosted a total of 29,119 tourists (including 6,735 foreign tourists), accounting for 117,320 nights spent (21,859 nights spent by foreign tourists). Despite continous growth, rural tourism in Serbia remains primarily oriented towards domestic tourist market, that constitutes about 80% of the total demand. However, when compared to the 288,883 registered second homes in 2022, the 712 rural tourist households seem relatively insignificant. This suggests that "second-home tourism" currently dominates rural tourism in Serbia.

Analysis of geographical distribution of second homes

Second homes are a notable feature of rural areas in Serbia, with a relatively low share in urban areas (0.6-2.8% of total housing) where they serve almost exclusively as weekend homes. The former Socialist Republic of Yugoslavia, despite being one of the poorest countries in the region, recorded approximately 33,200 second homes in 1981, with 38.4% of these located in Serbia, placing it among the top socialist countries for second-home ownership (Gosar, 1989). The relatively high number of second homes can be attributed to the country's attractive natural landscapes and the mass urban migration that followed lifestyle changes in the industrial population after World War II. Additionally, Yugoslavia's unique form of socialism allowed for real estate investments, even during periods of hyperinflation (Gosar, 1989).

Table 1. Second-home distribution in Serbia in 2011

Census 2012	Serbia		Belgrade		Vojvodina		West Serbia and Šumadija		East and South Serbia	
Total Housing	3231931		734909		848064		903139		745819	
Seasonal	201519		25789		38430		80031		57269	
% of seasonal	6.24		3.51		4.53		8.86		7.68	
Settlement type	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural

Census 2012	Serbia		Belgrade		Vojvodina		West Serbia and Šumadija		East and South Serbia	
% in total housing	56.9	43.1	80.7	19.3	59.2	40.8	44.1	55.9	46.4	53.6
Vacation and recreation (%)	1.8	10.4	0.6	15.4	2.5	6.7	2.9	11.8	1.8	9.9
Seasonal agriculture (%)	0.1	1.6	0.0	0.0	0.0	0.0	0.0	1.8	0.0	2.7

Source: Statistical Office of the Republic of Serbia, 2013

he 2011 census recorded a total of 201,519 second homes, accounting 6.24% of total housing units. In rural areas, the share of second homes in total housing is significantly higher, with a outlined tourism function (vacation and recreation), ranging from 6.76% in Vojvodina to 15.46% in Belgrade region. In the West Serbia and Šumadija region, second homes constitute 13.55% of rural housing (only 1.8% used for seasonal agriculture), while in South and East Serbia, they make up 12.61% of total housing (2.7% used for seasonal agriculture). In 2011, among second homes used for tourism and recreation 81.1% were located in rural settings (Table 1).

More recent data, from 2022 (Table 2) indicate a further expansion of second homes in Serbia, reaching 8% of total housing (2.4% in urban areas and 15.8% in rural areas). Compared to a decade ago, the increase of 1.76% seems modest, but the most dynamic rise in second homes occurred in rural areas, in average by 5.4%, most notably in West Serbia and Šumadija (6.9%) and South and East Serbia (6.6%). However, significant differences exist in the patterns of second home expansion. In West Serbia and Šumadija, the growth was primarily driven by the construction of new second homes (weekend settlements), while in South and East Serbia it was a direct consequence of rural abandonment and the spontaneous conversion from permanent living to seasonal use. Consequently, there are large concentrations of second homes in the suburban zones of capital cities and regional centers. The greatest concentration is evidenced in the Zlatibor district, accounting for 18.5% of total households. Observing rural areas only, Zlatibor district leads with over 28.3% of second homes in total rural housing. One most note that in the last decade the number of second homes in Zlatibor district doubled, jumping from 14,403 (2012) to remarkable 30,335 units in 2022.

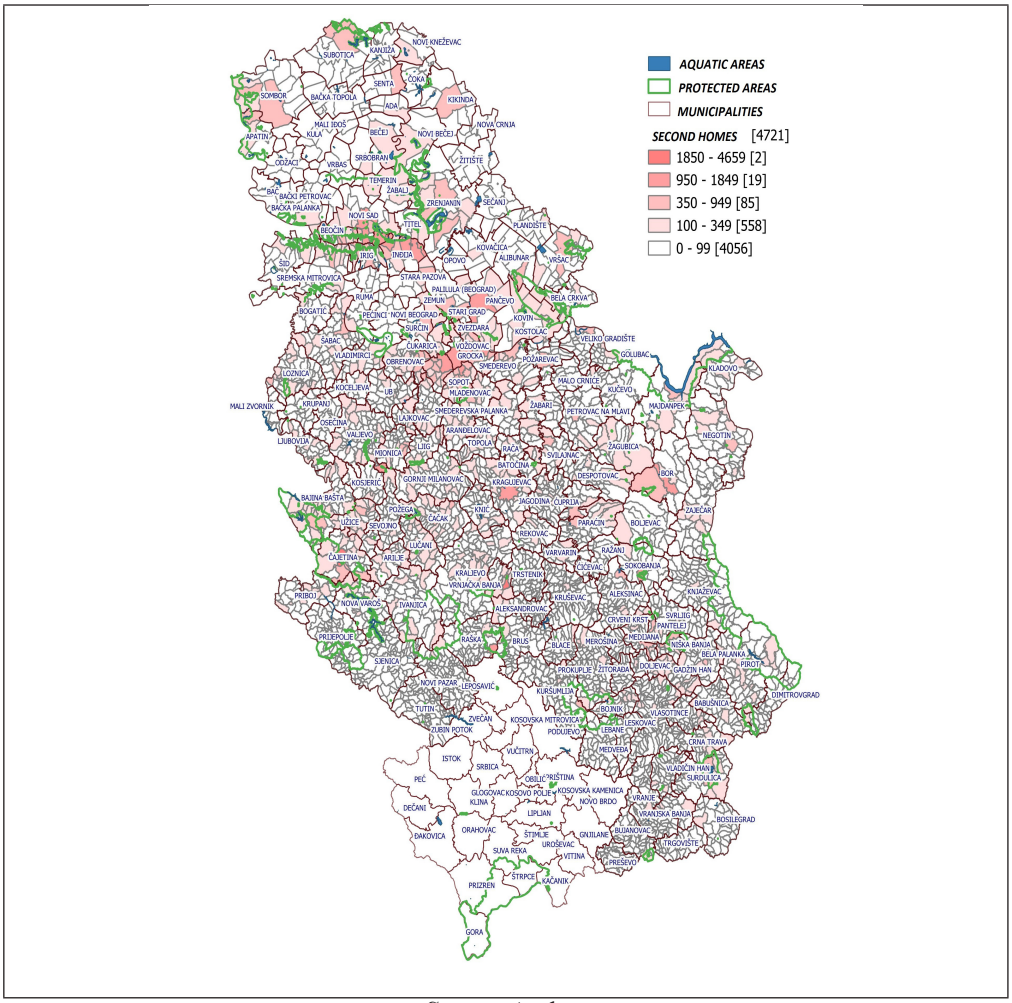
Large concentration of second homes is present in Kolubara (17.3%), Moravica (14.3%), Srem (10.9%) and Raška (10%) districts. Those concentrations in rural areas are much higher (Moravica - 25.4%, Kolubara - 24.6%, Šumadija - 20.9%, and Srem district - 17.3%. Medium concentrations are present in rural municipalities of Raška (14%), Pomoravlje (13.6%), Mačva (12.3%), and Rasina (11.9%) districts. The lowest share of second homes in total housing is in North Bačka (2.5%) and North Banat (3.2%) district.

Table 2. Second home regional distribution in Serbia in 2022

Census	2022	Serbia		Belgrade		Vojvodina		West Serbia and Šumadija		South and East Serbia	
Total Housing		3613352		868752		894275		1013756		836569	
Second homes		288883		34924		46970		121693		85296	
% of Second homes		7.99		4.00		5.25		12.00		10.20	
Regional distribution of Second homes (%)		100		12.09		16.26		42.13		29.53	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
% Total Housing		58.3	41.8	81.7	18.3	61.3	38.7	45.2	54.8	46.4	53.6
% of Seasonal		2.4	15.8	0.7	18.1	2.8	9.1	4.0	18.7	2.9	16.6

Source: Statistical Office of the Republic of Serbia, 2022

Figure 4. Spatial distribution of second homes in Serbia



Source: Authors

At the regional level, Vojvodina shows low concentration of second homes in rural areas (9.7%), particularly in Northern Banat (2.5%), Northern Bačka (3.4%), Middle Banat (6.3%), and Western Bačka district (6.5%). Municipalities with higest number of second homes are: Čajetina (8,376 units), Inđija (7,726), Niš (6,660), Grocka (6,622), Valjevo (6,194), Čačak (6,005), Sopot (5,902), Barajevo (5,848), Kragujevac (5,449), Novi Sad (5,434), Užice (5,306), Vrnjačka banja (5,286), and Obrenovac (5,006).

Discussion

Analysis reveals a widespread prevalence of seasonal tourism-related activities across all Serbian regions. Figure 4 underscores the concentration of second homes in suburban areas, established tourist centers and protected nature areas. Belgrade, with its large population and economic prominence, is the primarz demand center for such housing units. This urban-rural migration trend is evident in the concentration of second homes in suburban zones of Belgrade regions, where Avala and Kosmaj Mts., as well as coastal areas of Danube and Sava rivers have a high density of such units. Notable concentrations of second homes are present in Grocka, Vrčin, Ripanj, Barajevo, Ralja, Surčin, Borča and Pančevo.

In Vojvodina, although second homes have more modest share in total rural households compared to other regions, there is a significant concentration of such housing in Srem districts, especially in Inđija and Fruška Gora area. Dispite efforts to develop rural tourism in Srem, challenges such as accomodation shortages and workforce scarcity persist, and tourism is often viewed as a secondary income source (Kosanović et al., 2024:449). High concentration of second homes are to be found also in Petrovaradin, Beočin, Irig, Sremski Karlovci, and along the Danube banks. Additionally, areas around Sombor, Apatin, Subotica (Palić Lake), Vršac, and Pančevo (Delibato Sand) have a significant presence of second homes.

In West Serbia and Šumadija, second homes account for 13.55% of rural households, exceeding 15% in certain districts (Kolubara, Šumadija, Zlatibor, and Moravica). This region, known for its natural beauty and established tourist centers (Zlatibor, Kopaonik, Tara, Zlatar, Divčibare) has the highest tourist concentration (45.3%) and has witnessed substatial rural tourism development.

South and East Serbia also have a significant number of second homes (12.61%) with great concentrations near Bor (Brestovačka banja), Rtanj, Sokobanja, and Pirot. In particular, in Pirot district second homes constitute 25.7% of total housing due to extreme depopulation but also attractive potentials of the Balkan Mts. Niš, the largest city in the region, also has a notable presence of second homes around Niška banja. Second homes in Braničevo district are set in proximity to the Danube and Mt. Miroč while in Zaječar it is concentrated on Rtanj Mt. and Sokobanja. However, southern parts of this region seem less attractive to tourists and prone to extreme depopulation processes (Toplica, Nišava, Jablanica and Pčinja districts) with few exceptions around renown spa centers. In these regions, the higher share of secondary housing indicates

shift from permanent to seasonal settlements. Municipalities with a high concentration of agriculture-related second homes are Žagubica, Pirot, Zaječar, Negotin, Leskovac, Vranje and Boljevac, all located in the southeastern parts of Serbia, considered the poorest in the country.

The use of second homes in Serbia is primarily for personal purposes during the holiday season, which coincides with the peak tourist season (June-August). This creates intense pressure on the natural environment within a relatively short timeframe, particularly during spring holidays like Easter and May 1st, as well as during the summer months (June-August). The demand for tourist facilities in attractive rural areas can become strained, not only due to increased demand but also because many second-home owners - especially those who rent out their properties - tend to prioritize personal use, such as for family gatherings. Despite discrepancies between official statistics and actual visitation numbers, the economic impact of rural tourism in Serbia remains less significant compared to its social effects. With proper planning that aligns with the common interests of local communities, these tourist or tourist-like activities have the potential to enhance community well-being and sustain vitality over the long term.

Tourism's Impact on Rural Areas

Introducing tourism to rural areas through the provision of tourist services and activities can have both positive and negative impacts on a destination. On the positive side, tourism can enhance local resources, strengthen communities, and contribute to the resilience and sustainability of rural areas (Baoren, 2011; Ferrari et al., 2018; Ruiz-Real et al., 2020). It promotes local economic development by increasing the attractiveness of the environment and encouraging lifestyle changes (Petrevska, Terzić, 2020). Additionally, tourism stimulates the local economy, leading to growth in both economic and socio-cultural sectors, improved services, infrastructure investment, and better living standards. Rural tourism also plays a key role in multifunctional agriculture, offering a path to rural economic diversification and enhancing the marketing of agri-food products (Cvijanović, Ružić, 2017; Perić et al., 2020). This leads to positive economic diversity and peripheral growth in rural areas (Åkerlund et al., 2015). Notably, Gornji Milanovac stands out among Serbian municipalities with the highest number of categorized rural tourism households (Cvijanović, Ružić, 2017; Borović et al., 2022). On the negative side, tourism can lead to issues such as the gentrification of rural spaces, disruption of local cultures, rising housing prices, and increased living costs, all of which can strain local resources. Uncontrolled or unsustainable development can alter the visual and cultural identity of rural destinations and disrupt the functioning of local communities, as has been observed in some villages in the Čajetina municipality.

To implement tourism-related actions effectively, it is important to assess potential impacts based on the unique environmental, economic, and social conditions of each rural area. Rebuilding rural capacities is essential to preventing emigration and further degradation of these areas in Serbia. This involves renewing rural infrastructure, increasing the availability of public services, diversifying economic activities,

supporting small and medium-sized enterprises, encouraging rural tourism services, and promoting local knowledge initiatives in areas like organic agriculture and food safety (Drobnjković et al., 2021). For villages with declining populations and limited economic viability, such as those in South and East Serbia, a networking approach is recommended to support remaining communities and improve their quality of life. In demographically and economically stable areas, such as Šumadija and West Serbia, efforts should focus on stimulating both agriculture and the service sector, improving access to public services, and enhancing tourist infrastructure and cultural amenities to prevent youth migration. Organized rural tourism and creative industries can also help counter negative stereotypes about rural life, fostering demographic renewal (Rikalović, Molnar & Nikić, 2016).

Community development is another critical aspect of rural tourism. By stimulating entrepreneurship, creating jobs, and driving local production, tourism can meet the growing demand for high-quality food and crafts, relying on local networks. Additionally, attracting tourists to rural areas often brings greater attention to environmental preservation and local heritage conservation, which are vital to the sustainability of tourism.

Second homes, which can easily be converted into rural tourism households, offer the potential for additional income and can also contribute to revitalizing local economies. However, successful transitions require careful planning and a balanced approach. Potential benefits include utilizing existing real estate, renovating and increasing property values, generating additional income, stimulating local investments, and improving the overall appeal of villages without putting undue strain on primary housing markets.

Conclusion

This study explored the interplay between rural development, second homes and rural tourism in Serbia, particularly considering their alignement with the country's rural revitalization strategies. The dana presented revealed a spatial distribution of real estate primarily used for leisure and recreation.

The study suggests re-conceptualizing existing rural vacation homes as valuable economic resources for tourism development. To achieve sustainable growth, it proposes reducing the pressure on high-concentration zones by discouraging the unnecessary construction of new tourist accommodations in popular areas, thus mitigating overexploitation and overcrowding. A key strategy is to promote the spatial dispersion of tourists into surrounding rural areas by giving an "economic function" to existing rural real estate, such as converting second homes into small guesthouses or rural tourism households.

The analysis highlights West Serbia and Šumadija as regions with the highest concentration of second homes and tourists. This uneven distribution raises concerns about the negative impacts of concentrated tourism activity on fragile rural environments, especially when

second-homeowners, along with their families and friends, flock to these destinations at the same time as traditional tourists. The underutilization of second homes outside peak seasons also poses sustainability challenges. Furthermore, the growing demand for tourist rentals can reduce housing availability for permanent residents, driving up housing and living costs. Seasonal tourism variability leads to inconsistent occupancy rates, placing additional strain on the natural environment and disrupting the daily lives of local communities. Therefore, a balanced approach that incorporates second-home tourism into broader sustainable development strategies is essential.

The study highlights the significant potential of second homes as a resource for tourism development. However, a strategic and responsible approach is crucial. It prioritizes utilizing existing capital before constructing new facilities and ensures responsible tourism practices that minimize disruption by prioritizing resident well-being and protection of the natural environment. Drawing inspiration from successful West-European models (Austria, Slovenia, Italy) where living in attractive rural setting is considered prestigious, Serbia has the potential to emulate such approach. However, integrated rural development necessitates a well-coordinated, long-term strategy, based on combining traditional practices with modern methods to leverage local resources. There is a need for implementation of effective policies with continous financial support in enouraging economic diversification to create a more robust rural economy, while enhancing the competitiveness of rural households. Initial steps include significan investments in rural infrastructure and providing access to basic services such as healthcare and education, followed by improving cultural and tourism-related amenities in attractive rural areas.

The study concludes that different policies are required at the regional level in Serbia to facilitate the effective development of rural tourism, with a particular emphasis on the interests of local communities and environmental protection.

The present study is limited in several ways, which should be borne in mind when considering its findings. Future research should address the following points: While the study identified several challenges, including standardisation and effective management of tourism activities, it was limited by the lack of detailed tourism statistics at the settlement level. This impeded a more precise assessment of rural tourism's distribution and impact. Future research will integrate socio-demographic and economic data with geospatial information to provide a more nuanced understanding of the diverse processes shaping rural development, ranging from rural abandonment to tourismification.

Conflict of interests

The authors declare no conflict of interest.

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QUALITY OF LIFE AND ENVIRONMENT SUSTAINABILTY-YES OR NO?

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ABSTRACT

Quality of life and preserved eco-systems are important characteristics of sustainability and well-being. The aim of the paper is to analyze the relationship between the Legatum Prosperity Index, as the measure of quality of life and Environmental Performance Index, as a measure of the multidimensional ecological achievement. The research has covered 27 EU countries and applied statistical methods: simple linear correlation and cluster analysis. In this regard, the analysis showed the existence of a statistically significant relationship between these two composite indices. In other words, economically developed countries in which the quality of life is at a high level have better environmental performance, and vice versa.

Introduction

The issue of quality of life represents a multidimensional and complex question with both objective and subjective dimensions, and it can be measured at the individual or societal level on a global scale (Milivojević et al., 2015). Therefore, understanding the determinants, measurement techniques, and strategies for improving quality of life is crucial for promoting holistic well-being and social progress (Costanza et al., 2007). The most important fact about quality of life indicators is that they measure and reflect the true state of the matters we assess (Cobb, 2000). Accordingly, the measurement and evaluation of quality of life are essential for understanding the well-being of individuals and society.

Numerous instruments have been developed to measure and describe quality of life, and one of the more recent and comprehensive measures is the Legatum Prosperity

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Index. This index includes not only economic indicators but also social, institutional, and environmental indicators, thereby combining measures of subjective well-being and economic indicators. It represents a useful tool that contributes identifying the steps necessary to reduce poverty and achieve a better standard of living (Legatum Institute, 2014).

The environment represents a very important determinant of quality of life and has a profound impact on the well-being of individuals and society as a whole, affecting various aspects of life (Van Kamp et al., 2003). The combined effects of rapid population growth, urbanization, technological advancement, industrialization, and limited awareness of the finite nature of natural resources make environmental preservation a challenging goal (Keles, 2012). In a situation where the planet is facing the increasingly prevalent problem of pollution and the necessity of transitioning to more environmentally friendly energy sources, clean technologies become the main hope for building a sustainable future (Jefferson, 2006). In this regard, the Environmental Performance Index has been developed in practice. This indicator is used globally to measure the degree of environmental achievements and assess sustainability at the economic level.

The aim of this paper is to examine the degree and strength of the dependency between the Legatum Prosperity Index and the Environmental Performance Index. While the Legatum Prosperity Index emphasizes social and economic well-being, the Environmental Performance Index focuses on sustainability and environmental performance. However, both indexes are interconnected, as social well-being arises from environmental achievements, and neglecting one aspect can have negative effects on the other. In other words, both indices highlight the link between economic, social, and environmental spheres as important determinants of sustainable development. By jointly considering the Legatum Prosperity Index and the Environmental Performance Index, policymakers and researchers can gain a more comprehensive understanding of the multidimensional nature of social progress and work towards more sustainable and inclusive development strategies.

Legatum Prosperity Index

The use of composite indexes has gained significant popularity as a means of monitoring the advancement of economies on a national scale. One such index that has emerged is the Legatum Prosperity Index, a comprehensive and relatively new indicator that provides a distinct perspective on the level and fluctuations of prosperity in countries worldwide (Gligorić at al, 2018). This composite index offers valuable perspectives on different facets of societal well-being and the progress of economic development.

Khan et al., (2019) claim that Legatum Prosperity Index may be assumed as genuine indicator of prosperity because it covers broad prospects of life than GNI, GDP or *per capita* income frameworks. According to (Günay at al., 2021) Legatum Prosperity Index can be considered as a valid source of welfare assessment as it expresses dimensions that are fundamental to individual or national well-being.

As prosperity is a multidimensional concept that the Legatum Prosperity Index aims to measure, explore, and explain as comprehensively as possible, its analysis is conducted through the monitoring of three domains that form the foundations of economic well-being: inclusive societies, open economies, and empowered people. Each domain contains four pillars of prosperity, and key elements that best define each pillar have been identified. As a result, a set of 67 elements is created to reflect the quality achieved in various spheres. These indicators will provide policymakers with a detailed insight based on which they can take appropriate steps to achieve the desired level of quality of life. It is important to note that not all elements are equally important for the pillars of prosperity, and each element is assigned a weight that reflects its importance within the pillar. Additionally, each element of the Legatum Prosperity Index is defined by several indicators, and each indicator is assigned a weight expressed as one of the following four values: 0.5, 1.0, 1.5, and 2.0. The initial weight of each indicator is 1.0, and in accordance with its significance, the weight can be adjusted up or down.

To obtain the index score for each country, the average of the 12 pillars of prosperity is calculated, which can be represented by the following expression:

$$Prosp = \frac{1}{12}\sum_{j=1}^{12} P_j$$

where P_j represents the score of the i-th pillar of prosperity. Based on this formula, we can easily conclude that all pillars of prosperity are equally important for calculating the Legatum Prosperity Index, meaning that all pillars of prosperity have the same weight.

The Legatum Prosperity Index ranges from 0 to 100. Logically, the higher a country's index, the better its quality of life. In the literature, there is still no clear classification of countries according to the achieved values of the Legatum Prosperity Index, but each year a ranking list of countries is formed based on the results of this indicator.

Enviromental Performance Index

The Environmental Performance Index presents environmental achievements and ranks 180 economies in terms of three dimensions: climate change, ecosystem health and vitality. In this regard, the Environmental Performance Index is constructed using 40 different indicators that are grouped into 11 units. For example, air quality and the state of water resources are measured by the presence of PM particles, the concentration of NO_x, SO and CO_2, the degree of wastewater treatment, etc. Also, the efficiency of waste management is assessed by the recycling rate, while the prevalence of climate change is assessed through the intensity of GHG emissions.

According to (Szymczyk et al., 2021) the Environmental Performance Index has global significance in the context of creating green policies and decisions making to improve the environmental image. The environmental performance index provides insight into the progress, current achievements and lagging of specific economies in the implementation

of green policies (Zhang & Wu, 2021). The Environmental Performance Index detects priority areas for defining future steps and actions with the aim of achieving a green transition. This index can take values in the range of 0-100 (Zhang & Wu, 2021). Higher values of the Environmental Performance Index indicate better results.

According to (Jefferson, 2006), environmental protection is an important element of sustainable development. The Environmental Performance Index is closely related to the Sustainable Development Goals (Hsu & Zomer, 2014). Pimonenko et al. (2018) showed that countries with a better Environmental Performance Index score have a higher degree of achievement of sustainable development goals. In other words, more efficient environmental achievements imply a better level of sustainable social well-being. A preserved environment is not only an important feature of sustainability, but can be seen as a factor of economic growth. Various studies (Ave & Babolsar, 2010; Alam et al., 2013; Duasa et al., 2013; Tamim et al., 2016; Fakher et al., 2017) have shown that there is a positive correlation between the Environmental Performance Index and GDP growth or GDP *per capita* as a measure of the total economic activity of the economy. The aforementioned relationship is essentially „two-way street", because economies with a higher level of income will invest more in cleaner technologies and renewable energy sources, which will result in less ecosystem degradation and climate change mitigation.

The authors Chowdhury & Islam (2017) observed that there is no clear relationship between the Environmental Performance Index and the GDP growth rate in developing countries. The focus of the research was on BRICS[3] countries, where the only exception to the rule was precisely the economy of Russia.

Raza et al. (2021) went a step further in their analysis, showing that the quality of the environment measured by the Environmental Performance Index declines with greater trade liberalization, especially in developing economies. The distinction compared to developed countries arises as a result of low energy efficiency in production, suboptimal energy use, and significant GHG emissions. However, trade and export growth will stimulate economic growth, thereby creating conditions for better environmental performance and a reduced impact on the environment.

Materials and methods

Empirical research covers 27 member states of the European Union: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Malta, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden. The aforementioned economies are characterized by different levels of quality of life satisfaction, as well as the state of the environment, so they are therefore relevant for examining the strength of the relationship between the selected determinants.

3 BRICS countries are: Brasil, Russia, India, China and South African Republic.

In this regard, the last available data are used in empirical analyses[4] Legatum index (2023. year) as an indicator of the overall quality of life and EPI index (2022. year) as aggregate measures of environmental performance of the economy. According to (Freudenberg, 2003), it is possible to use indicators belonging to different ages. The data were taken from the official databases of the mentioned indexes[5]. Both indicators have the same direction, in the sense that higher values indicate a higher quality of life and better ecological health of the economy.

The paper defines the premise of the research based on the idea that there is a statistically significant relationship between the Legatum Prosperity Index and the Environmental Performance Index. Understanding the correlation between quality of life and the environment is crucial for developing effective strategies to improve well-being and create sustainable communities. By addressing economic inequality, improving access to basic services, and implementing environmental initiatives, we can work towards enhancing the quality of life for the entire society (Portney, 2013).

Simple linear correlation analysis was conducted in the study in order to analyze the existence and strength of the relationship between the observed variables. Furthermore, the statistical significance of the obtained coefficient has been tested. Additionally, cluster analysis was performed, and an EPI-LPI[6] matrix was created. In the final stage of the research, the main conclusions of the study were defined based on the obtained values and graphical representation.

Correlation analysis

Simple correlation analysis is a fundamental statistical technique widely applied in various fields, involving the examination and quantification of the relationship between two variables, providing insights into how they interact with each other (Cohen et al., 2013). It is important to emphasize that simple correlation analysis does not imply causation, meaning that even if two variables are correlated, it does not necessarily mean that one variable causes the change in the other. Instead, correlation measures the degree to which changes in one variable are associated with changes in another (Schober et al., 2018).

The value of the correlation is measured by the correlation coefficient, which represents a numerical value indicating the degree of dependency between the observed variables. This indicator takes values in the range from -1 to 1. The closer absolute value to 1 indicates the stronger the mutual dependency of the observed phenomena (Vuković, 2013). In the case of a positive correlation, the observed phenomena move in the same direction, while in the case of a negative correlation, the phenomena are inversely proportional.

4 In the moment of collecting date (april, 2024) the last available date was from 2022 and 2023. year.

5 Source: https://epi.yale.edu/ [access: april, 2024] and https://www.prosperity.com/rankings [access: april, 2024]

6 EPI is abbreviation of Environmental Performance Index and LPI is abbreviation of Legatum Prosperity Index.

Cluster analysis

In the study, cluster analysis was also conducted to group EU member countries into homogeneous clusters, taking into account quality of life and environmental sustainability. The clustering of EU member countries was performed based on the aforementioned variables[7].

Cluster analysis can be defined as a statistical interdependence technique whose primary purpose is to group observed units based on the similarity or dissimilarity of pre-selected variables (Šoja et al., 2023). Groups are formed in such a way that the observed units within a group are similar to each other, aiming to minimize within-group variance and maximize between-group variance (Carvalho et al., 2019). The effective use of clustering algorithms depends heavily on the choice of an appropriate distance metric. The task of determining a suitable distance measure for a given dataset is indeed a challenging one (Kumar et al., 2014). The distance between observed units can be quantified using various measures that take into account all analyzed features. One of the most frequently utilized measures is the Euclidean distance (Elmore & Richman, 2001). In this paper, we use this measure obtained according to the following formula (Kovačić, 1994):

$$d_{rs} = \sqrt{\sum_{j=1}^{p} (x_{rj} - x_{sj})^2}$$

where x_{rj} and x_{sj} are values of indicator j for observed units r and s, respectively.

Once the convenient distance measure has been determined, the subsequent stage involves the selection of the grouping method. Numerous techniques have been developed for grouping units of observation, and they can be categorized into two distinct groups: hierarchical and non-hierarchical. Hierarchical methods are more often used in the literature, and most often Ward's method of connection (Šoja et al, 2020). Ward's connection method is built upon the intergroup sum of squares. This technique entails merging two groups into one if their combination results in the minimal increase in the sum of squares between groups, relative to the increase that would occur from merging any other pair of groups (Kovačić, 1994).

Results

A correlation coefficient value of 0.69 indicates a significant positive correlation between the observed indicators, and the significance testing of this value has shown that the correlation coefficient is statistically highly significant. The substantial positive

7 The value of the Legatum prosperity index is obtained as the arithmetic mean of 12 pillars of prosperity that measure the achieved quality in various spheres, and the value of the environmental performance index is obtained as the arithmetic mean of 3 pillars: climate change, health. and ecosystem vitality.

correlation between the Legatum Prosperity Index and the Environmental Performance Index suggests that economically wealthier countries and those with a high quality of life tend to prioritize environmental sustainability and allocate more resources for the preservation and protection of the environment.

Table 1. Correlations

		Legatum Prosperity Index	Enviromental Performance Index
Legatum Prosperity Index	Pearson Correlation	1	,690**
	Sig. (2-tailed)		<,001
	N	27	27
Enviromental Performance Index	Pearson Correlation	,690**	1
	Sig. (2-tailed)	<,001	
	N	27	27

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

Source: Authors' calculations

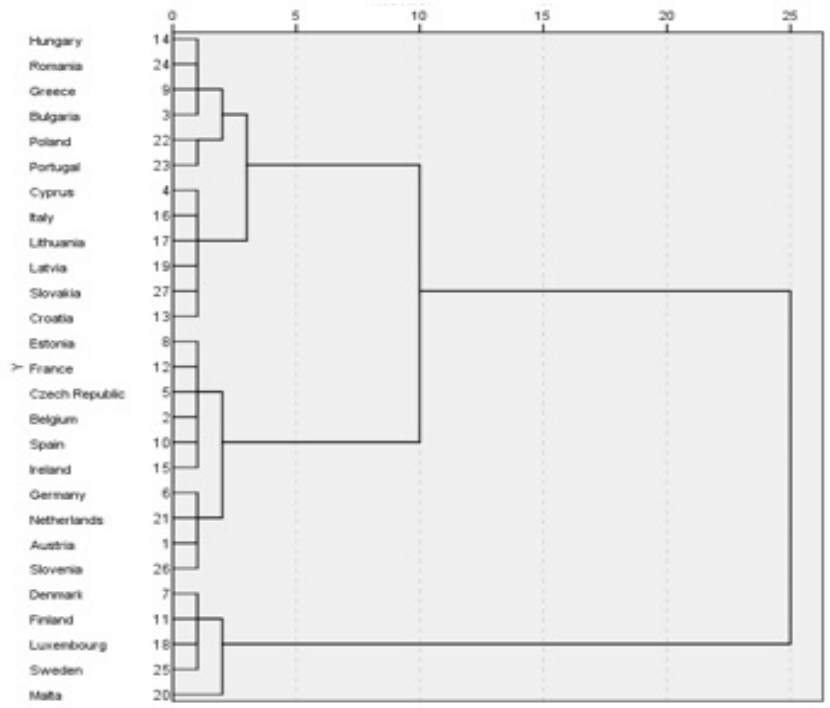
On the basis of the obtained results, the solution with four clusters was selected as the most appropriate. According to the Ward's linkage method, EU countires were grouped as follows in table 2.

Table 2. Distribution of EU countries by clusters

Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**
Hungary	Cyprus	Estonia	Denmark
Romania	Italy	France	Finland
Greece	Lithuania	Czech Republic	Luxembourg
Bulgaria	Latvia	Belgium	Sweden
Poland	Slovakia	Spain	Malta
Portugal	Croatia	Ireland	
		Germany	
		Netherlands	
		Austria	
		Slovenia	

Source: Authors' calculations

Figure 1. Dendrogram using Ward Linkage



Source: Authors' calculations

Discussions

Based on the results of the cluster analysis, we come to the conclusion that within the first cluster there are EU member states with the worst results in terms of satisfaction with the quality of life and achieved environmental performance. The common characteristic of this group of countries is the low level of well-being of the inhabitants, which is the result of the absence of efficient functioning of institutions, inadequate health care, non-transparent business conditions, as well as pronounced macroeconomic instability (especially Greece). Based on the value of the EPI index, the mentioned economy is characterized by unsystematic implementation of green policies, absence of appropriate infrastructure, conventional linear model of production, reliance on fossil fuels, as well as suboptimal forms of financing environmental projects. In other words, it is of great importance to realize the green transition, as well as to create innovations to encourage cleaner production, and to change consumption models in favor of a circular economy. More efficient enforcement of environmental laws and regulations focused on the use of alternative sources is necessary, as well as the internalization of negative externalities through the system of green taxes and thus less devastation of natural resources (Gavrić & Mitrović, 2019). Current achievements do not a priori represent bad performance, but can be seen as a development opportunity and a signal to policy makers for defining future steps.

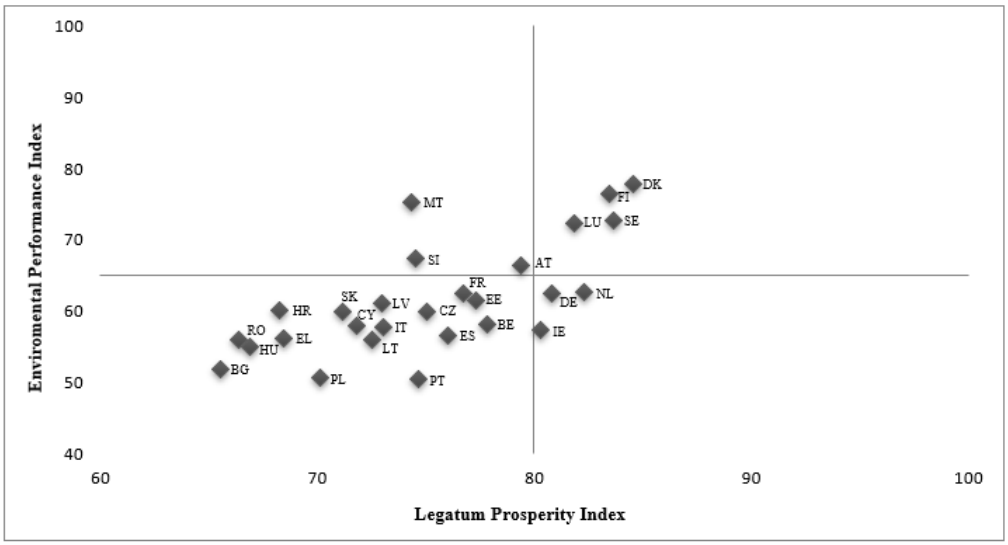
The population of EU member states classified within the fourth cluster is characterized by a high degree of satisfaction with the quality of life and very notable results in the field of environmental achievements. What these countries have in common are good living conditions, opportunities for education, the degree of personal freedom, as well as safety and security of life, which determine the well-being of citizens. In other words, freedom of speech and expression, great social tolerance, good quality of basic services and nutrition, availability of resources, absence of violence and educational institutions that function at a high level contributed to the high values of the Legatum Prosperity Index. This group of countries is also characterized by a high living standard, i.e. financial well-being (D'agostino, Rosciano & Sarita, 2020) and are leaders in the implementation of the Europe 2020 strategy, which aims at economic development based on knowledge, nature conservation, high productivity and social cohesion (Simonescu et al., 2019). On the other hand, the Northern European countries also excelled in environmental achievements. In particular, Denmark has the most fixed mitigation and management of climate change by reducing the carbon footprint and total GHG emissions by 50%. Also, Denmark invests in clean technologies, energy efficiency, uses the benefits of renewable energy sources and green transport models. Sweden and Finland have minimized large amounts of waste through the circular transition and the use of the total potential of recycling, while Luxembourg leads the way in terms of ecosystem health. For example, 46% of municipal waste in Sweden is used to generate new energy (EPI report, 2022). Bearing in mind the aforementioned facts, the conclusion is that countries with a higher degree of life satisfaction and social well-being also have better environmental efficiency.

The second cluster consists of Slovakia, two Baltic countries (Lithuania, Latvia) and three Mediterranean countries (Cyprus, Italy, Croatia). The common specificities of the mentioned cluster are reflected in the form of an efficient system of all levels of education, satisfactory living conditions and achieved general safety and security of citizens. On the other hand, there was room for improving the ecological image and overall green performance. An analysis of the eco-performance of each of the mentioned economies can point to specific weaknesses that can be seen as the backbone of future green strategies.

The third cluster includes the largest number of EU member states, and the common feature of the observed economies are the relatively high values of the Legatum Prosperity Index and the Environmental Performance Index. That indicates the population of the third cluster, is characterized by a relatively high standard of living, high trust in public institutions, satisfaction with safety conditions and security, as well as commitment in the area of circular economy. Countries like Germany, the Netherlands and Ireland have slightly higher values of the Legatum Prosperity Index compared to the values of the Environmental Performance Index, and this is a consequence of a strong industrial sector and GHG emissions. On the other hand, the higher values of the Environmental Performance Index in Austria and Slovenia are the result of the synergistic effect of adopted and applied environmental laws and action plans, institutional support, investments in renewable energy sources and infrastructure for using their potential. Also, Slovenia has made the most progress in the area of circular economy and green innovations.

In order to provide a more detailed insight into the achieved values of the Legatum Prosperity Index and the Environmental Performance Index by EU member states, we designed a scatter plot (Figure 2) which is one of the most powerful and most widely used techniques for visual data exploration. By visually representing data points on a two-dimensional graph, a scatter plot helps researchers identify patterns, trends, and various deviations among observed countries.

Figure 1. Scatter plot



Source: Authors' own work

In Figure 2, the countries are graphically represented based on two criteria - the values of the Legatum Prosperity Index (x axis) and the Environmental Performance Index (y axis).

When naming the countries, official abbreviations were used[8]. The lowest value of the Legatum Prosperity Index is 65.55 and the highest is 84.55, while the Environmental Performance Index achieved values in the interval of 50.40-77.90. The diagram is divided into 4 squares for easier observation of the relationship between the observed variables.

Conclusions

Satisfaction with the quality of life, as well as the level of ecological achievements, are very important topics, especially in developed economies. In general, the complexity of both terms requires a multidisciplinary research approach. Consequently, in the research were used two composite indexes: Legatum Prosperity Index as a measure

8 Austria-AT, Belgium-BE, Bulgaria-BG, Cyprus-CY, Czech Republic-CZ, Croatia-HR, Germany-DE, Denmark-DK, Estonia-EE, Greece-EL, Finland-FI, France-FR, Hungary-HU, Ireland-IE, Italy-IT, Lithuania-LT, Luxembourg-LU, Latvia-LV, Malta-MT, Netherlands-NL, Poland-PL, Portugal-PT, Romania-RO, Slovenia-SI, Slovakia-SK, Spain-ES, Sweden-SE.

of quality of life and Environmental performance index as a comprehensive indicator of environmental condition and performance. Empirical research covers 27 member countries of the European Union, for which are specific different levels of realization of the selected determinants.

Within the research, it was proven that there is a very significant degree of dependence between the Legatum Prosperity Index and the Environmental Performance Index, which indicates that countries with a higher level of income have a more pronounced satisfaction with the quality of life, as well as better achievements in the field of the environment, and the reverse is also true. In other words, economies with a higher standard of living are characterized by excellent conditions in the context of education and health care, a transparent and stimulating environment for investments and business operations, efficient institutions, as well as a high degree of personal freedom and general safety and security. Also, these economies effectively manage resources and challenges caused by climate change, use the benefits of clean technologies and alternative energy sources, and implement green innovations.

Furthermore, a cluster analysis was conducted based on the values of the Legatum Prosperity Index and the Environmental Performance Index, and as a result were obtained four homogeneous units (clusters) and certain similarities among the EU member states were observed.

The analysis of the work pointed to a group of economies characterized by devastation of the ecosystem, as well as a low level of social well-being: Hungary, Romania, Greece, Bulgaria, Poland and Portugal. The common feature of the separated countries that belong to the first cluster is reflected in: unfavorable living conditions of citizens, macroeconomic instability, unsystematic implementation of environmental policies, pollution and the dominant application of the conventional linear model of production. The actual situation does not mean a priori bad performance, but can be seen as a backbone for defining future development strategies and activities.

The fourth cluster includes the Scandinavian countries (Denmark, Finland, Sweden) as well as Luxembourg and Malta, which are characterized by the best results of the observed indicators. In addition to being leaders in the implementation of the Europe 2020 strategy, these economies are characterized by financial well-being, high productivity, nature conservation, economic development based on knowledge and social cohesion. Furthermore, the countries of the fourth cluster have achieved significant results in the context of the green transition seen through the reduction of total emissions and carbon footprint, the effective application of green taxes and the principle of lung pollutants, as well as the use of the potential of the circular economy, eco-friendly products and green technologies.

The broad framework and multidimensionality of the Legatum Prosperity Index and Environmental Performance Index can be useful for economic policy makers to define steps with an emphasis on inclusiveness, sustainability and well-being.

Conflict of interests

The authors declare no conflict of interest.

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FARM ECONOMY IN SERBIA – DISTRIBUTION CHANNELS OF SUSTAINABLE PRODUCTS

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ABSTRACT

Sustainable agricultural products are sophisticated because they are directly related to the health of end users and have a specific quality and yield. The market for these products is specific and determined by various factors. This paper analyses the placement of sustainable agricultural products on small farms in the Serbian economy through multiple sales channels. We organized a one-on-one meeting with 150 small and medium-sized farm owners and collected data through a questionnaire. We then created a model through the Analytical Hierarchy Process (AHP method) to evaluate the decision-making of small farmers about placing products on the market. The results showed that the quality of the products is crucial for small farmers, who need to distribute them through local shops, retail chains, and markets. In this way, we have opened space for future analyses that can include regression models and assess relationships between individual categories.

Introduction

The agricultural sector is traditionally the most important in the economy. For centuries, it satisfied the basic population needs, and ensured the security of food supply in times of crisis, but was also used to strengthen other sectors of the economy. Farmers manage to realize subsidies from the state to ensure the progress of farms and to meet the food needs of people living in cities. At the same time, quality was a priority because the final product relates to population health. The price reduction has always been at the expense of the agricultural sector, but it has also brought progress to other faster-growing sectors, especially industry. Today, organized agriculture is a profitable and rapidly developing sector. Modern trends have made agricultural production sustainable, and it is the backbone of a circular and green economy, biodiversity, and sustainable development.

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Some authors believe that too much focus on agriculture aimed at high productivity to ensure food security and reduce poverty, along with the economic growth of other sectors and the intensive use of non-renewable energy, significantly affects the degradation and collapse of the quality of the environment (Parušić et al. 2023; Usman et al. al. 2022). Because of that, Pešić and Janković (2009) underline the major emphasis which is today and it is placed on sustainable agriculture, i.e. sustainable natural resources for exploitation - agricultural production is expected to preserve biodiversity and equilibrium in the biosphere, i.e. enabling the survival of genetic resources of both animal and plant origin, contributing to their adaptability and future use in food production. According to FAO (2023), agro-food businesses are increasingly adopting sustainable practices and reporting on their environmental, social, and governance performance, but still, many private businesses might have a vested interest in maintaining the status quo, therefore governments may impose laws and regulations affecting the private sector.

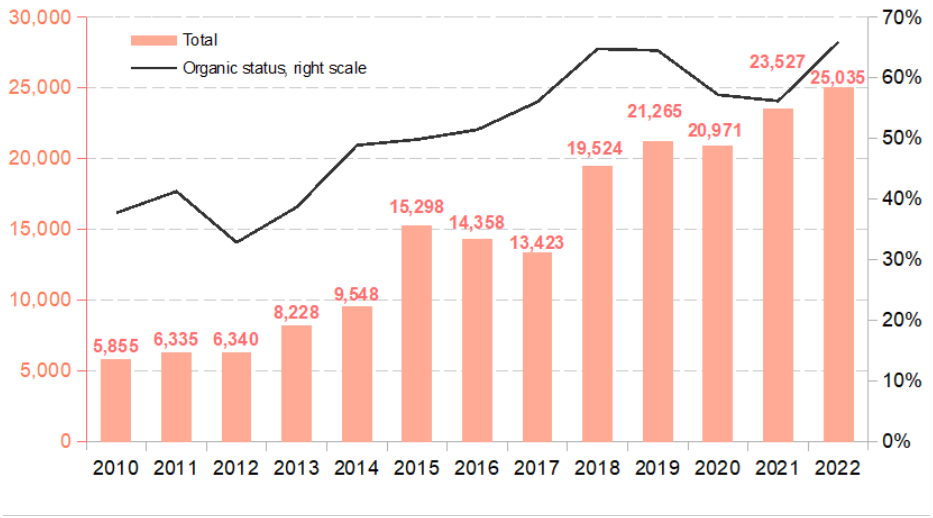
Tomić et al. (2007) believe that rural areas in Serbia represent our comparative advantage in applying sustainable development in food production. It is up to us to turn the previous backwardness and devastation of rural areas into our advantage. Other authors (Šeremešić et al. 2017) have the opinion that directions of this type of production can be considered within organic agriculture because it is stated (Reganold & Wachter, 2016) that organic agriculture (biological or ecological) is based on the integration of traditional agricultural production methods with modern technological processes in agriculture. Precisely by achieving better results in organic agriculture, environmental protection, and overall rural development, the quality of life of the population in the given territory is improved, which according to Subić et al. (2010), an excellent example of agricultural producers throughout the territory of the Republic of Serbia, but also beyond.

A similar conclusion is reached by one of the studies conducted in Serbia (Đurić et al. 2018), which shows that the agroecological conditions for growing alternative cereals and the sustainable agricultural production system for small farmers in Serbia are very favorable. However, in practice, it is obvious that small and medium-sized farms have the most difficulties and dilemmas regarding the transition from traditional to sustainable agricultural production, both due to insufficient knowledge, administrative and advisory support from professional services, and financial assistance, motivation, and support. This is not the case only in Serbia, but also in other countries. Smallholder farmers are unwilling to engage in their small farms due to low returns food and farm income, instead relying on off-farm alternatives to feed their families (Mugambiwa, 2023; Ritzema et al., 2017). Widespread challenges organic growers face includes lower yields, difficulty maintaining soil fertility levels, obtaining proper certification, and accessing markets.

However, despite the mentioned difficulties that farmers face, their number in organic production is gradually increasing. One of the reasons is the high demand for this type of product, so, apart from the awareness and importance we attach to sustainable production, the economic moment is very significant and certainly represents one of

the main motivators, both in Serbia and Europe. This is supported by the figures from the records of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, which show an increase in the total number of producers (including subcontractors from group production) from 1,073 in 2012 to 6,408 certified producers in 2021. Also, there was a significant increase in the total organic production area from 2010 to 2022 (Figure 1), especially by types of production of organic products for the same analyzed period.

Figure 1. Area under organic production 2010-2022 (ha)



Source: http://www.minpolj.gov.rs/organska

The next key issue, when agricultural producers decide to produce organic products, is related to distribution channels. Given the limited number of products of organic origin, the question arises as to how best to choose distribution channels, bearing in mind the gap between the insufficient amount of organic food that can be offered, and on the other hand, the high prices of those same products. Some authors (Stanković et al. 2023) highlight problems related to poor information management, inadequate communication with each partner channel, and divergent objectives between partners, but also highlight the constant growth of retail sales, as one of the main channels of distribution of organic products. According to the research carried out in Serbia, an analysis of the market channels of organic products was carried out and the following stand out as the most significant (Simić, 2020): Retail trade chains, Specialized stores, Internet sales, Sales through direct marketing, and Greenmarkets.

Numerous studies have been conducted on distribution channels (Nikolaou et al 2017; Zhu 2020; Šostar and Ristanović 2021), but there is a lack of research on alternative distribution channel types in organic agriculture. Brezović et al. (2021) show that an accurate assessment of available distribution channels is crucial for the effectiveness and efficiency of confectionery distribution. Atanasoaie (2011) recommends that smallholder

farmers maintain a closer relationship with the end customer, using distribution channels directly, without intermediaries, such as Community Supported Agriculture (CSA) "box" systems, farmers' markets, and farm gate stores. Tošović-Stevanović et al. (2020) investigated the distribution channels of agricultural products of small farms in Serbia showing that farmers first decide to sell their products to factories for processing agricultural products, prioritizing product quality. Ristanović et al. (2022) analyzed the distribution channels of small farms in Eastern European countries showing that farmers mainly sell their products on markets and processors and that the quality and price of agricultural products are the dominant criteria for channel selection. Modern food distribution channels in Taiwan's agricultural sector were investigated by Chang et al. (2021). They showed that the sale of agro products through modern food distribution channels (supermarkets, hypermarkets, branded retailers) does not make a positive difference compared to traditional sales facilities, but the inclusion of small farmers in this distribution channel type improves the general well-being of the rural population. Gajdić et al. (2018) show that most producers sell their organic food products directly to the end consumer, mostly at family farms and local fairs. Concerning indirect distribution, specialty stores are the dominant retail format, followed by wholesale.

Serbia is an agricultural country with large capacities and various advantages for a certain type of agricultural production. As much as 60% of the total agricultural land is used for grain production. We used data from a survey conducted in the northern province of Vojvodina, among 150 small and medium-sized farms engaged in grain production. The mission is to analyze the best way to distribute sustainable agricultural products to small and medium-sized farmers in Serbia. The idea is to look at the criteria and make the right decision on the placement of this type of product. Our goal is to show small farms the advantages of different channels of distribution of sustainable agricultural products based on the results of analysis and practice from the market. Based on the available data from the survey, the following research hypotheses were defined: H1 - Quality is the basic characteristic of sustainable agricultural products; H2 - If distribution channels require more labour participation, they will be less acceptable to farmers; H3 - Distribution to local chains is the best distribution channel for the farmer.

The AHP method, devised by Thomas L. Saaty, represents a sophisticated pillar in multi-criteria decision-making (MCDM). The extensive validation and application of AHP in various fields – from resource allocation and strategic planning to health care and environmental management – confirms its versatility and effectiveness. For example, Forman and Gass (2001) discuss the application of AHP in operations research, emphasizing its ability to reconcile qualitative and quantitative data. Similarly, Wind and Saaty (1980) highlight its utility in marketing, where AHP helps to reveal consumer preferences and competitive strategies. The AHP model, using Saaty's precise methodology, turns the intricate maze of multi-criteria decision-making into a navigable path. By constructing hierarchies, performing pairwise comparisons, ensuring consistency, and synthesizing results, AHP provides a comprehensive framework that guides decision-makers with precision and clarity.

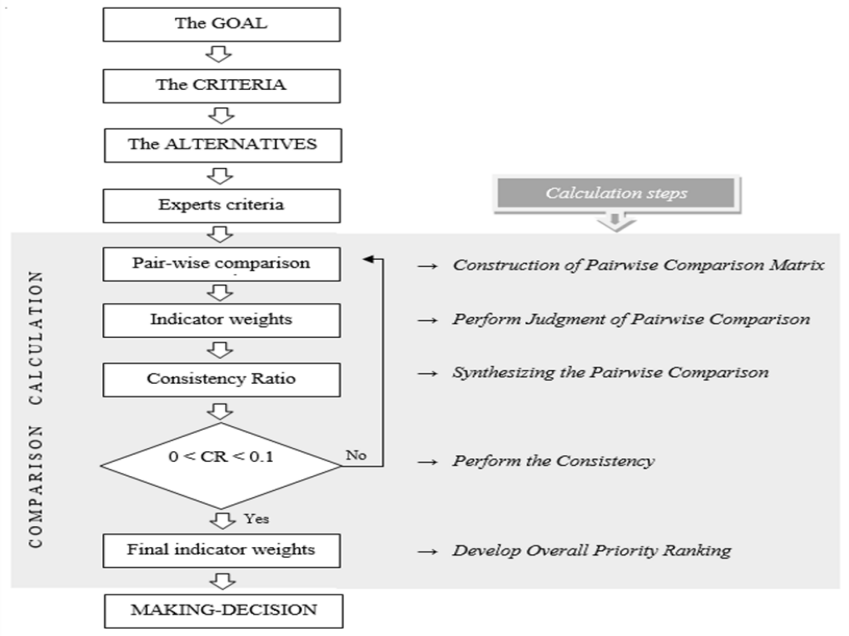
The structure of the manuscript is as follows. After its introduction, the AHP method was stated as the most suitable for application in the distribution of sustainable products by small farmers because it can help in more efficient decision-making in ranking criteria and alternatives in order of importance. The results are presented in the next part of the manuscript. At the end of the paper are the conclusions.

Materials and methods

The data source for this research was taken from a survey that is part of the project titled "Eco-efficiency and sustainability of small-scale farming: exploring slacks for undesirable outputs and public goods". Sample data from 150 small and medium-sized farms in Serbia were analysed. The analysis advantage is the sample size, while the disadvantage is that the survey was conducted for only one part of Serbia, the northern province of Vojvodina (1/3 organic producers and agriculture). The interviews were conducted using a pre-prepared survey. The database consists of responses from farmers, cleaned of unnecessary data so that the sample is relevant. Experts, who are members of the academic community (50%), research centres (30%), and business (20%), based on the data from the survey, created the comparison matrices necessary for the continuation of the analysis.

The AHP model is like a finely tuned algorithm, designed to decompose complex decision-making problems into a structured and comprehensible hierarchy of criteria and alternatives (Figure 2). The beauty of AHP lies in its systematic approach to quantifying subjective judgments and synthesizing them into objective priorities.

Figure 2. AHP hierarchy structure



Source: Authors' calculation

As part of monitoring the sustainable products of small and medium farmers, it is necessary to evaluate their placement on the market. A structure was devised for criteria evaluating for making decisions about product placement and alternatives in the way of product placement. 8 criteria (prices, certification, incentives, and quality) and 4 alternatives (local shops, the market, sales chains, processing plants, a fence, trade fair, and the network) were identified for discussion with experts in the field of agriculture. Using the AHP model, an expert evaluation was performed to determine the weight of indicators and compare indicators by level. Such an algorithm allowed us to identify the main distribution channels of sustainable agricultural products of small farms in Serbia.

At the top level, a general goal is broadly set. The lower level specifies the criteria used for evaluation. The evaluation begins by constructing a comparison matrix of all elements in the hierarchy level with the immediately higher level. In this way, priorities are determined and used for individual comparative judgments with the help of Saaty's scale of measurement ratios. Decision alternatives are at the lowest level. The synthesis of priorities is the final evaluation to determine the criteria's importance and alternative performance (Saaty, 1987). The advantage of this method is that this structure can be elaborated following the existing problem in the company's management system or decision-making at higher management levels.

This hierarchical structure enables decision-makers to dissect a problem into its elemental components (Ristanović et al., 2021). The process begins with the hierarchy construction, establishing the goal at the apex, cascading down through the various criteria that influence the decision, and culminating in the possible choices.

In the part of the comparison calculation, AHP uses pairwise comparisons to quantify decision-maker's preferences. It evaluates different criteria, systematically comparing them to determine which one best suits the farmer's interests. These comparisons generate a set of matrices, each representing the relative importance of criteria and alternatives. The intensity of preferences is expressed using Saaty's scale (1990) which typically ranges from 1 (equal importance) to 9 (extreme importance), capturing the nuanced judgments of decision-makers.

Saaty's methodology is underpinned by the consistency ratio (CR), a diagnostic tool ensuring the reliability of the comparisons. The aim is to ensure that the ratio remains coherent and credible. The consistency ratio (CR) is the ratio of the consistency index (CI) to the random index (RI). First, a calculation is made for the eigenvalue (λmax) and the consistency index. A CR below the threshold of 0.1 indicates that the pairwise comparisons are consistent, reinforcing the robustness of the derived priorities. Should the CR exceed this threshold, it signals the need for a reassessment, much like a detective revisiting a crime scene to uncover overlooked details. When the final weights are obtained, the overall priority ranking is realised. The final step is to fusion these priorities across the hierarchy to rank the alternatives. This is akin to executing a complex algorithm where inputs from multiple stages are combined to produce a definitive output. The overall priority of each alternative is determined by aggregating

the weights assigned at each level, ensuring that the final decision reflects a balanced consideration of all criteria.

Results and Discussions

The results from Table 1 show the ranking of distribution channels of the agricultural products and the criteria related to deciding the channel type. The final decision of the best distribution channel for organic products for small and medium-sized farms in Serbia is found in the alternative with the highest ranking value of the overall weight.

These data show that farmers are mainly oriented toward local marketing of organic agricultural products (about 62%). As the dominant distribution channel, we can include local stores (rank 0.26), then retail chains (rank 0.19), and markets (rank 0.17), while direct sales to customers are made on the farm itself, over the fence (as much as 13%). Similarly, Stanković et al. (2023) show that customers in Serbia most often buy directly from producers (19.44%), in specialized stores and markets (16.85%), in new distribution channels (hypermarkets 14.09%, supermarkets 13.60% and pharmacies 10.15%). Milanović et al. (2020) show that as many as 77% of organic products are sold by farmers in Serbia through direct sales, at markets, but this percentage also includes sales at home and in local stores. In neighbouring Croatia, Gajdić et al. (2018) show that the main distribution channel of agricultural products is direct sales to consumers with 60.6%.

Table 1. Total weight and rank of criteria and alternatives

GOAL	P	C	I	Q	Rank
LS	0.06	0.04	0.03	0.13	*0.26*
M	0.04	0.03	0.02	0.08	*0.17*
SC	0.04	0.04	0.02	0.10	*0.19*
PP	0.01	0.02	0.01	0.05	*0.10*
F	0.03	0.02	0.01	0.07	*0.13*
TF	0.02	0.02	0.01	0.04	*0.08*
N	0.02	0.01	0.01	0.03	*0.07*
Rank	*0.22*	*0.18*	*0.11*	*0.50*	1.00

Source: Authors' calculations

Note: P – prices, C – certification, I – incentives, Q – quality, LS – local shops, M – the market, SC – sales chains, PP – processing plants, F – a fence, TF – trade fair, and N – the network

Farmers of small and medium-sized farms sell only 10% of organic products to agricultural processing plants. It is the complete opposite concerning other agricultural products. Some studies show that for farm products, the dominant distribution channels of farmers in Serbia are processing plants, followed by markets (Tošović-Stevanović et al. 2020; Ristanović et al. 2022).

The lowest placement of organic agricultural products in Serbia is achieved through fairs (rank 0.08) and the Internet (rank 0.07) because farmers focus more on the production

process than marketing. Milanović et al. (2020) show that of the 23% of organic products in Serbia, that are marketed through intermediaries (wholesale and retail), a small percentage is realized via the Internet. Also, Stanković et al. (2023) show that customers in Serbia buy the least amount of organic agricultural products online (9.07%). In Croatia, the online sale of organic farm products is only 6.0% (Gajdić et al. 2018).

The criteria that determine organic agricultural products are the quality (rank is 0.50) and price (rank is 0.22) of the product. Product certification (rank 0.18) also shows that quality is a dominant criterion, which guarantees quality control. Control and certification of organic products in Serbia is an advantage chosen by a few buyers, primarily due to a lack of knowledge or incomplete information. State incentives (rank is 0.11) are in the last place among the criteria because farmers on small and medium farms mostly rely on their capacities and varieties. Other researchers also single out the quality and prices of agricultural products as dominant criteria for farmers (Tošović-Stevanović et al. 2020; Ristanović et al. 2022; Xu 2009) as well as for consumers (Milić et al. 2022; Tsakiridou et al. 2008).

Conclusions

This research was conducted on a sample of 150 small and medium-sized farms in Serbia. The paper presents the criteria and alternatives in the multiple decision-making system using the AHP model. The results of the analysis confirmed all three hypotheses. Product quality is always associated with organic agricultural products which is confirmed by the assessment that quality is a key characteristic of sustainable agricultural products among farmers. Farmers are mostly interested in producing quality products, not in marketing. This is why online and fair sales are at the bottom of the list of distribution chains, while product placement through local and sales chains dominates.

The AHP model has again, through a compelling hierarchical structure, created an abstract network into a tangible decision-making framework. This hierarchy descends from the ultimate goal at the top, through different criteria levels, to the base level of alternatives. Once again, the application of the AHP model proved to be successful. This confirms that the AHP model is the most widely used tool for evaluating multi-criteria problems. The AHP method successfully solved the decision-making problem around the distribution of sustainable products for small and medium farmers.

This paper provides valuable new insights into the growing literature on the perceptions of small and medium farmers. We faced two limitations in this research. First, the focus is on the part of Serbia that is very fertile and rich in crops. Second, only those farms that produce arable and vegetable production are included. Future research should conduct a more detailed analysis of the main factors affecting all farmers, identify new criteria, and examine the importance of expanding the various distribution channels of sustainable agricultural products.

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Conflict of interests

The authors declare no conflict of interest.

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THE POTENTIAL OF DIGITAL MARKETING IN THE PROMOTION OF ORGANIC AGRICULTURAL PRODUCTS

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ABSTRACT

Organic agricultural production as a holistic approach that aims to promote food production without the use of synthetic chemical fertilizers, pesticides, genetically modified organisms and the system of food production and use takes place in accordance with the principles of preserving biodiversity, soil and ecosystems. However, this system of agricultural production incurs significantly higher costs, and the price of organic agricultural products comes also at a high cost. In addition to the price, one of the most important aspects of acceptance of organic agricultural products by consumers is environmental awareness. The aim of this paper is to analyze the potential for the improvement of digital marketing channels for the promotion of organic agricultural products. The factor analysis applied in this paper has shown that advertising through digital marketing channels has the potential to boost sales, according to producers of organic agricultural products in the Republic of Serbia.

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Introduction

The modern world is facing serious environmental problems, due to the negative (adverse) attitude of people towards the environment. For many years, capital and its increase represented the basis of the economic existence of people on planet earth. (Stojanović, 2017) For years, the production of agricultural products has been characterized by the use of chemical agents, which aim to increase the yield, but not the quality of the product. (Stojanović, 2019) On the contrary, their use not only reduces the quality of agricultural products, but also very often makes them unhealthy for use by consumers.

All environmental problems have led to the fact that almost all countries of the world accept sustainable development as a basic development concept in their macroeconomic development strategies. However, in addition to this, significant environmental problems are present in all fields, including in the field of production and use of agricultural products.

In order for any product, in the modern digital era, to be accepted and used by consumers, especially by the younger generation, it is necessary to talk about it on digital platforms. (Hall, 2020) Digital marketing in combination with traditional marketing channels represents the basis through which consumer awareness can be influenced today. Digital marketing offer significant opportunities, in the sense that products/services can be advertised through search engines, websites, social networks, video sharing platforms, mobile devices, influencers, on other sites, and the like. (Bryła, 2016) All these channels give the possibility to reach consumers and target audience. (Filipović, 2021) When it comes to the subject of this paper, namely the promotion of organic agricultural products, the target audience is everyone. However, in order for a wider audience to accept organic agricultural products, it is necessary to start from a clearly defined target audience, who is ready to change their behavior and is financially capable of switching to organic agricultural products. Only after that, the target audience can be expanded.

In order to successfully promote the acceptance of organic agricultural products among consumers, it is of paramount importance that these products are presented to them in the right way. Consumers need to be made aware of the environmental and health consequences of non-organic production. In other words, it is crucial to gradually raise consumers' ecological awareness. To achieve this, collaboration between the government and organic agricultural product producers is necessary (Czudec et al., 2022; Nedumaran & Manida, 2019). Campaigns aiming to encourage the use of organic agricultural products must be organized both by the government through social marketing campaigns and by the producers themselves. These campaigns should focus on increasing awareness and, ultimately, achieving commercial success through conversion.

The aim of this paper is not only to point out the potential of digital marketing in the promotion of organic agricultural products, but also to identify factors that can improve the application of digital marketing communications in the promotion of these products in the Republic of Serbia.

Literature review

Organic agriculture is a prerequisite for sustainable development, i.e. preserving the quality of the soil, ensuring quality nutrition for the population and, on that basis, raising the quality of the nation's health. The Republic of Serbia has great potential when it comes to nature and unpolluted (unspoiled) natural resources for these branches of agriculture. (Tabaković et al., 2017; Golijan & Sečanski, 2021) Certainly low environmental awareness and high costs of producing agricultural products in this way have a great influence on the fact that it is still accepted to a small extent in the Republic of Serbia. (Stojanović, 2019)

Countries of the European Union, unlike our country, are economically more advanced. Additionally, the EU has emphasized, for a significantly longer period, the importance of sustainable development and sustainable agricultural production. The level of environmental awareness among both agricultural producers and consumers is much higher than in the Republic of Serbia. However, even within the European Union, agricultural product producers often face a lack of demand. One solution to this problem and a way to increase their sales volume is by utilizing digital marketing channels.

The application of modern digital technology has opened doors for producers in all business sectors to enter the global market, facilitating easier communication with consumers, responding to their demands, and thereby fostering brand loyalty. (Kannan & Li, 2017; Marshall & Johanston, 2018; Hall, 2020) Agricultural production is no exception to this trend, as digital marketing channels are used worldwide, including in our country, to promote agricultural products. Novytska et al. (2021), in their study conducted in the European Union, pointed out that digital marketing, specifically its channels for promotion and advertising, can significantly contribute to brand recognition for organic agricultural producers. However, they concluded that digital marketing is still in its developmental stage. Their study also found that larger agricultural enterprises engaged in organic production and with sufficient resources for hiring marketing experts are more likely to utilize digital marketing channels. In contrast, smaller agricultural farms with up to 15 seasonal workers struggle to allocate significant funds for digital marketing. These smaller farms engaged in organic production primarily leverage social media, especially organic advertising on social networks. The reason for choosing organic advertising on social media is that it does not require substantial expenses yet contributes to brand recognition, raising awareness of a specific agricultural producer/farm. Similar conclusions regarding the importance and growing significance of social media for promoting organic agricultural products have been reached by other researchers such as Jurado et al. (2019), Aydogan & Kursat (2018), Albizua et al. (2021), Lippert & Feuerbacher (2023). Additionally, these authors have shown that younger individuals engaged in organic agricultural production exhibit a greater inclination towards digital marketing communication channels, particularly through social media communication. Li (2017) and Semenova (2023) have also indicated that communication through digital marketing channels has a positive impact on the growth of online sales for organic agricultural products.

Bojkić et al. (2016) pointed out in their study that agriculture is a sector where marketing is adopted at a slower pace. Despite this conclusion, they emphasized that digital marketing, in combination with traditional marketing, can significantly contribute to brand awareness and sales growth in the future, particularly in the context of organic agriculture and agriculture in general.

To foster an increase in demand for organic agricultural products, it is essential to develop consumers' ecological awareness. Stojanović et al. (2018) indicated that ecological awareness among consumers in Southern Serbia is not sufficiently developed. Based on the scientific papers (research) they analyzed, they concluded that the situation is similar in other parts of Serbia. Consumers in the Republic of Serbia mainly purchase agricultural products at markets, grocery stores, or shops without necessarily distinguishing between organic and traditional products. (Dašić et al., 2019)

The promotion of organic agricultural products and organic farming largely depends on the government. (Czudec et al., 2022) It is a fact that this form of agricultural production has a significant positive impact on preserving the quality of the environment. However, in developing countries, it is extremely challenging for the government to provide substantial support for the development of organic farming due to the extensive social issues. Consequently, the promotion of organic agricultural production through both traditional and digital media is lacking. (Scialabba, 2000) Such a situation negatively affects the acceptance of organic agricultural products by consumers in these countries. On the other hand, highly developed countries invest significant resources in supporting organic farming and promoting it through marketing channels, increasingly utilizing digital marketing in recent times. This has a substantial influence on raising consumer awareness about the importance of a quality environment and organic agricultural products. (Aceleanu, 2016; Reddy, 2018; Paunglad, 2023) The role of the government in establishing regulations and controlling the production of organic agricultural products is crucial for consumer acceptance. In countries where the government lacks sufficient trust, and its institutions do not function as they should, it is impossible to be certain that the product consumers purchase is genuinely organic. In this sense, it is essential for the government to enact sound regulations, establish control measures, provide financial support to farmers, and support the promotion of organic agricultural products through both digital and traditional marketing channels. (Attri & Bairagi, 2023)

The Covid-19 pandemic contributed to the acceptance of digital marketing at a fast pace by both organic and traditional agricultural producers compared to the pre-pandemic period. This was accentuated by Hardiyanti et al. (2023) in their study. Through their analysis, they highlighted that high-quality content delivered through digital marketing channels can significantly influence the growth of consumer awareness about the importance of organic agricultural production, consequently leading to an increase in demand for these products. They also underscored the importance of digital communication with consumers, establishing long-term relationships, and the use of measurable metrics. The study identified that consumers still prefer to purchase agricultural products (both organic and non-organic) in physical locations, but there is a

gradual increase in online sales of these products. For larger organic agricultural products and perishable items, digital marketing primarily serves to raise brand awareness. In the case of products that do not require special conditions and are easy to deliver, digital marketing channels can be used for both brand awareness and conversion, i.e., sales. Tambiev (2019) demonstrated, based on his analysis, that organic agricultural products have great potential to be sold through online sales channels, with younger farmers expressing such opinions.Social media, as one of the most significant digital marketing channels, has been studied for its potential contribution to the promotion of organic agricultural products by consumers.

Materials and methods

The research sample in this study included 218 participants engaged in the production of organic agricultural products in the territory of the Republic of Serbia. Registered farms were included, and responses were provided by the owners of these farms. This approach allows us to conclude that the survey process was conducted on a representative sample, aligning with the desired participant model in the research. The data collection process was carried out through face-to-face interviews and email communication from May to December 2023.

Before creating the survey questionnaire, publications were analyzed, and the results of empirical research on this topic were considered to define the questionnaire. The questionnaire consists of two groups of questions. The first group pertained to demographic variables: gender, age, level of education, average number of people working on the farm (including family members and seasonal/employed workers), duration of engagement in agricultural production, duration of engagement in organic agricultural production, and region. The second part of the questionnaire covered seven statements that participants rated on a Likert scale from 1 (completely disagree) to 5 (completely agree). The statements were defined based on the analysis of the papers of the authors, who have dealt with this topic, and their adjustment was made in accordance with the research objective and the area where the research is conducted. . The statements that were evaluated by the respondents in the research were as follows:

1. Digital marketing channels can be used to raise environmental awareness among consumers in the Republic of Serbia (Jurado et al., 2019; Aydogan & Kursat; 2018; Albizua et al., 2021; Lippert & Feuerbacher, 2023);
2. The state must promote organic agricultural production through digital channels to support producers of these products (Jurado et al., 2019; Aydogan & Kursat; 2018; Lippert & Feuerbacher, 2023);
3. Digital marketing channels can contribute to the recognition of producers (farms) of organic agricultural products (Jurado et al., 2019; Aydogan & Kursat; 2018), Albizua et al., 2021);

4. Online sales channels can enhance the overall sales of organic agricultural products (Li, 2017; Jurado et al., 2019; Aydogan & Kursat; 2018);
5. The impact of Covid-19 has led consumers of organic agricultural products in the Republic of Serbia to more rapidly embrace digital communication and sales channels (Nikolić & Jelić, 2022; Hardiyanti et al., 2023);
6. Digital communication channels create new markets for organic agricultural products (Li, 2017; Jurado et al., 2019; Aydogan & Kursat; 2018);
7. Social media is a particularly significant communication channel with consumers of organic agricultural products (Jurado et al., 2019; Aydogan & Kursat; 2018; Albizua et al., 2021; Lippert & Feuerbacher, 2023).

The goal was to determine how domestic agricultural producers value digital marketing communication channels with their consumers and whether they believe that digital communication channels can enhance the sales of organic agricultural products.

When conducting the survey, ethical principles were respected. All respondents were guaranteed anonymity and were told that the research results would be used exclusively for scientific purposes.

After collecting data from participants, the information was coded and entered into the SPSS software package for the application of appropriate tests and analysis. In addition to descriptive statistics, independent t-tests and one-way analysis were applied to determine whether there are differences in participants' attitudes towards the importance and potential of digital marketing communication based on their demographic characteristics.

Results

As Table 1 illustrates, out of the total number of participants, which is 218, 178 are male, accounting for 81.65%, while the participation of women (owners of agricultural farms) is 18.35%. When observing the age structure of the participants, those between 41-50 years old are the most represented. Their participation in the total number of participants is 31.19%, while the least represented age group is those under 30 years old, accounting for 8.72%.

Table 1. Demographic characteristics of the respondents

	N	%	AS	SD
Sex			1.59	.469
Male	178	81,65		
Female	40	18,35		
Year			2.12	1.449
Up to 30	19	8,72		
31-40	46	21,1		
41-50	68	31,19		
51-60	54	24,77		
more than 60	31	14,22		
Education			2.59	1.198
Elementary school	9	4,13		
High school	132	60,55		
College	33	15,14		
Faculty/Master/PhD	44	20,18		
Average number of people working on the farm annually			3.17	1.397
Up to 10	29	13,30		
11-20	74	33,94		
21-30	89	40,83		
31 and more	26	11,93		
Length of engagement in agricultural production			2.01	1.012
Up to 5	16	7,34		
6-10	49	22,48		
11-15	77	35,32		
16 -20	52	23,85		
21 and more	24	11,01		
Duration of engagement in organic agricultural production			1.99	.917
Up to 3	29	13,30		
4-8	72	33,03		
9-13	90	41,28		
14-18	24	11,01		
19 and more	3	1,38		
Region			2.63	1.074
Vojvodina	134	61,47		
Belgrade Region	9	4,13		
Central and Western Serbia	39	17,89		
Southern and Eastern Serbia	36	16,51		
Total	218	100		

Source: Autors

Table 1 also shows that the majority of farm owners surveyed have completed secondary education (60.55%), but there is a significant proportion of participants with higher education (20.18%). Participants commonly mentioned in their responses that the average number of engaged workers on the farm ranges from 21 to 30 (40.83%). Regarding the period of time dedicated to agricultural production, respondents most

frequently reported engaging in it for 21 to 30 years, constituting 40.83%. As for organic agricultural production, the largest number of respondents has been involved for 9-13 years (41.28%).

Considering that the Vojvodina region is exceptionally suitable for agricultural production and has the largest areas under organic agricultural production in Serbia (Simin et al., 2019), it was expected that the highest percentage of participants in such research would be from that region. Indeed, 61.47% of the participants are from the Vojvodina region out of the total number of respondents.

Table 2. Descriptive analysis of the rating of statements

Potentials and Impact of Digital Marketing Communication Channels (α= .949)	M	SD
Digital marketing channels can be used to raise environmental awareness among consumers in the Republic of Serbia	4.01	1.091
The state must promote organic agricultural production through digital channels to support producers of these products	4.13	1.196
Digital marketing channels can contribute to the recognition of producers (farms) of organic agricultural products	3.91	1.211
Online sales channels can enhance the overall sales of organic agricultural products	3.86	1.155
The impact of Covid-19 has led consumers of organic agricultural products in the Republic of Serbia to more rapidly embrace digital communication and sales channels	4.09	1.097
Digital communication channels create new markets for organic agricultural products	3.9	1.118
Social media is a particularly significant communication channel with consumers of organic agricultural products	4.02	1.143

Source: Autors

Table 2. shows the results of descriptive statistics on how respondents rated the potentials of using digital marketing communication channels with consumers and the possibilities of electronic sales of organic agricultural products in the territory of the Republic of Serbia.

To determine the reliability of the measurement scale, the Cronbach's alpha coefficient was used. Its value in this specific case is .949, indicating high responsiveness and reliability between the observed variables.

Looking at Table 2, it can be observed that Statement 2 has the highest rating: "The state must promote organic agricultural production through digital channels to support producers of these products" (4.13), while Statement 5 has the lowest rating: "Online sales channels can enhance the overall sales of organic agricultural products" (3.86).

The tables presented below (showing the results of ANOVA tests), as already mentioned in the methodology, serve to analyze the impact of demographic characteristics on respondents' ratings for specific statements about the potentials of digital marketing communications in the promotion and sales of organic agricultural products.

Independent samples t-tests were applied to examine whether there is a statistically significant difference in the attitudes of respondents with different demographic characteristics regarding the ratings of specific statements. The results showed that in

the case of gender, the length of engagement in agricultural production, the duration of engagement in organic agricultural production, and the average number of people working on the farm annually, there were no statistically significant differences. However, for other demographic characteristics, differences were observed and will be presented in the following tables.

Table 3. Results of applying one-way analysis of variance based on the age of the respondents

Statement	Average value					F	p
	do 30	31-40	41-50	51-60	više od 60		
Digital marketing channels can contribute to the recognition of producers (farms) of organic agricultural products	4.41	4.09	4.03	3.91	3.12	2.465	.029
Online sales channels can enhance the overall sales of organic agricultural products	4.35	4.13	3.98	3.79	3.05	2.852	.019
Digital communication channels create new markets for organic agricultural products	4.46	4.25	4.07	3.72	3.0	3.011	.014

*results are significant at the 0.05 level

Source: Autors

When it comes to age, a statistically significant difference was identified in three out of seven statements, as seen in Table 3. Based on the table, it can be concluded that farm owners who are younger are more aware of the potential of digital marketing and online sales of organic agricultural products. The results of subsequent measurements using post-hoc tests showed that differences in all three statements from Table 3 are present (between the ratings given by respondents to the statements) between those who are up to 30 years old and those who are 51-60 years old or those who are over 60 years old.

Table 4. Results of one-way analysis of variance based on the level of education of farm owners

Statement	Average value				F	p
	Elementary school	High School	College	Fakultet/ Master/ PhD		
Online sales channels can enhance the overall sales of organic agricultural products	3.18	3. 48	4.22	4.55	3.86	.013
Social media is a particularly significant communication channel with consumers of organic agricultural products	3.31	3.59	4.39	4.78	4.02	.027

*results are significant at the 0.05 level

Source: Autors

The results of the conducted analysis, as shown in Table 4, indicate that when it comes to the level of education of farm owners, there is a statistically significant difference in two statements. Ad-hoc tests subsequently conducted revealed differences in the attitudes of respondents who completed primary and secondary school compared to those who completed vocational school, as well as those who completed primary and secondary school compared to those who completed college, master's, or doctoral studies.

Table 5. One-way analysis of variance based on the region to which the owners of the plots where organic agricultural production takes place belong

Statement	Average value				F	p
	Vojvodina	Belgrade Region	Central and Western Serbia	Southern and Eastern Serbia		
Online sales channels can enhance the overall sales of organic agricultural products	4.29	4.05	3.82	3.30	3.86	.014
Digital communication channels create new markets for organic agricultural products	4.35	4.02	3.94	3.30	3.9	.025
Social media is a particularly significant communication channel with consumers of organic agricultural products	4.41	4.33	3.88	3.46	4.02	.017

*results are significant at the 0.05 level

Source: Autors

Table 5. shows the presence of different attitudes among respondents when it comes to regions in three statements. Ad-hoc tests conducted revealed a significant difference in the attitudes of respondents from Vojvodina compared to those who own farms and engage in organic agricultural production in Central and Eastern, as well as Southern and Western Serbia.

Discussion

In the Republic of Serbia, the level of environmental awareness is not yet at a commendable level. Among other factors, this is a crucial reason why consumers are reluctant to accept these products, and thus their demand impacts the volume of organic agricultural production. Based on the conducted research, which focused on the impact of digital marketing communication channels with consumers, it was shown that these channels can influence the development of environmental awareness. However, it was found that this influence can be achieved through synergistic efforts of both the owners of agricultural farms producing organic agricultural products and the state, which should assist in promoting these products among the population. The assessment of the statement by farm owners at 4.13 also indicates the significant importance of state assistance in promotion through digital communication channels. As emphasized

in the study, for sustainable development and for future generations to possess the same quality of resources as the present generations, it is necessary for agriculture to move towards sustainability. It is crucial to reduce the use of chemical substances that negatively affect soil quality and substances used for crops, which can reduce the quality of agricultural products. The importance of state assistance in this field has been demonstrated in the works of Aceleanu (2016), Reddy (2018), Paunglad (2023), and Ahri & Bairagi (2023), Stojanović (2019).

The use of digital marketing channels for product presentation and communication with consumers contributes to brand strengthening (Kannan & Li, 2017). This trend is gradually being embraced, even when it comes to organic agricultural products. Based on the conducted research, it has been determined that the younger population engaged in the production of organic agricultural products strongly believes in the ability to strengthen the brand of their farms and organic products through digital channels. Respondents aged up to 30 years rated this statement with a score of 4.41. Older populations, especially those above 50 years, have somewhat less confidence in the power of digital channels, with even more skepticism from those over 60. However, considering that young producers rated this statement exceptionally high, it can be concluded that digital marketing will have a significantly important role in promoting the brand of organic agricultural producers in the future. The notion that the brand of organic agricultural producers/farms can be strengthened through digital marketing has been proven in the study by Bojkić et al. (2016). Similar views are reflected when considering the significance of online sales channels for organic agricultural products and the creation of new markets for organic products. Younger populations highly value these statements, indicating that digital marketing channels can enhance organic agricultural production by stimulating increased demand and facilitating online sales of agricultural products in the future. This aligns with the findings of studies by Novytska et al. (2021), Jurado et al. (2019), Azdagon & Kursat (2018), Albizua et al. (2021), and Lapperti & Feuerbacher (2023), all of which concluded that younger agricultural producers are more inclined to communicate with consumers through digital channels and promote their organic products.

Furthermore, highly educated individuals who own agricultural farms in the Republic of Serbia believe that online sales can amplify the sales of organic agricultural products. Those who have completed college, master's, and doctoral studies strongly agree that online sales can increase the sales of organic agricultural products, while those with basic or secondary education have less trust in online sales and their contributions when it comes to these products. Highly educated individuals also believe that social networks can be particularly significant in promoting organic agricultural products and attracting consumers, as well as maintaining their loyalty. This aligns with findings in studies by Tabiev (2019) and Semenova (2023), particularly among the more educated population in the Republic of Serbia.

The Vojvodina region, where organic agricultural production is most prevalent, has shown a high inclination toward the significance of digital marketing communications

and online sales of organic products, which is somewhat less present in the territory of Southern and Eastern Serbia

Another aspect highly rated is the impact of the COVID-19 pandemic. Respondents agreed that isolations and the need for distance had an impact on shifting the communication and promotion of organic agricultural products to digital channels. This has been demonstrated in the study by Hardiyanti et al. (2023), as digital marketing channels can significantly improve customer relations, influence their awareness, and help establish loyalty or long-term relationships with consumers.

Statement number 6, rated 3.9 overall, 4.35 for the Vojvodina region, and 4.46 for young agricultural producers, indicates trust that digital marketing channels can open new markets for producers. Digital marketing channels are not constrained by spatial limitations. Communication with consumers can be established with a few clicks, but for all this to have a positive impact, it is necessary to create quality content and direct that content through the right channels to the target consumer group (Hardyanti et al., 2023).

Nowadays social media enjoys significant popularity with a large number of users. This is also the reason for the presence of a considerable number of brands on these platforms. Agricultural producers have also recognized their importance, as indicated by previous research and the study conducted in this work in the territory of the Republic of Serbia. Surveyed producers highly rated the potential of social media in promoting their products, especially in the Vojvodina region. Social media allows producers to distribute content, advertise their products, influence awareness, and stimulate consumer conversion. The significance of social media has been demonstrated in the works of Jurado et al. (2019), Azdagon & Kursat (2018), Albizua et al. (2021), and Lapperti & Feuerbacher (2023).

Based on the overall analysis, it can be said that digital marketing channels, from the perspective of agricultural producers in the Republic of Serbia, have significant potential. However, in order to harness this potential, training is necessary, as well as the involvement of the state in promoting environmental awareness and organic agricultural production.

Conclusions

The comprehensive study which has been conducted indicates that agricultural producers in the Republic of Serbia believe that digital marketing channels can enhance their business. However, in order to make this possible, it is necessary for the state, through both traditional and digital marketing channels, to collaborate with producers to promote the development of environmental awareness, as it is a prerequisite for accepting organic agricultural products. The results of the analysis suggest that education about the significance of digital marketing channels is necessary among older populations engaged in organic agricultural production. Additionally, education is required among producers living in the territories of Southern and Eastern Serbia, as well as Western and Central Serbia, where the ratings for the importance and possibilities of digital marketing communication channels are slightly lower.

Limitations encountered during this research include the high costs borne by the researchers, which forced them to reduce the sample to 218 producers of organic agricultural products. If a larger sample had been collected, there might have been slightly different results. Also one of the limitations is that the respondents may not have been honest when giving their answers in the survey. In addition to this, the limitation of this paper is that it does not include consumers and their habits, which and how they can influence the channels through which they are reached.

Recommendation for future researchers exploring the role and significance of digital communication channels for promoting organic agricultural products is to identify the target consumer group to whom these producers should address their communication and identify content that can contribute to establishing long-term relationships between producers of these products and consumers.

Conflict of interests

The authors declare no conflict of interest.

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IMPROVING THE FINANCING OF THE PURCHASE OF FOOD PRODUCTS FOR THE IMPROVEMENT OF STANDARDS AT THE UNIVERSITY OF DEFENCE

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ABSTRACT

This paper analyses financial resources for procuring agricultural products at the University of Defense as an organizational part of the Ministry of Defense of the Republic of Serbia. The physical condition of students and cadets is crucial because it affects the overall operational capability of the Army of the Republic of Serbia. Therefore, this paper points out the weaknesses and shortcomings in the supply of food products for nutrition needs. This paper analyzes data for the procurement of items by category in the period from 2018 to 2020, as well as the expenditure of funds by groups of things in the period from 2010 to 2021 to ensure the proper nutrition of students and cadets of the University of Defense. The SPSS software was used to analyse the tendency of spending financial resources. It is concluded that the main problem is the inconsistency of budget procedures with public procurement.

Introduction

This research aims to understand better the procedures for supplying food items at the University of Defense in Belgrade. In addition to knowledge of legal and normative regulations in the Ministry of Defense and the Serbian Army, as well as in the Republic of Serbia, the essential precondition for an efficient and adequate supply of food items is knowledge of food products, their division and the importance of proper, regular and varied nutrition. The Greek philosopher Hippocrates said: "Let your food be your medicine and let your medicine be your food" (Vujičić, 2017).

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In modern production, trade, and consumption flows, food products occupy a significant place primarily because of their purpose. They are procured daily to satisfy one of the basic physiological needs of man - nutrition. (Tešanović & Kecman, 2008; Barjaktarović, 2023) For this reason, researchers and food producers' interest in understanding motives when choosing food products by consumers has been growing lately. Based on their research, authors Mitic and Vehari (2021) concluded that students behave responsibly when buying food because they choose healthy foods containing natural ingredients, vitamins, minerals, and proteins that do not contain artificial ingredients. Younger generations of consumers are called "new conservatives" (Williams, 2011; Issa et al., 2022) because they nurture traditional beliefs and values of responsible consumption.

Food products refer to everything used as food and beverage in processed or unprocessed form, as well as spices, dyes, and other substances that are added to them for preservation, improvement of appearance, smell or taste, enrichment, and the like. (Born, 2012)

It is common to classify food products based on different criteria. To define "proper nutrition", the most practical measure to use is the one that separates food products based on their biological value since, in that case, food products classified into one group can be interchanged. Based on this criterion, food products are classified into six groups (Stojanović, 2012):

1. cereals and cereal products,

2. vegetables and vegetable products,

3. fruits and fruit products,

4. meat, fish, eggs, and homologous foods,

5. milk and dairy products,

6. fats, oils, sugars, and sugar concentrate.

Proper nutrition is a significant factor in maintaining health, working ability, and combat readiness. Therefore, when determining the appropriate diet, it is obligatory to plan cereal products, with preference given to wholemeal bread, rice, corn, and cereal flakes. Corn and wheat are traditionally the most widely spread crops in our country. In addition to them, our country has rye, barley, and oats. Each of them is useful in nutrition, both for people and animals. (Dašić et al., 2022)

Eating different types of fruits and vegetables in a raw state is vital because they prevent damage and ageing of organisms due to their low caloric value. It is recommended to eat two portions of fruit and three portions of vegetables every day. As for milk and dairy products, they are a good source of calcium, but nutritionists recommend that adults should use dairy products with a lower percentage of fat. Meat, fish, and eggs, as well as legumes and nuts, are essential sources of protein and vitamins. The recommended daily intake for this product group is two servings per day. Moreover, finally, foods that

should be consumed in minimal quantities are fats, oils, sweets, or foods rich in calories with a shallow content of vitamins and minerals.

According to most scientific research, the basic principles of proper nutrition are (Stojanović, 2012): 1) regularity of meals during the day; 2) diversity in food choices; 3) adequate representation of food, and 4) proper way of food preparation.

Since this paper aims to study and research the supply of food items, the system of supplying food products at the University of Defense in Belgrade was considered and analysed. The procedures and actions the University of Defense should implement to provide the necessary assortment and quantity of products of the prescribed quality at a particular time under the most favourable conditions established mechanisms are listed. The method of storage and warehousing of food products has been investigated, and mechanisms and procedures for quality control and safety of food products have been established. Of course, without the provision of financial resources for the procurement of food products, the whole procedure would not make sense, and therefore the consumption of the same was analysed. Problems related to the supply of food items to the University of Defense in Belgrade were identified, and proposals for their solutions were given.

Materials and methods

The Military Academy, as a segment of the Ministry of Defense, is a budget user whose obligation is to achieve rational and economic expenditures. In the Republic of Serbia, all revenues that finance costs and the volume and types of expenditure are shown in the budget that the Republic of Serbia, autonomous provinces, and local self-government units must have. Budgets are adopted - they are adopted within the deadlines determined by a special law that regulates temporary financing in case the budget is not adopted within the prescribed deadlines (Stoilkov, Ivanova, 2017).

The primary source of funding for the University of Defense is, of course, the Budget of the Republic of Serbia, i.e. the part of budget funds that, by the decision of the Minister of Defense, has been determined for financing the University. Other sources of funding are represented in a tiny percentage. These are the funds that the University and its higher education units earn by collecting tuition fees, providing services to third parties, leasing real estate, receiving gifts, receiving donations, and other income and receipts. These funds constitute the income of the University, i.e. the higher education unit within it (Knežević et al., 2021; Dašić et al., 2023).

The size of GDP conditions the financing of the defence system as a product of overall socio-economic activity. This statement is logical, considering that the defence system is part of the social system and a socio-economic structure segment. Therefore, the source of its financing must come from the source of financing of overall social reproduction(Zupur & Janjetović, 2023). Considering that the total reproduction of a society can be financed from domestic and foreign sources, it follows that when considering the sources of defence financing, this aspect must first be considered.

For the analysis of the issuance of food items at the Military Academy, data for 123 food items from 2018 to 2020 were used. As previously described, food items were grouped into six groups based on their biological value for each observed year. Then, a comparative analysis of the participation of individual groups by year was performed.

For the analysis of financial resources for the procurement of food products at the University of Defense in Belgrade, data on their consumption in the period from 2010 to 2021 were collected. It is essential to emphasise the addition to the analysed items for which the Military Academy procures; the University of Defense in Belgrade is also supplied centrally at the Ministry of Defense and the Serbian Army level. The data used for this analysis were taken from the Logistics Department - General Logistics Department of the Secretariat of the Military Academy.

To observe the tendency of spending financial resources during the observed period, the relevant data were processed in the statistical package IBM SPSS Statistics v.20. It was noticed that the data follow the pattern of an exponential trend which has the form:

$$y = b_0 \cdot b_1{}^t \quad \text{or} \quad lny = ln(b_0) + ln(b_1) \cdot t \tag{1}$$

Whereby y represents a dependent variable, b_0 и b_1 are the regression coefficients, a t means time. Estimated parameter b_1 multiplied by 100 shows the average relative growth of the observed phenomenon over time. Applying complex trend functions requires special care, especially if the series is not long enough. Any change in the direction of the trend line should be analysed to determine whether some new factors have influenced the development trend (Njegić, Žižić, 1983)

Results and Discussions

Supply of food items at the University of Defense

The Ministry of Defense is a direct budget user and accordingly operates by the laws and regulations of the Republic of Serbia as well as internal regulations and norms. The University of Defense in Belgrade is an independent higher education institution of the Ministry of Defense of the Republic of Serbia. Logistical Support (from now on: Lopa) is organised within the Sector for Material Resources. All processes and procedures related to logistical support that take place at the University of Defense in Belgrade are exclusively part of the logistical procedures and processes of the Ministry of Defense and the Serbian Army.

In the Ministry of Defense and the Serbian Army, the term “supply” is precisely defined in the Doctrine of Logistics of the Serbian Army. Supply, as a logistical function, is an organized activity of administrative and executive bodies which, through the planned and systematic use of material resources and supplies in the defence system and on the territory, ensure timely and uninterrupted supply of the Serbian Army with material resources necessary for missions, life and work. (Ministry of Defense of the Republic of Serbia, 2012). According to the LoPa scheme, the University of Defense in Belgrade

is logistically based at the Military Academy. The Military Academy, which has a logistics battalion, organizes the procurement of food items, storage, warehousing, and their preparation and service for the needs of the University of Defense in Belgrade.

At the University of Defense in Belgrade, strict care is taken to respect all the above principles of proper nutrition. The first stated principle of adequate nutrition (regularity of meals during the day) is strictly defined by the Schedule of the daily time of students and cadets. It is thus implemented according to the given schedule. Nutrition in the Serbian Army is planned, programmed, and organised based on the Nutrition Plan in the Serbian Army. As the second stated principle, diversity in food choice is represented during the preparation of meals and by offering more meals during lunch. The third principle, the appropriate representation of food, is determined by norms and nutrition tables and is strictly applied when preparing the food menu at the University of Defense. Finally, the fourth principle, the proper way of food preparation, is determined and defined by the rules and procedures that apply in the Ministry of Defense and the Serbian Army. The Culinary and Healthy Eating manual shows the technical-technological procedure of food preparation.

It should be emphasised that the issuance of food items at the University of Defense in Belgrade is by the norms and planned values. Of course, it is directly proportional to the number of students and cadets as end users. The nutrition of students and cadets at the University of Defense in Belgrade is, above all, safe, high quality, and to the existing regulations and norms in the Ministry of Defense and the Serbian Armed Forces(Vladisavljević et al., 2023).

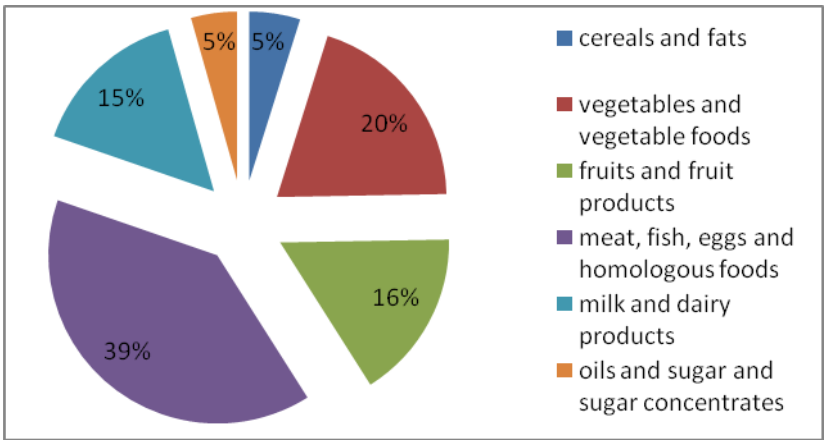
It is essential to point out that food items provide specific biological and energy requirements and health safety because otherwise, human health and life can be impaired. In this regard, the division of food products by groups, depending on the biological value, was studied and investigated. The everyday items, 123 procured at the University of Defense in Belgrade, are divided into six groups for each observed year m 2018 to 2020. The least amount of money was spent in 2018 and the most in 2019. Since the University of Defense in Belgrade started procuring cereal flakes in 2020, it is expected that more funds will be spent in that year; however, due to the COVID-19 pandemic and reduced numbers, fewer food items were procured. Thus, Fewer financial resources were spent compared to 2019.

This paper investigated the participation of issued food products by groups in the total assortment by observed years at the University of Defense in Belgrade. After that, a comparative analysis was performed by individual years to notice the tendency of procurement and the respect for the principles of proper nutrition.

By grouping 123 food items according to their biological value at the University of Defense in Belgrade and then the analysis during 2018, it was noticed that meat, fish, eggs, and homologous foods were issued in the most significant percentage (39%). The next group of food products by size of representation in the same year is vegetables and vegetable foods (20%). It is followed by fruits and fruit products (16%), milk and dairy

products (15%), and finally, in the same percentage share of the food products cereals and fats, oils and sugar and sugar concentrates. It is essential to emphasise that the sizes of the issued groups of food products are different from the sizes, that is, the share of their consumption in the form of ready meals prepared for cadets and students of the University of Defense. Because the issued sizes are different from the finished product, heat-treated and prepared for consumption, it should also be emphasised that the bodies of young people, such as students and cadets, have different needs for food items than adults because they develop, grow, learn, and physically consume much more energy.

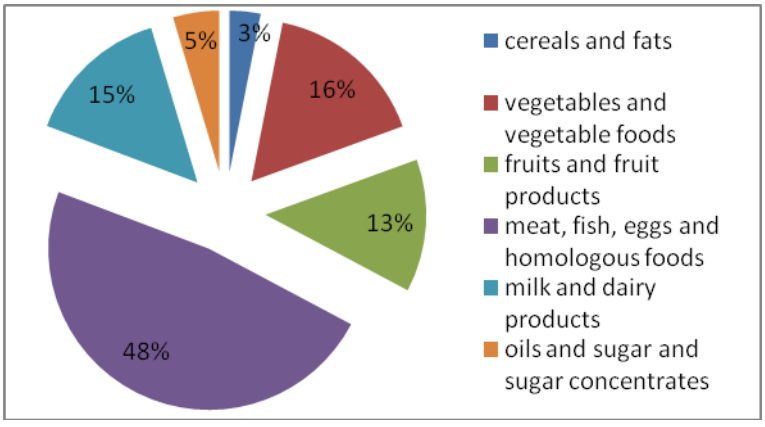
Figure 1. Issuance of food items in 2018 at the University of Defense in Belgrade



Source: Authors' calculations

In 2019, the University of Defence analysed the exact structure of the food items in the total assortment. Figure 2 gives an overview of all food items by product groups.

Figure 2. Issuance of food items in 2019 at the University of Defense in Belgrade

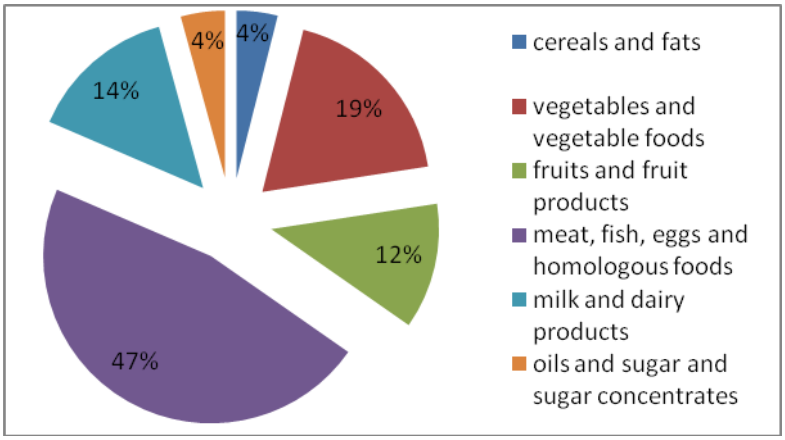


Source: Authors' calculations

At the University of Defense in Belgrade in 2019, food items were issued by groups with a percentage similar to 2018. Meat, fish, eggs, and homologous foodstuffs were given the highest rate (48%), slightly more than in 2018. Vegetables and vegetable products are in second place with a share of 16%, slightly less than in 2018. Milk and dairy products are in third place (15%) with the same share as in 2018, followed by fruits and fruit products (13%), fats, oils, sugar, and sugar concentrates (5%), and in last place are cereals and cereal products (3%).

By analysing the obtained data on the total number of issued food items at the University of Defense in Belgrade for 2020 (Figure 3), the results are similar to 2019 for product groups.

Figure 3. Issuance of food items in 2020 at the University of Defense in Belgrade



Source: Authors' calculations

In addition to the similar structure of food groups in the observed years, the fact common for all experimental years is that the University of Defense provides proper nutrition for students and cadets, procurement and consumption of all food groups. For students and cadets, it is vital to introduce regular physical activity because it is part of a healthy lifestyle. At the University of Defense in Belgrade, conditions are provided for regular physical activities of students and cadets, additional activities, and professional training and disciplines.

Quality control, safety, quality reception, and storage of food products

When supplying food products for the needs of the University of Defense in Belgrade, special attention is paid to quality. The issue of the quality of food items and the conditions for their production and trade is treated in our country by several laws and bylaws.

Before being placed in the warehouse, all food products must be established to meet the prescribed technical conditions, regardless of whether they are delivered under

a concluded contract or purchased on the market. Quality testing is also performed during storage whenever the warehouse manager or some other body notices a change in the quality of certain products (Kecman, 2006; Gojković et al., 2023).

At the University of Defense in Belgrade, of the need for food storage and preparation and distribution of food, food facilities are used (military restaurant, dining halls, and food warehouse). In the restaurant, samples of dishes are taken from all prepared dishes daily – article food as a control meal, stored in a separate refrigeration area, locked and held for 48 hours. The commander of the general logistics unit, which includes a military restaurant, puts one control meal of food for each meal daily. The control meal is kept only in the military restaurant where the food is prepared.

Food is received by expert commissions or individuals who are qualified for that. Upon reception, care must be taken about the quality and correctness and that the food corresponds to the intended use(Paspalj et al., 2024). Food products are received at a separate entrance of the restaurant, different from the door for the staff working there. The restaurant manager performs qualitative and quantitative control of food products by the food manager and transport attendant. Received food products are stored in a handy warehouse that should provide conditions for storing products, have ventilation, be protected from direct sunlight, and have enough space and necessary equipment for proper storage and storage of food products.

A high risk accompanies the production and trade of food items because these items are subject to spoilage. Spoilage, hardening, and loss of quality are present in all phases, from production to final consumption. This is especially evident during distribution, transport, and storage. To preserve the quality of food items, production and trade are accompanied by high technology in processing, canning, and freezing, which requires the construction of adequate refrigerators, production plants, and other specialised facilities (Kecman, 2006).

There are many definitions of warehouses depending on their purpose. Still, the Rule of Service in the Serbian Army (2015) defines warehouses as complexes of facilities, warehouses, and other supporting infrastructure intended for storing and handling movables. For warehouses to correspond to their purpose, they must meet the conditions for storing specific items and the requirements for loading, unloading, and maintenance. Due to their nature, food products require a special storage regime. Most food products require general conditions such as certain temperatures, humidity, protection from atmospheric influences, and the like. In addition to these general storage conditions, they must also meet specific requirements required by each item.

The primary task of food storage is to protect it from loss of properties, physical-mechanical, biochemical and chemical changes, illegal and incompetent alienation, and disappearance (Tešanović, Kecman, 2008).

The General Logistics Directorate of the Ministry of Defense and the Serbian Army, the Directorate for Logistics of the General Staff of the Armed Forces, the Central Logistics

Base, and units and institutions of the Serbian Army are responsible for the organisation and implementation of food storage activities in the Ministry of Defense and the Serbian Army. The Central Logistics Base consists of dedicated warehouses for storing food items for extended periods (outside the carcass. At the same time, the units contain stored items for current consumption, financial stocks, and food reserves in case of emergency and mobilisation (carcass stocks). (Vudragović, 2017; Krunić et al., 2023).

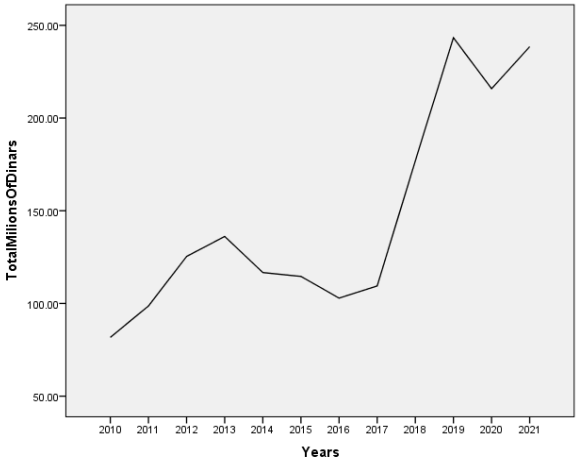
Analysis of financial resources spent during the procurement of food products at the University of Defense in Belgrade

Financing of the University of Defense in Belgrade as an organisational part of the Ministry of Defense and the Serbian Army, i.e. the direct user of budget funds, is regulated by the Law on Budget System of the Republic of Serbia. Namely, planning, programming, and preparation of the financial plan defence system and its execution are part of preparing and executing the budget of the Republic of Serbia. So, the total amount of available funds for the defence system is determined by the Law on a budget of the Republic of Serbia for a given year.

After adopting the Law on a budget of the Republic of Serbia, the competent administration of the Ministry of Defense prepares the Financial Plan, which allocates funds to organisational units of the ministry that are directly subordinated to the Minister, i.e. material and financial bodies of the 2nd degree. Funds are allocated to the University of Defense in Belgrade immediately after the adoption of the Budget Law. The Rector of the University of Defense in Belgrade, as the ordering party of the University, distributes financial resources to directly subordinate units. Among others, the Military Academy is directly subordinated to the University. The head of the Military Academy allocates financial resources for all organisational units in its composition and is responsible for planning and direct realisation of funds. Every dinar of allocated funds is subject to strict control and discipline, both during the planning of funds and during its implementation. Well-planned works in the public procurement of goods and services and a well-conducted public procurement procedure contribute to significant savings for the procuring entity of goods and services (Mihajlović et al., 2021).

Also, with his organizational orders for each budget organisational of the University of Defence defines the holders of planning and execution according to the approved accounts. The Military Academy is responsible for planning for all versions of logistical support because, according to the LOP Scheme, all organisational units of the University of Defense rely on the Military Academy. Since the nutrition of cadets, students, listeners, and others at the University of Defense in Belgrade is a part of logistical support, all financial resources intended for food are allocated to the Military Academy for implementation. The Military Academy is responsible for planning, spending, monitoring, and controlling the funds pro ta for the analysis of spent funds from 2010 to 2021 are taken from the decision on financing the expenditures of the University of Defense in Belgrade and are presented in Figure 4.

Figure 4. Financial resources spent for the purchase of food products in the period from 2010 to 2021 at the University of Defense in Belgrade



Source: Authors' calculations

Given the shape of the curve followed by the spent financial resources, the exponential function of the trend was estimated, which best described the movement of data with R^2=0,631. The estimated parameters of this function are given in Table 1.

Table 1. Estimated parameters of the exponential trend function

	Coefficients	**Stand. Error**	**t-statistic**	**p-value**
Years	1,085	0,022	48,256	0,000
Constant	80,347	11,293	7,115	0,000

Source: Authors' calculations

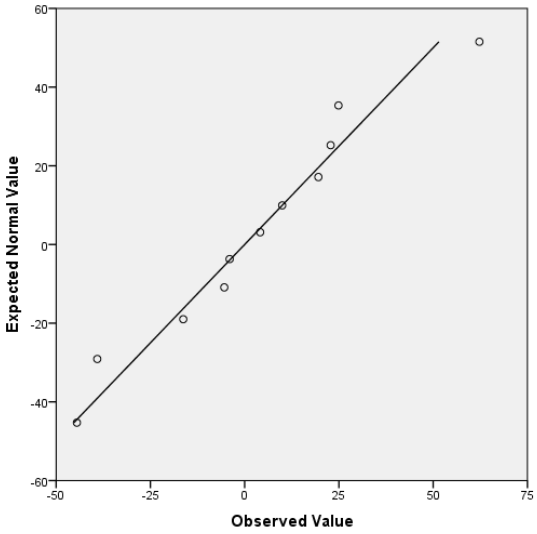
Table 1 shows that both terms, the constant and the coefficient of the time variable, is statistically significant ($p < 0.05$), and the residuals follow the normal distribution (Figure 5). For this reason, based on the estimated trend function, the value of the variable spent financial resources for the procurement of food products at the University of Defense in Belgrade for the next three years was forecast (Table 2).

Table 2. Projected funds were spent on purchasing food products at the University of Defense in Belgrade, 2022-2024. years

Years	**Forecast** (millions of dinars)
2022.	232,0365
2023.	251,7596
2024.	273,1591

Source: Authors' calculations

Figure 5. Normal Q-Q Plot for Error estimated trend functions



Source: Authors' calculations

Weaknesses and shortcomings in the supply of food products at the University of Defense in Belgrade and proposals for their elimination

As already mentioned in this paper, the University of Defense in Belgrade is an independent higher education institution of the Ministry of Defense of the Republic of Serbia. The Ministry of Defense is the direct budget user of the Republic of Serbia and, by the Law on Budget System and the Law on Public Procurement, the only user of funds. So, the Ministry of Defense is preparing the Financial Plan of the Ministry of Defense and the Serbian Army and a unique Public Procurement Plan. However, any change in the Public Procurement Plan is conditioned mainly by the amendment of the Financial Plan, but e. Still, events not, the procedures for supplementing and amending the Public Procurement Plan are complex and last for the longer University of Defense in Belgrade, as a complex organisation with logistical support sometimes has urgent and unplanned public procurement needs, and then problems arise. The solution stems from the "recognition" of the University of Defense in Belgrade as an indirect budget user who would have the right to prepare a Financial Plan and a Public Procurement Plan independently. The speed of changes to these documents at the University of Defense in Belgrade would depend mainly on the professional services at the University itself, except when additional funding would be needed from the Ministry of Defense or other entities outside the University.

Also, the inconsistency of budget procedures with public procurement procedures is a problem in procuring food products, especially off-storage food products. Namely, it is necessary to organise and coordinate professional services for a given purpose, creating

conditions for the procurement of food items to be more efficient at the University of Defense in Belgrade.

Changes in the market and the introduction of innovations in the technology of food production processes require continuous change, harmonisation, and adjustment of all standards, norms, and regulations to new trends. With the quality norms adopted by the Ministry of Defense and the Serbian Army, these changes have been slowed down, which creates difficulties in defining the subject of public procurement. The discrepancy between the exact name of the product, its organoleptic and quality properties, packaging, and other elements with the market creates confusion among many potential bidders, resulting in numerous disagreements between buyers and sellers (Tešanović, Kecman, 2008).

Due to the COVID-19 pandemic, there were changes in the world market and, thus, in the Republic of Serbia, ultimately affecting the University of Defense in Belgrade. The reduced volume of production in all sectors has been affected. It continues to affect the frequent changes in the prices of all products and, thus, the prices of food items, as a result of which bidders do not respond to public procurement tenders. Bidders feel insecure due to price changes and reduced production volumes, asking for extended delivery deadlines. However, thanks to the readiness and professionalism of the management structures of the University of Defense in Belgrade, the end users, i.e. students and cadets, have not yet experienced problems of this kind caused by the current pandemic.

Conclusions

The paper examines the procurement procedures for food items and the principles of proper nutrition and analyses the funds spent by the University of Defense in Belgrade on food products for the needs of students and cadets.

Members of the University of Defense are young people whose organisms have not yet been formed, which conditions the need for a healthy and proper diet. When solving the nutrition problem at the University of Defense in Belgrade, one should keep in mind: the development of the organism of students and cadets, their health and physical condition, morale, and operational ability. To ensure this, the proper nutrition of members of the University of Defense in Belgrade must be based on scientific principles. Scientific norms on energy and biological needs of members of the University of Defense in Belgrade must be set based on the actual energy output, which depends on the degree of stress, living and working conditions, and physiological needs of the organism.

The quality of food is very complex. It depends on several factors, such as the impact of raw materials and additives, the effect of the technological process, the impact of packaging, transportation, storage, and more. Therefore, quality control must be performed not only after the technological process is completed but also during processing, storage, and distribution, and it is tested by organoleptic and laboratory methods.

The procurement process of food items takes place within the market of the Republic of Serbia; it is the primary source of supply for the University of Defense in Belgrade. The market for food items is specific, sensitive, and unpredictable primarily due to the characteristics of the items, which are the subject of supply and demand. Safety is an essential prerequisite for proper nutrition. It is ensured by selecting quality food products and their proper storage, i.e. storage, and, of course, the correct use of the same. In addition to quality, one of the essential criteria is supplier reliability.

Therefore, the supply of food items to the University of Defense in Belgrade is a very complex process in which a large number of entities are involved, who are engaged in a particular area and at a specific time to achieve the planned goals.

Finally, we conclude that the supply process of the University of Defense in Belgrade is a very responsible, multidisciplinary, and dynamic process, in addition to the logistics of the University of Defense in Belgrade, nutritionists and doctors participate because it is about organising nutrition for young people quality professional staff of the Serbian Army.

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Conflict of interests

The authors declare no conflict of interest.

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DEVELOPING BUSINESS ENVIRONMENTS AND FINANCIAL STRATEGIES FOR MANAGING COUNTRYSIDE WALKING TOURISM (CWT)

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ABSTRACT

Legal framework, infrastructure expansion, community engagement, capacity development, public-private partnership (PPP), cluster development, and financial strategies are variables that contribute to creating a business environment for CWT development. This research aims to analyse aspects of managing the abovementioned variables for a sustainable and pleasant experience for residents and visitors. The data collected through the survey were analysed using non-parametric statistical methods. The analysis showed that regulation and infrastructure (64.2%) are prerequisites for encouraging CWT development, and education of the local population about clustering contributes to this. PPP projects mean greater attractiveness of rural tourist destinations (80.1%). Financial strategies for the development of CWT are donations, vouchers, and joint ventures. Adolescents, students, and families with children prefer the crowdfunding strategy. The authors propose strategic planning, management, and monitoring of key business environment variables for CWT development. Further research should focus on safety, security, accessibility, environmental sustainability, technology integration, and visitor feedback.

Introduction

Considering that plenty of factors influence the creation of an enabling business environment for the development of CWT, various studies by plenty of authors regarding the influence of factors reviewed.

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Kelley et al. (2016) analysed the determinants of demand for recreational walking trails in Ireland and determined that endowment and infrastructure attributes emerge as primary influences affecting demand. They point out that flat or valley-endowed trail infrastructure, which includes signs, content, and maps or leaflets, has a positive impact on demand. Thetsane (2019) research indicated that local communities want to be involved in the creation of tourism policy, as well as to be part of decisions on tourism development so that their needs and problems are taken into account. A strong sense of community awareness and active participation facilitates the revitalization of local production practices and the consistent promotion of cultural and tourist assets within local areas (Belliggiano et al., 2021). According to social scientists, walking strengthens community bonds, reduces crime rates, boosts the local economy by increasing street activity, and helps alleviate daily stress (A Harvard Medical School. Special Health Report, 2023). The outcome of Rasethuntsa's study reveals that strong cooperation between the public and private sectors, intra-governmental collaboration and investment in modern technology, and the development of relevant laws and regulations in ensuring safety and security in the tourism sector are key to providing a safe and secure environment for tourists (Rasethuntsa, 2023). The walking route should become known to potential visitors and this is possible by distributing information via the Internet, printed and other materials, and depending on the budget, advertising can be carried out, and media trips can be organized (World Tourism Organization, 2019). In cooperation with the tourism industry, the destination can create package arrangements that include a walking route, to raise awareness of the destination as a walking tourism destination through promotional events such as the organization of a walking festival (World Tourism Organization, 2019). Godtman Kling and Ioannides (2022) observed in their study that research in the field of accessibility in tourism is more numerous from the perspective of the consumer, while far less attention is paid to the perspective of the tourism provider, and the nature-based tourism for people with disabilities is a rather marginalized field of study. According to Muñoz and Navia's (2015) research, due to the small population and low control, there are usually no formal channels for recycling in rural areas, even though tourism in untouched nature has grown significantly in recent decades. These authors suggest that municipal waste management programs minimize solid waste from tourism activities. The organization of training is a way to preserve the natural and cultural heritage in rural areas, as well as to promote the local economy through the involvement of local communities in these activities (Interreg Atlantic Area, 2020). Mondino and Beery (2018) believe that introducing environmental education in schools would play a vital role in the sustainable development of the destination, and the responsibility for creating this policy lies with higher levels of government. The assessment of the carrying capacity of the destination, as an important element of capacity development, aims to find different tourist activities such as walking, cycling, diving, archaeological tourism, and excursions in an exceptional natural environment, which will reduce the negative effect of tourism and contribute to the sustainable development of the destination (Vandarakis et al., 2019). The issue of industry regulation is more important than tourism development because the institutional and regulatory framework

should be incorporated into the law that will enable the development of tourism master planning (USAID Governing for Growth (G4G) in Georgia, 2019). According to Buhalis (2020, p. 1) "smart environments transform industry structures, processes, and practices, having disruptive impacts for service innovation, strategy, management, marketing and competitiveness of everybody involved". New technologies have changed the working environment of qualified tour guides, but access to digitization is still limited, and digital technologies are not seen as an opportunity (Bourret et al., 2022).

Sustainable financing of CWT is achievable through a combination of public support, private investment, and community engagement and, in addition to benefiting the tourism industry, improves the overall well-being of rural communities. Radović et al. (2020) confirmed that acquiring financial assets is a significant obstacle to sustainable rural tourism development. The same research results showed that revenue generated by the tourism service providers is correlated with the workforce structure. Authors conclude that suitable financial investments, both on micro and macro levels, are crucial for developing rural tourism. The COVID pandemic shed some light on the main value drivers of CWT in Serbia, being: safety, content, and price; with female visitors particularly emphasizing authentic food and beverages, local inclusion, and the well-being of urban residents (Milojković et al., 2023). Mentioned value drivers could be considered as suggested avenues of financial investment and support of CWT.

The issue of finding proper financial strategies for special types of tourism is an issue most countries in the world face. Tourism can help nature-protected fields in the long term, as tourists can also contribute to the funding of nature-protected areas, as well as all regions through volunteering and payout incomes (Trišić et al., 2023). Authors Boháč and Drápela (2022) claim that over-tourism hotspots could serve as both a threat, and an opportunity for rural tourism development, and therefore financing.

According to Năstase and Vasile (2019), clusters, as associations for regional economic development, can be an effective strategy for destination management organizations. They provide consistency in development policies and strategies, strengthen institutional and company relationships, improve legislation, develop and diversify tourism products, enhance marketing and tourism infrastructure, increase the economic impact of tourism, attract new investors, and promote human resource development.

PPP is a powerful mechanism for financing CWT projects. Collaboration between the public sector and private investors would promote regional tourist identities and implement strategies for sustainable development. Authors (Pascariu and Gabriela, 2006) suggest the following factors for successful PPPs: strategic planning, clear objectives, broad stakeholder involvement, and financing solutions tailored to rural communities. The same authors list main principles such as integrated destination management, preserving authenticity, and balancing economic, social, and environmental objectives, as vital for effective partnership implementation. Analysed partnerships facilitated private financing for public projects, reduced costs for governments, and improved project efficiency and quality.

State grants and subsidies at different levels can play a leading role in financing CWT by offering grants and subsidies aimed at socio-economic and infrastructure projects. In the period from 2014-2020, public funds for the development of tourism in Finland amounted to 694 million euros, of which 53% was allocated for tourism projects, of which 40% were business subsidies, 40% for the development of tourism business - tourism marketing and development products, while 20% was set aside for the development of services and infrastructure to support tourism (Ministry of Economic Affairs and Employment of Finland, 2024).

The crowdfunding campaign affects the empowerment of local communities to take ownership of their tourism initiatives. Temelkov and Gulev (2019) view crowdfunding platforms as alternative sources of financing that should be an integral part of any tourism development strategy in order to provide additional funds for stimulating the development and promotion of rural tourism. Simeoni and De Crecenzo (2019) in the 'VA' SENTIERO' case study point out that crowdfunding is important for stimulating the development of walking tourism, as well as for the sustainable development of such projects. To collect financial resources for the protection of the trail and the trailside heritage in Lebanon Mountain Trail, online crowdfunding was used during the Thru-Walk in 2017 (World Tourism Organization, 2019, p. 32). Considering that crowdfunding is based on raising small amounts of money from a large number of individuals as contributors (Stofa and Soltes, 2021, p. 80; Adamek and Janku, 2022, p. 172), this method of financing is increasingly used for fundraising for project financing.

Non-profit organizations and foundations dedicated to rural development and sustainable tourism can provide financial support through grants, technical assistance, and capacity-building initiatives that align with CWT goals. In 2003, the non-profit organization Shinetsu Trail Club was founded in Japan to develop and arrange the trail with the help of volunteers and financial assistance from the local government (World Tourism Organization, 2019, p. 45). The Jeju Olle Foundation, a non-profit organization in Korea, developed, managed, and promoted the Jeju Olle Trail in the period from 2007-2012 (World Tourism Organization, 2019, p. 33).

The establishment of dedicated funds for sustainable tourism projects influences the attraction of investors interested in supporting environmentally friendly and socially responsible initiatives. Funds can be managed by financial institutions or government bodies, focusing on projects that promote CWT. The European Bank for Reconstruction and Development through The Property & Tourism Sector Strategy 2020-2024 provided funds for managing and developing greener hospitality facilities and promoting rural tourism (EBRD, 2024a), while through The Property & Tourism Sector Strategy 2025-2029 it plans green financing of projects in tourism sector through green loans and bonds (EBRD, 2024b).

Engaging local businesses and corporations as donors or sponsors can provide a significant funding source for CWT development. Good examples of using sponsorship as a way of financing non-profit organizations are the Jeju Olle Foundation in Korea and the Shentsu Trail Club in Japan (World Tourism Organization, 2019, p. 34, p. 46).

Cooperation with regional development agencies can be crucial in providing financial support for CWT development, as these agencies' mission is to stimulate economic growth in certain regions and can offer grants, loans, or technical assistance to projects in the CWT area. Good examples of practice are the "Connecting Pearls" and "Land of Legends" projects supported by the EU, which encourage the development of tourism in Leskovac, Serbia, through the Serbia-North Macedonia cross-border cooperation program (EU PRO+, 2024). These projects made it possible for the City of Leskovac from Serbia to improve the tourist offer through the construction of footpaths leading from the hydroelectric power plant to the waterfall on the Vučjanka River, and to build a children's playground along with the mapping of tourist attractions (EU PRO+, 2024).

A broad positive impact on the rural economy, society, and environment is achieved by enabling the development of a business environment in the countryside. Following the goal of this research, which is the analysis of the possibility of managing variables that influence the creation of a favourable business environment for the development of CVT, the following hypotheses are put forward in the paper:

H1. Legislation and infrastructure are prerequisites for the development of countryside walking tourism.

H2. The local population should be trained on how to contribute to the development of countryside walking tourism.

H3. Associations, cooperatives, or cluster establishments accelerate faster sustainable rural tourism development of the destination.

H4. Cooperation between the public, education, and private sectors contributes to balanced rural tourism development.

H5. PPPs contribute to the attractiveness of a rural tourist destination.

H6. Alternative financial strategies to accelerate the growth of countryside walking tourism are crowdfunding and loans combined with a grant.

H7. Regardless of the differences in demographic and social psychology characteristics, people have the same views on alternative funding strategies.

The research paper consists of two chapters, encompassing the introduction and conclusion. Within the second and the third chapters the research methodology, the results, and discussion are sequentially presented.

Materials and methods

Analytical-synthetic and hypothetical-deductive methods were used in the paper. The data was collected using the survey method. For gathering data the researcher designed a questionnaire comprising closed-ended multiple-choice questions, drawing inspiration from the 'VA' SENTIERO' project case (Simeoni and De Crescenzo, 2019). The survey was distributed to the general public through academic and social networks. From

March to May 2022, the 467 completed questionnaires were collected and utilized in the study. The collected data underwent analysis-using SPSS. Non-parametric statistical methods, the Mann-Whitney test, and the Kruskal-Wallis H test were chosen for their flexibility in analysing data that do not follow a normal distribution. These methods enable the precise determination of statistically significant differences in respondents' responses based on demographic and socioeconomic variables.

Results and Discussions

The sample included 467 participants, with 66.4% being females and 33.6% males. The age distribution was as follows: ≤25 years – 17.6%, 26-35 years – 11.6%, 36-45 years – 25.5%, 46-55 years – 27.4%, and ≥56 years – 18.0%. Based on marital status, respondents were categorized as single – 26.8%, cohabiting – 13.1%, married – 51.0%, divorced – 6.2%, and widowed – 3.0%. Regarding parenthood the majority of respondents share, 39.0% were childless, followed by those with two children – 30.4%, one child – 21.4%, three children – 8.8%, and four or more children – 0.4%. Concerning education, the largest group consisted of respondents with a university education, totalling 66.4%, followed by those with secondary education – 19.7%, college – 12.8%, and primary or non-formal education – 1.0%. Concerning employment status, a significant respondents' share 59.9%, were employed, and followed by 21.6% unemployed, 6.4% retired, and 2.1% in other categories. Regarding their willingness to invest in tourist trips and holidays annually, 38.5% of respondents were prepared to spend less than 500 euros, 34.0% between 500 and 1,000 euros, and 27.4% more than 1,000 euros.

The survey on respondents' views on variables that influence the establishment of an enabled countryside business environment for the development of CWT indicated (Table 1):

Table 1. Statistical review of variables that impact the creation of an enabled countryside business environment for the development of CWT

Are legislation and infrastructure prerequisites for the development of CWT?		
Value label	***Frequency***	***Percent***
No	83	17.8
Yes	300	64.2
Indifferent	84	18.0
Total	467	100.0
Is it necessary to train the local population on how to contribute to the development of CWT?		
Value label	***Frequency***	***Percent***
No	28	6.0
Yes	405	86.7
Indifferent	34	7.3
Total	467	100.0

Would associations, cooperatives, or cluster establishments contribute to faster sustainable rural tourism development of the destination?		
Value label	***Frequency***	***Percent***
No	17	3.6
Yes	387	82.9
Indifferent	63	13.5
Total	467	100.0
Would cooperation between the public, education, and private sectors contribute to balanced rural tourism development?		
Value label	***Frequency***	***Percent***
No	8	1.7
Yes	409	87.6
Indifferent	50	10.7
Total	467	100.0
Would PPPs contribute to the attractiveness of a rural tourist destination?		
Value label	***Frequency***	***Percent***
No	22	4.7
Yes	374	80.1
Indifferent	71	15.2
Total	467	100.0

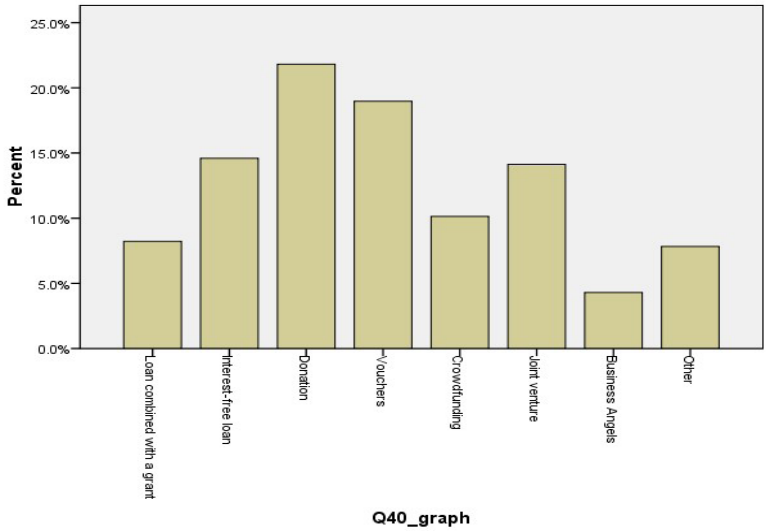
Source: Authors' calculation

- Most respondents (64.2%) express the view that legislation and infrastructure are essential prerequisites for the advancement of CWT, with 35.8% expressing opposing or indifferent opinions, thereby affirming hypothesis H1.
- A significant share of respondents (86.7%) believe that providing training for the local population is instrumental in contributing to the development of CWT, while 13.3% express opposing or indifferent views, supporting hypothesis H2.
- Most respondents (82.9%) consider that associations, cooperatives, or cluster establishments accelerate sustainable development in rural tourist destinations, with 17.1% expressing opposing or indifferent views, confirming hypothesis H3.
- A substantial majority of respondents (87.6%) believe that collaboration among the public, education, and private sectors contributes to the balanced development of rural tourism, since 12.4% express opposing or indifferent views, supporting hypothesis H4.
- The prevailing opinion among respondents (80.1%) is that PPPs enhance the appeal of rural tourist destinations, with 19.9% expressing opposing or indifferent views, confirming hypothesis H5.

The study's statistical analysis suggests that variables related to regulatory support and infrastructure, community engagement, training, and capacity building within the local community, PPP set-up, and cluster development play pivotal roles in shaping an enabling countryside business environment. This environment, in turn, supports the sustainable and enjoyable development of CWT for both residents and visitors.

The study results of financial options that can help speed up the development of CWT are presented in the following figure (Figure 1)**.**

Figure 1. Alternative financial strategies to accelerate the growth of CWT



Source: Authors' calculation

The most frequent variable was **"**donation" (V3) supported by 284 (60.8%) respondents followed by variables: "vouchers" (V4) and "joint venture" (V6) supported by 247 (52.9%) and 184 (39.4%) respondents respectively. In addition, the following variables were chosen by the respondents: "crowdfunding" (V5) 132 (28.3%), "loan combined with a grant" (V1) 107 (22.9%), and "other" (V8) 102 (21.8%). The results of descriptive statistics did not confirm hypothesis H6 that alternative funding strategies to accelerate the CWT growth are: crowdfunding and loans combined with a grant.

The research determined whether there are differences in the attitudes of women and men regarding alternative funding strategies that accelerate the development of CWT (Table 2).

Table 2. The outcomes of the Mann-Whitney test statistics concerning gender

	V1	V2	V3	V4
Mann-Whitney U	23861.500	23196.500	2.282E4	2.199E4
Wilcoxon W	72066.500	35599.500	3.523E4	3.439E4
Z	-.472	-.971	-1.298	-1.968
Asymp. Sig. (2-tailed)	.637	.331	.194	.049
	V5	**V6**	**V7**	**V8**
Mann-Whitney U	22555.000	22901.000	23594.000	2.427E4
Wilcoxon W	70760.000	71106.000	71799.00	3.667E4
Z	-1.657	-1.230	-.956	-.069
Asymp. Sig. (2-tailed)	.098	.219	.339	.945

Source: Authors' calculation

The outcomes of the Mann-Whitney U test, along with Cohen's criteria for interpreting differences (Cohen, 1988), revealed minor yet statistically significant distinctions in variable V4 between male (Md=1, n=157) and female (Md=1, n=310) groups, U=2.199E4, z = -1.968, p = 0,049, r = 0.09. The significance of variable V4 is higher among females compared to males. When formulating funding strategies, it is crucial to consider that voucher schemes hold greater importance for the female population. When creating programs, such as schemes with vouchers, it is necessary to take into account that the female part of the population values such initiatives more significantly. This information can contribute to more effective targeting of resources and ensure greater acceptance among women, which is key to achieving inclusiveness and success in policy implementation.

The research findings indicate notable distinctions in choosing alternative funding strategies based on group variables such as age, marital status, parenthood, education, employment status, and willingness to invest in tourist trips and holidays (Table 3)

Table 3. The outcomes of the Kruskal-Wallis test

	Respondents' attitudes about alternative financial strategies according to the group variable: age							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
Chi-Square	6.640	9.786	8.728	6.290	38.632	.612	11.869	7.464
df	4	4	4	4	4	4	4	4
Asymp. Sig.	.156	.044	.068	.179	.000	.962	.018	.113
	Respondents' attitudes about alternative financial strategies according to the group variable: marital status							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
Chi-Square	2.847	2.842	3.598	7.728	24.671	.914	9.834	5.053
df	4	4	4	4	4	4	4	4
Asymp. Sig.	.587	.585	.463	.102	.000	.922	.043	.282
	Respondents' attitude about alternative financial strategies according to the group variable: parenthood							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
Chi-Square	2.260	13.828	1.210	3.716	24.573	5.086	16.555	2.336
df	4	4	4	4	4	4	4	4
Asymp. Sig.	.688	.008	.876	.446	.000	.279	.002	.674
	Respondents' attitudes about alternative financial strategies according to the group variable: education							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
Chi-Square	11.264	4.771	8.781	2.502	2.135	5.068	1.258	1.767
df	4	4	4	4	4	4	4	4
Asymp. Sig.	.024	.312	.067	.644	.711	.280	.868	.779

	Respondents' attitudes about alternative financial strategies according to the group variable: employment status							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
Chi-Square	7.844	7.626	7.629	10.585	31.047	1.121	17.943	6.821
df	5	5	5	5	5	5	5	5
Asymp. Sig.	.165	.178	.178	.060	.000	.952	.003	.234
	Respondents' attitudes about alternative financial strategies according to the group variable: willingness to invest in tourist trips and holiday							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
Chi-Square	7.521	1.454	2.778	1.515	.850	1.946	.840	1.389
df	2	2	2	2	2	2	2	2
Asymp. Sig.	.023	.483	.249	.469	.654	.378	.647	.499

Source: Authors' calculation

Due to the comparison of all pairs of groups, and to avoid level one errors, the Bonferroni correction (Dunn, 1961) of the alpha value was applied, which means that the alpha value of 0.05 is divided by the number of tests, performed, to use the revised value of the alpha level as a criterion for determining significance. In the case of the group variables "age", "marital status", "education" and "parenthood" the alpha level was 0.01, while in the case of the group variable "employment status" it was 0.008 and the group variable "willingness to invest in tourist trips and holiday" " amounted to 0.017.

Utilizing the Kruskal-Wallis H Test revealed statistically significant variations concerning the following variables:

- V5 between the *age groups* (≤25, n=82, 26-35 n=54, 36-45 n=119, 46-55 n=128, ≥56 n=84), c^2 (4, n=467)=38.632, p=0.000, Md=1; regarding the mean values of group ranks, V5 was at the highest level in the *≤25 age group* in relation to other age groups. Population up to 25 years old emphasizes crowdfunding as an alternative funding strategy for countryside walking tourism development. Strategies for the promotion of crowdfunding should be specially adapted to the younger population, with a focus on digital tools, social networks and interactive campaigns.
- V5 between the *marital status groups* (single, n=125; cohabitation, n=61; married, n=238; divorced, n=29; widow/widower, n=14), c^2 (4, n=467)=24.671, p=0.000, Md=0; regarding the mean values of group ranks, V5 was at the same level in all *marital status groups.* Regardless of marital status, the population emphasizes crowdfunding as an alternative funding strategy for countryside walking tourism development. Crowdfunding campaigns can be designed for a broad demographic base, as different groups according to marital status have similar attitudes towards this strategy.

- V5 between the *parenthood groups* (0, n=182; 1, n=100; 2, n=142; 3, n=41; ≥4, n=2), c^2 (4, n=467)=24.573, p=0.000, Md=0.5; regarding the mean values of group ranks, V5 at the highest level in the *≥4 parenthood group* in relation to other age groups. Population with four or more children emphasizes crowdfunding as an alternative funding strategy for countryside walking tourism development. Crowdfunding campaigns can include elements that highlight support for families, which could further motivate larger families to participate.
- V5 between the *employment status groups* (student, n=71; unemployed, n=30; self-employed, n=46; employed, n=280; retired, n=30; other, n=10), c^2 (5, n=467)=31.047, p=0.000, Md=1; regarding the mean values of group ranks, V5 was at the highest level in the *student employment status group* concerning other employment status groups. Students emphasize crowdfunding as an alternative funding strategy for countryside walking tourism development. Crowdfunding campaigns targeting the student population should emphasize the benefits as well as opportunities for inclusion through digital platforms and educational programs.

Based on demographic and social psychology people characteristics, there were statistically significant differences in their views on alternative funding strategies. Hypothesis H7 was not confirmed.

Conclusions

Legislation and infrastructure form essential foundations for fostering the growth of CWT. It is imperative to educate the local population on ways to actively participate in advancing CWT. The establishment of associations, cooperatives, or clusters can expedite the sustainable development of countryside tourist destinations. Regional or local tourism organizations can be transformed into tourism clusters if their members are innovative and entrepreneurial, local authorities maintain low levels of bureaucracy and formalization, and cooperating institutions have a high inclination for knowledge sharing. Collaborative efforts involving the public, education, and private sectors are pivotal for achieving a well-rounded evolution of countryside tourism. Engaging in PPPs enhances the appeal of CWT. PPPs as a model can include joint investments in projects such as the construction and maintenance of walking trails, ecological centres, or business hubs for local entrepreneurs, where public funds are combined with private investments. To expedite the expansion of CWT, alternative sustainable financing such as donations availability, voucher schemes, and joint venture arrangements should be explored. A loan combined with a grant is a less popular alternative financing strategy to accelerate the growth of CWT. The voucher scheme is of particular importance to the female population. Adolescents, families with four or more children, and students emphasized crowdfunding as an alternative funding strategy for CWT development. Younger populations and students have shown the greatest openness to crowdfunding, indicating the need for digital campaigns that will engage this demographic. Using platforms such as (GoFundMe, 2024) or (Kickstarter, 2024) can be key to raising funds for projects such as local festivals, renewable energy sources, or the conservation of natural resources. Families with four or more children

can be a target group for promoting projects that offer direct benefits to families, such as housing subsidies or outdoor activities. Local organizations and associations can initiate crowdfunding campaigns supported by educational programs that explain how to participate in this type of financing, thus encouraging the wider community to contribute. Financing countryside tourism requires a multifaceted approach that leverages the strengths of various stakeholders. By combining public support, private investment, and community engagement, it is possible to create a sustainable financial framework to continuously improve the tourism industry and enhance the overall well-being of countryside communities.

The authors strongly advocate for employing a strategic approach in the planning, management, and monitoring of factors that impact the creation and advancement of a conducive business environment for the development of CWT. Future research initiatives will focus on delving into factors related to safety and security, the ease of access to countryside destinations, environmental sustainability, integration of technology, and feedback from visitors.

Conflict of interests

The authors declare no conflict of interest.

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VISIBLE INTANGIBLE ASSET EFFICIENCY AND TANGIBLE ASSETS EFFICIENCY: WHO CONTRIBUTES MORE TO THE BUSINESS PERFORMANCE OF AGRICULTURAL FIRMS?

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ABSTRACT

The realization of business activities is carried out by agricultural firms using available assets. Assets can be tangible and intangible. Theoretical and practical experiences show that these two types of assets affect firm value, create a competitive advantage, are a significant driver of productivity growth, and a key factor for the firm's survival in crisis. The paper aims to analyze the contribution of visible intangible assets efficiency and tangible assets efficiency to the business performance of agricultural firms, monitored through labor productivity, profitability, and firm growth. The sample consists of 42 agricultural firms that operated in 2023 in Serbia. A regression model was used to test the hypotheses. The results prove the contribution of visible intangible assets efficiency and tangible assets efficiency to the productivity of agricultural firms. At the same time, the influence of these variables on firm growth and profitability was absent.

Introduction

The agricultural sector contributes significantly to the overall Serbian economic activities (Ognjanović et al., 2023a) and therefore constitutes one of the most important sectors of the Serbian national economy (Dimitrijević et al., 2022; Milošev, 2023).

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By strengthening the agricultural sector, the domestic market reduces the demand for imports, contributes to the strengthening of GDP, and affects the growth of employment (Milošev, 2023). The agricultural sector of Serbia accounts for 6.3% of the total value of GDP, employs 13.1% of total employees, participates in exports 16.2%, and imports 9.1% (Report on the State of Agriculture in the Republic of Serbia in 2023, 2024:11-12). However, the agricultural production market in Serbia is undergoing rapid transformations as it adapts to world trends, especially to the dynamics of Internet technology (Mihailović et al., 2024). Perhaps this is the reason why the agricultural sector of Serbia records a decline in the value of most economic indicators in 2023 (Report on the State of Agriculture in the Republic of Serbia in 2023, 2024:11).

Agricultural firms create a business result by using available assets - tangible and intangible. It is common for intangible assets, such as industry knowledge and managerial expertise, to be viewed as a separate entity from tangible assets in terms of ownership, but in practice, one cannot function without the other (Ognjanović et al., 2023c). Comparing these two types of assets, some scholars (Qie et al., 2023) believe that tangible resources are essential for the firm's growth, while intangible resources are significant factors of sustainable competitive advantage. Before the advent of the knowledge era, tangible assets were the primary factor of production (Coulter, 2010). Later, intangible assets gained primacy in business. Research even shows that intangible assets are up to twice as productive as tangible assets (Castillo, Crespi, 2024). It should also be mentioned that the financial statements show only one, visible part of intangible assets (keeping in mind the framework of IAS 38), which will be the subject of research in the paper. The paper aims to analyze the contribution of visible intangible assets efficiency and tangible assets efficiency to the business performance of agricultural firms, monitored through labor productivity, profitability, and firm growth.

The following research gaps have been observed in the literature. First, the paper analyzes only one part of intangible assets - the one that is disclosed in the balance sheet. Most studies are based on only one component of intangible assets - intellectual capital (Bhatia & Aggarwal, 2018), which is evaluated either by quantitative methods (most often by applying VAIC) or qualitative methods. By analyzing the visible intangible assets efficiency, the study aims to show the contribution of that part of intangible assets that are proven to exist in the firm, is owned by the firm, and meets the criteria of IAS 38. Second, regardless of the obvious impact of tangible assets on the business results of agricultural firms, research on this topic is rather modest. Supplementing the existing literature with such research is necessary, all the more so since intensive use of physical capital has been observed in the agricultural sector, while the use of intellectual capital is minimal (Ognjanović et al., 2023a). The research focus is in line with the recommendations of Okobo et al. (2022) that managers of agricultural firms must pay considerable attention to tangible asset efficiency to ensure a better contribution to the return on assets. Third, previous studies did not compare the strength of the impact of tangible and intangible assets on the business performance of agricultural firms, which will be analyzed in the paper. This is consistent with the suggestion of Sulaiman et al.

(2021) that agricultural firms must separately analyze tangible and intangible assets to total assets to ensure a better impact on business results.

The research questions that will be considered in the paper are:

- What is the contribution of visible intangible assets to the business performance of agricultural firms?
- What is the contribution of tangible assets to the business performance of agricultural firms?
- Which type of asset contributes more to the business performance of agricultural firms?

The study's contribution is that it is among the first to analyze the visible intangible assets efficiency and tangible assets efficiency. Previous studies have analyzed the impact of this type of property, but not through the efficiency coefficient. Second, the paper analyzes the value of the visible intangible asset that is owned by the firm and for which it is possible to estimate the future benefit and purchase value. Thirdly, the paper indicates which type of property has a stronger impact on the business performance of agricultural firms to ensure greater efficiency of use and a stronger impact on business performance.

Literature review

Assets of agricultural firms

The development of the agricultural sector largely depends on natural factors as well as state subsidies, agricultural policy, and regional characteristics (Milošev, 2023; Qie et al., 2023). As the results of the studies show, the agricultural sector is characterized by a low return on production as well as cyclical growth and decline in production (Ognjanović et al., 2023a). The industrialization of agriculture, the liberalization of the food market, the rise of food empires in the food supply chain (Cavicchi & Vagnoni, 2018; Ognjanović et al., 2023A), as well as technological trends that change the way agricultural products are produced and sold, are cited as possible explanations for such results (Mihailović et al., 2024). Such trends require a change in traditional methods of agricultural production and trade to comply with the requirements of a more interconnected and technologically driven marketplace (Mihailović et al., 2024). A significant role in this process of adaptation of agricultural firms, in addition to tangible assets, is also played by intangible assets, i.e. knowledge and know-how (Cavicchi & Vagnoni, 2018).

An agricultural firm's use of tangible and intangible assets. A competitive business market views tangible resources as necessary, while intangible resources can be used to gain and maintain a competitive advantage (Silver Coley et al., 2012). This trend is particularly pronounced with the emergence of the knowledge era, where intangible assets are seen as a significant resource that gradually replaces tangible ones (Qie et al., 2023). However, practice shows that these two types of assets are used simultaneously, complement each other, and add value to each other.

Tangible assets. According to the International Accounting Standard 16, tangible assets include property, plant, and equipment firms own for performing activities or leasing items to other entities that will use them for more than one year (Ognjanović et al., 2023c). The value of these assets is not complicated to show since tangible costs and benefits can be easily measured in money (Silver Coley et al., 2012). Due to its immeasurable importance in agriculture, Pezeshkian & Hamidi (2020) indicate the need for quality management of these assets throughout the firm's entire life cycle. Otherwise, high productivity, efficient distribution, and lower return on invested capital can occur (Okobo et al., 2022).

Intangible assets have a nonphysical nature, the ability to produce future economic benefits (Bhatia, Aggarwal, 2018), determine the competence of the firm and provide support for the implementation of innovative activities (Intara & Suwansin, 2024). The development and efficient management of these assets enables the agricultural firm to generate high yields in the long term in the future (Rizaev & Kadirov, 2022). Due to its intangible nature, the presentation of the value of intangible assets in financial statements is not complete. That was the criterion for dividing intangible property into visible and invisible (Sveiby, 1997). Assets that can be seen on the balance sheet and that are quantified in monetary terms, such as goodwill, patents, licenses, and copyrights, are visible intangible assets (Bhatia, Aggarwal, 2018). Assets that are part of "under the surface" in the balance sheet are invisible intangible assets (Bhatia & Aggarwal, 2018). The paper will analyze the visible tangible asset (VTA) due to its monetary value, fulfillment of IAS 38 criteria, and proven ownership of the agricultural firm over this asset.

Considering the growing importance of intangible assets as well as the dominant role of tangible assets in agricultural production, it is useful to point out the differences between these two assets. First, intangible assets are characterized by a high degree of risk and uncertainty (Ognjanović et al., 2023a), which is not characteristic of tangible assets. As the main cause of high risk, Zhang (2003) cites the scarcity of public information on the value of intangible assets, which makes it difficult for investors to make assessments and projections. Second, intangible assets cannot be used as collateral for borrowing, unlike tangible assets (Grujić et al., 2024). This means that firms that borrow and own more tangible assets reduce their debt costs (Ognjanović et al., 2023c). Thirdly, the uncertainty in determining the specific benefit from the use of the asset as well as the duration of that benefit is more present in intangible assets compared to tangible assets (Zhang, 2003; Bhatia & Aggarwal, 2018; Ognjanović et al., 2023c). Fourth, since they do not have a physical form, intangible assets do not follow the same amortization pattern as tangible assets (Bhatia & Aggarwal, 2018). As a result, economic rents, growth opportunities, and other factors associated with intangible assets are not fully captured by accounting systems (Bhatia & Aggarwal, 2018).

The problem of intangible assets disclosure

Proper asset management involves accurately determining its value to identify future economic benefits (Intara & Suwansin, 2024). Management teams and reporting system aim to describe which combinations of tangible and intangible resources influence the creation of returns (Cavicchi & Vagnoni, 2018). The level of return on intangible assets is high (Rizaev & Kadyrov, 2022), which is supported by the difference between the market and book value of the firm (Bhatia & Aggarwal, 2018). However, intangible costs are difficult to assess in monetary terms (Silver et al., 2012) as well as the cash flow generated by these assets (Zhang, 2003). The problem arises that most intangible assets should be expensed at the time of creation and that only those that can be quantitatively identified can be capitalized in the balance sheet (Keong Choong, 2008).

Intangible assets disclosure is important, first of all, for firm management. It is also important for investors because a firm that provides greater expectations to use the existing technology, knowledge, and firm brand has a higher value (Bhatia & Aggarwal, 2018). Understanding the valuation of intangible resources should be of interest to both suppliers and customers who co-create value in business relationships (Silver Coley et al., 2012).

Tangible assets, intangible assets, and business performance

The analysis of the contribution of tangible and visible intangible assets to the business performance of agricultural firms is in line with the resource-based view, according to which firms gain a competitive advantage by using and developing internal resources (Barney, 1991; Milošev, 2023). To monitor the efficiency of using internal resources, Sveiby (1997) recommends that firm management use performance that emphasizes renewal, efficiency, and change and suggests the use of efficiency indicators, growth/renewal indicators, and stability indicators. Accordingly, the paper will analyze three performance groups: productivity, profitability, and firm growth. Productivity is an indicator of employee performance that depends on the efficiency of using available resources by employees (Ognjanović et al., 2023b). Profitability and firm growth are generally accepted indicators of the drivers of firm value that indicate the price market participants are willing to pay for the firm's capital (Calandro & Lane, 2007).

Previous researches provide different results about the contribution of intangible and tangible assets to the business performance of agricultural firms. Milošev (2023) concludes that internal factors are the key determinants of agricultural firms and that leverage is the most significant determinant of the profitability of these firms. Intara & Suwansin (2024) emphasize the importance of intangible assets stating that firms that invest more in these assets are more likely to experience positive benefits than those that do not invest enough. This is supported by the results of previous studies that empirically prove the impact of intangible assets on corporate sustainability growth in agricultural firms (Qie et al., 2023) and on the value of these firms (Sulaiman et al., 2021). In the literature, intangible asset was also observed through the VAIC method. Applying this method, Vetchagool (2022) concludes that intangible assets significantly

increase the profitability of agricultural firms. Analyzing the same method, Ognjanović et al., 2023a) come to the opposite conclusion that intangible assets do not affect the profitability of agricultural firms in Serbia. When it comes to the relationship between intangible assets and productivity, Castelli et al. (2024) prove that the long-term relationship of investment in the intangible assets of agricultural firms affects the growth of labor productivity. Hatane et al. (2021) state that productivity growth can occur by investing in intangible components such as education, training, certification programs, and internship activities. Further, research by Sim-im et al. (2019) shows that intangible assets have a positive relationship with the sustainable growth rate of agricultural firms. Also, the same authors concluded that agricultural firms in Thailand have the highest average sustainable growth rate. However, none of these studies analyze the visible intangible assets efficiency (VIAE) and its impact on the performance of agricultural firms. The following hypotheses were defined:

H_{1a}: VIAE positively contributes to the productivity of agricultural firms.

H_{2a}: VIAE positively contributes to the profitability of agricultural firms.

H_{3a}: VIAE positively contributes to the growth of agricultural firms.

Research shows that tangible assets are the most influential determinant of capital structure in the agricultural sector of Serbia (Grujić et al., 2024; Ognjanović et al., 2023A; Ivanović et al., 2021). Tangible assets contribute to the improvement of financial results (Varghese, 2023), short-term debt ratio, and leverage of agricultural firms (Grujić et al., 2024). Okobo et al. (2022) prove that tangible assets play a significant role in the ROA of food manufacturing firms in Nigeria. Some studies analyze the impact of tangible assets using the VAIC method through the capital employed efficiency coefficient (CEE). Ivanovic et al. (2021) conduct research in agricultural firms in western Balkans counties concluding that CEE is the most important element of IC. Ognjanović et al (2023a) prove the impact of CEE on the ROE of agricultural firms in Serbia. Similar results are reached by Vetchagool (2022), stating that a CEE affects the efficiency of agricultural firms. Other studies come to opposite conclusions. Yen et al. (2023) prove the negative impact of tangible assets on the performance of agricultural firms in Vietnam. As the tangible assets efficiency (TAE) in agricultural firms has not been sufficiently investigated, and as an asset that is significantly represented in the capital structure, it is necessary to determine how much its contribution is to the observed performance. That is why the following hypotheses were defined:

H_{1b}: TAE positively contributes to the productivity of agricultural firms.

H_{2b}: TAE positively contributes to the profitability of agricultural firms.

H_{3b}: TAE positively contributes to the growth of agricultural firms.

Materials and methods

Sample description

The sample includes agricultural firms that operated in Serbia during 2023. The sample includes firms with industrial classification codes 011; 012; 013; 014 and 015. Dependent and independent variables were calculated according to the value of the corresponding balance sheet positions. The financial reports for the observed firms were taken from the Serbian Business Registers Agency website. Out of a total of 200 analyzed firms, all necessary data for the calculation of variables were available for 42 agricultural firms. Data were collected in August and September 2024. The description of the sample according to three criteria (legal form, firm size, and number of working years) is given in Table 1.

Table 1. Sample descriptives

The legal form of the firms	**Number**	**%**
Agricultural cooperative	9	4.8
A limited liability company	30	71.4
Stock company	2	4.8
Limited partnership	1	2.4
Σ	**42**	**100**
Firms size	**Number**	**%**
Micro firms	10	23.8
Small firms	17	40.5
Medium firms	10	23.8
Large firms	5	11.9
Σ	**42**	**100**
Number of working years	**Number**	**%**
up to 10 years	4	9.3
11-20 years	11	26.6
21-30 years	15	35.5
31 years and more	12	28.6
Σ	42	**100**

Source: Author's calculation

Based on the results, it can be concluded that the sample is dominated by limited liability companies (71.4%), small agricultural firms (40.5%) as well as firms operating "from 21 to 30 years". (35.5%). The smallest participation in the sample is present in agricultural firms in the form of limited partnerships (2.4%), large firms (11.9%) and firms operating "less than 10 years" (9.3%).

Variables

Independent variables, visible intangible assets, and tangible assets are monitored through the efficiency coefficient. This coefficient assesses a firm's ability to use its assets and manage its liabilities to generate income in the short term with minimum costs (Alarussi & Gao, 2023). The calculation of this coefficient follows the VAIC model, analyzed by Pulić (2004), using value-added. Value added is an indicator of a

firm's ability to create value (Pulić, 2004). The calculation of the efficiency coefficient is measured as value added per value of the observed assets (Sveiby, 1997). Following the VAIC method (Pulić, 2004), value-added is calculated:

$$VA = OP+EC+D+A \quad (1)$$

VA = value-added; OP = Operating; EC = Employee costs; D = Depreciation; A = Amortization.

The paper analyzes only visible intangible assets that are shown in the financial statements. The analysis of disclosure of intangible assets has its advantages, primarily because financial information is still the predominant source of information based on which the sustainability of business activities is assessed (Ognjanović et al., 2023c). Accordingly, the VIAE coefficient is calculated:

$$\text{VIAE coefficient} = \frac{\text{Value added}}{\text{Value of visible intangible assets}}$$

Some authors examined the influence of tangible assets, calculating it as the ratio of the value of these assets and total assets (Xuezhou et al., 2020). The TAE coefficient in the paper is calculated: (Ognjanović et al. 2023c):

$$\text{TAE coefficient} = \frac{\text{Value added}}{\text{Value of tangible assets}}$$

The dependent variables analyzed in the paper are:

- Labor productivity shows how much each employee contributed to the creation of profit before tax and is calculated (Ognjanović et al., 2023b):

$$\text{Labor productivity} = \frac{\text{Profit before tax}}{\text{number of employees}}$$

- The profitability of agricultural firms is monitored through the Return on assets (ROA). ROA measures the overall efficiency of management in generating profits considering the level of assets at its disposal (Bhatia & Aggarwal, 2018). ROA is calculated (Lin & Li, 2024):

$$\text{ROA} = \frac{\text{Net income}}{\text{Total assets}}$$

- The growth of agricultural firms is monitored through the firm growth indicator, which shows whether there has been a change in operating income compared to the previous year. It is calculated (Lin & Li, 2024):

$$\text{Firm growth} = \frac{\text{Current year's operating income}}{\text{Previous year's operating income}}$$

Statistical methods

The analysis of dependent and independent variables will be performed using the program IBM SPSS. A confidence interval ά = 0.05 was used to determine statistical

significance. The set research hypotheses will be tested using regression analysis with descriptive statistics and correlation analysis.

Results

Descriptive statistics

The results of descriptive statistics show the mean values for the observed sample and the value of standard deviation, kurtosis, and skewness. The results of descriptive statistics for the observed sample are shown in Table 2.

Table 2. Descriptive statistics

Variables	Mean	St. Deviation	Kurtosis		Skewness	
			Statistics	St. Error	Statistics	St. Error
VIAE	1138.49	2658.88	4.24	0.365	21.43	0.717
TAE	2.10	7.94	4.97	0.365	26.09	0.717
Labor productivity	260.41	2345.96	0.906	0.365	4.779	0.717
ROA	-0.0029	0.11	1.30	0.365	10.50	0.717
FG	0.94	0.34	-0.10	0.365	2.72	0.717

Source: Author's calculation

Based on the results, it can be concluded that the mean is the highest in the case of the VIAE coefficient (mean=1138.49) and that in the case of this variable, the highest value of the standard deviation was identified (St. Dev = 2658.88). A significantly lower mean efficiency coefficient was identified for tangible assets, even 500 times lower than intangible assets. A possible explanation is the high value of tangible assets, which does not justify the creation of added value in agricultural firms. It is worrying that the companies in the observed sample have a negative mean value of ROA (-0.0029). On the other hand, the observed companies have a high growth compared to the previous year (2022), even almost 100%. Analyzing the kurtosis values, most of the observed variables, except firm growth, have positive values. This means that the distribution is more skewed than normal. On the other hand, the skewness values are also positive for all variables, which means that they are positioned left of the arithmetic mean, i.e. closer to lower values. Since the sample is less than 50, the Shapiro-Wilk test will be used to test the normality of the distribution. For all observed variables, the p-value is statistically significant, which means that the normality of the sample distribution is proven.

Correlation analysis

Correlation analysis aims to determine the strength and direction of the relationship between the observed variables. The strength of the relationship is measured based on the value of the Pearson coefficient since the normality of the distribution has been proven. The results of the correlation analysis are shown in Table 3.

Table 3. Correlation analysis

Variables	VIAE	TAE	Labor productivity	ROA	FG
VIAE	1				
TAE	0.257	1			
Labor productivity	0.604**	0.543**	1		
ROA	-0.054	0.039	0.382*	1	
FG	-0.014	0.055	0.236	0.194	1
* *Correlation is statistically significant on the level of 0.050* ** *Correlation is statistically significant on the level of 0.000*					

Source: Author's research

The between the VIAE and TAE coefficients is not identified significant correlation (ρ=0.257, p=100). The VIAE coefficient achieves a significant and strong correlation only with labor productivity (ρ=0.604, p=0.000), which was also determined in the case of the TAE coefficient and labor productivity (ρ=0.543, p=0.000). By observing the correlation between business performance, a statistically significant and medium correlation was identified between labor productivity and ROA (ρ=0.382, p=0.013).

Regression analysis

The application of regression analysis requires the fulfillment of appropriate conditions: multicorrelation and autocorrelation. Multicollinearity is monitored through the VIF coefficient, which should not exceed 10 (Field, 2009). For the observed three regression models, the VIF value is in the limit values, which means that there is no high degree of correlation between the variables and the regression can be carried out. Autocorrelation is monitored through the Durbin-Watson coefficient, which should not be higher than 4. This coefficient does not exceed the limit values for the observed three regression models, which means that this condition for the application of regression analysis is also met.

Table 4. Model 1 – VIAE coefficient, TAE coefficient, and labor productivity

Independent variables		Standard regression model		
		β	**t-value**	**Sig.**
VIAE coefficient		0.654	**5.091**	**0.000**
TAE coefficient		0.194	**1.512**	**0.039**
Dependent variables: Labor productivity *Significant: ** p ≤ 0.01; * p ≤ 0.05* *DW =1.448* *R^2 = 0.400* *F = 12.982* *p = 0.000*				

Source: Author's calculation

Table 4 shows the results of regression model 1, based on which it can be concluded that hypotheses H_{1a} and H_{1b} are accepted. A positive and significant impact of the VIAE coefficient on the labor productivity of agricultural firms was identified (p=0.000). The value of the β coefficient shows that an increase in the VIAE coefficient by 1 unit of standard deviation leads to an increase in productivity by 0.654 units of standard deviation. Also, the TAE coefficient positively and significantly contributes to the labor productivity of agricultural firms (p=0.039). An increase in the TAE coefficient by 1 standard deviation unit leads to an increase in productivity by 0.194 standard deviation units. The coefficient of determination R^2 for the observed model is 0.400, which means that 40% of the productivity variability of agricultural firms is explained by the regression model, while the rest is influenced by other factors.

Table 5. Model 2 – VIAE coefficient, TAE coefficient, and ROA

Independent variables		**Standard regression model**		
		β	**t-value**	**Sig.**
VIAE coefficient		-0.069	**-0.416**	**0.679**
TAE coefficient		0.057	**0.346**	**0.732**
Dependent variables: ROA *Significant: ** p ≤ 0.01; * p ≤ 0.05* *DW =1.721* *R^2 = 0.006* *F = 0.117* *p = 0.890*				

Source: Author's calculation

Based on the results of regression model 2, it can be concluded that hypotheses H_{2a} and H_{2b} are rejected (Table 4). The VIAE coefficient does not contribute positively to the ROA of agricultural firms (p=0.679), nor does the TAE coefficient (p=0.732).

Table 6. Model 3 – VIAE coefficient, TAE coefficient, and Firm Growth

Independent variables		**Standard regression model**		
		β	**t-value**	**Sig.**
VIAE coefficient		-0.030	**-0.182**	**0.857**
TAE coefficient		0.063	**0.379**	**0.707**
Dependent variables: Firm growth *Significant: ** p ≤ 0.01; * p ≤ 0.05* *DW =2.046* *R^2 = 0.004* *F = 0.076* *p = 0.927*				

Source: Author's calculation

The results of regression model 3 are shown in Table 5. VIAE and TAE coefficients do not contribute to the firm growth of agricultural firms, which means that hypotheses H_{3a} and H_{3b} are rejected.

Discussions

The research provided answers to the research questions. First, visible intangible asset efficiency affects only the labor productivity of agricultural firms. Similar results were obtained by Castelli et al. (2024). The obtained results follow the resource-based view according to which investment in internal resources creates economic value and a sustainable competitive advantage (Ognjanović et al., 2023b). The growth of labor productivity of agricultural firms is the result of the effective application of intangible assets - technology and creative processes created by upgrading the knowledge and abilities of employees (Bai et al., 2024). Competencies of employees are crucial for agricultural firms aiming for agility and adaptability (Bešić et al., 2024). The paper did not prove the impact of visible intangible asset efficiency on the profitability and growth of agricultural firms. One of the causes of such results may be insufficient education of farmers (Hadelan et al., 2022) or insufficient investment in research and development (Castelli et al., 2024).

Second, tangible asset efficiency positively contributes to the labor productivity of agricultural firms, which is in line with the results of Castelli et al. (2024). In Serbian agricultural firms, the availability of tangible assets and their efficient use remains one of the key factors of high productivity (Ognjanović et al., 2023a). Managers of these firms should use agricultural subsidies to influence productivity growth through additional investment and more efficient use of tangible assets (Qie et al., 2023).

Thirdly, the results show that the visible intangible asset efficiency has a stronger influence on the labor productivity of agricultural firms than the tangible asset efficiency. The results of the correlation analysis confirm this conclusion. As a possible explanation for such results, the value of human capital is mentioned, which is a key component of intangible assets and which significantly affects tangible asset efficiency. In agricultural firms with superior human capital, employees creatively perform various tasks, show appropriate behavior at the workplace, dedication to business tasks, which ensures production efficiency (Ognjanović et al., 2023b).

Practical implications. Employees in agricultural firms use visible intangible assets and tangible assets with a minimum of costs and energy, which improves labor productivity. Managers of agricultural firms are recommended to increase the visibility of intangible assets and their more efficient use to ensure greater profitability and growth. This can be achieved by aligning investment expenditures in various components of intangible assets (R&D, technology, employee training, brand activities, customer relationship improvement) with the value created. Managers are recommended to invest additionally in intangible assets, first of all, modern food production technology as well as branding of these companies to strengthen their competitive position. It is also recommended that through agricultural subsidies and favorable loans, agricultural firms continue to invest in tangible assets.

Limitations of the research. The first limitation is the sample size. The observed sample consists of only 21% of the firms from the collected base of agricultural firms. This

result is a consequence of the limited disclosure of intangible assets in the financial statements, which was a condition for the firm's inclusion in the research. The second limitation is the analysis of only the visible part of intangible assets, which limits the precise determination of the impact of this variable. The nondisclosure part of the intangible assets did not meet the criteria of IAS 38 for the presentation of the value of this property. That is why the presented intangible assets do not influence operating performance enough (Intara & Suwansin, 2024) and the value of the VIAE coefficient is quite high compared to the TAE coefficient. However, the displayed value of the intangible asset meets certain standards (it is possible to determine the purchase value and future benefits), which confirms the presence and ownership of the company over this asset. Given the intangible nature of intangible assets, each of the applied methods for estimating its value had some limitations.

Future research may focus on more precisely determining the value of intangible assets. Also, researchers can analyze the impact of each of the components of intangible assets on the business performance of agricultural firms, as well as the impact of the components of tangible assets on this performance. It would be useful to make a comparison with the results from the agricultural sector of other, comparable countries.

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Conflict of interests

The authors declare no conflict of interest.

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THE IMPACT OF RATIO ANALYSIS ON THE EVALUATION AND MANAGEMENT OF LIQUIDITY IN AGRO-PROCESSING COMPANIES

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ABSTRACT

Liquidity is a fundamental element of business partnerships, directly influencing the establishment or loss of trust, with emphasis on the dynamics financial interactions. The assessment of liquidity in financial analysis requires the use of predefined metrics or analytical guiding star. The aim of this research is to investigate the contribution of ratio analysis on the valuation and management of liquidity in agro-processing enterprises. The research employs annual financial reports of agroprocessing companies from 2016 to 2023, utilizing regression analysis to identify critical challenges in liquidity management. The findings show that there is a positive correlation between the selected metrics of the static and dynamic basis of liquidity, and their negative correlation with the indebtedness indicator on the example of the agro-processing industry of Serbia. The contribution of this study is that its results can be used in the preparation and implementation of effective liquidity strategies in agroprocessing companies.

Introduction

Liquidity is a crucial determinant of a company's survival or failure, reflecting the overall outcome of its financial operations and significantly impacting business confidence. A company may operate at a loss yet continue functioning due to adequate liquidity. In contrast, a profitable yet illiquid company can face severe operational challenges, potentially leading to bankruptcy, restructuring, acquisition, or, at best,

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continued operations in a modified form. Ultimately, such a company risks losing managerial autonomy, with benefits shifting to investors. Thus, maintaining liquidity alongside profit generation is essential for a company's financial health and its capacity to adapt to changing external and internal business factors (Malešević, Čavlin, 2020).

Liquidity issues remain a central topic in numerous studies, gaining prominence in times of crisis, both locally and globally. Notable domestic research (Orsag, 2012; Malešević, 2014; Belak, 2014; Mikerević, 2015; Milojević, 2016; Žager, Ježovita, 2017) underscores the importance of ratio analysis in assessing and managing liquidity. Similarly, international scholars (Friedlob & Schleifer, 2003; Pantić & Milojević, 2023). Altman, 2019; Shim, Siegel, 2019) emphasize the importance of comprehensive liquidity analysis for a company's sustainability.

One key debate in financial management concerns the use of multiple static and dynamic indicators to assess liquidity comprehensively. Although these indicators are widely applied, they often overlook specific internal and external factors. Research (Anjum, Malik, 2013) highlights a positive correlation between effective liquidity indicators and variables such as board size, board independence, and firm profitability. Likewise, (Mursalini et al., 2017; Pantić et al., 2022) found that, in Turkey's agro-processing industry, the cash conversion cycle and sales growth significantly affect liquidity. Additionally, findings from (Čavlin et al., 2022) indicate that liquidity ratios and dynamic solvency are strong predictors of the variable rentability during and before COVID-19 in agro-industrial companies in Serbia. Moreover, cash flow management is recognized as a key liquidity mechanism. Studies by (Garanina, Belova, 2015) show that operational cash flow significantly explains variations in liquidity, with its positive influence extending to debt, market, productivity, and dividend indicators at different levels of significance (Al-Shubiri, Aburumman, 2013). According to (Vu et al, 2020) findings, based on the analysis of Vietnamese companies from the production sector does not find a statistical relationship among: the cash conversion cycle-rentability and solvency-age of the company. While, he finds a negative statistical relationship among the net business cycle-rentaability and the performance of the company's organizational context.

The impact of Serbian agriculture is significant in generating basic macroeconomic outcomes measured as GDP, employment and similar (Đurić et al, 2019).The agricultural sector represents a promising prospect for Serbia in the process of EU integration; however, it is accompanied by a range of challenges, including a decline in real income, which limits its potential for transformation, including digitalization (Tankosić et al., 2024). Many agro-processing companies, in response to these liquidity challenges, should adopt lean management principles to create value with minimal waste (Pešić et al., 2022). The agro-processing industry is a vital sector in Serbia, with 35,878 companies operating in the Manufacture of Food Products sector in 2023 (APR, http://www.apr.gov.rs), representing 20.64% of the entire processing sector. While, their number in the subsectors represents 31.79% of the entire agro-processing sector, medium and large enterprises have a relatively more significant presence in the subsectors.

The core hypothesis of this study is that the complementary use of static and dynamic liquidity indicators is justified, not only for assessing but also for improving liquidity management in agro-processing companies. The analysis of selected liquidity indicators in agro-processing companies from 2016 to 2023, using descriptive and statistical methods, aims to identify key features of liquidity indicators for more informed decision-making.

The fundamental aim of this research is to evaluate the interdependence of liquidity indicators in agro-processing companies, with the hypothesis that a complementary application of these indicators can provide a comprehensive view of liquidity and enhance the effectiveness of liquidity management practices. The conclusions support the complementary application of static and dynamic basis metrics as a holistic platform for corporate liquidity management.

Materials and methods

As the primary source of data, the financial statements submitted to the Serbian Agency for Economic Registers were used, while the methodology of the Serbian Republic Institute of Statistics was used for the selection of the statistical sample of the acquisition of agro-processing activities.The sample is categorized by sector, for period 2016 to 2023, as follows: Sector – Manufacture of Food Products and its following Subsectors: Meat Processing and Preservation, Processing and Preserving of Fruits and Vegetables and Manufacture of Other Food Products.

The construction of indicators for liquidity ratio analysis relies on analytical standards: (Malešević, Čavlin, 2020):

Indicator of prospective liquidity = Liquid assets / Current liabilities

Indicator of effective liquidity = (Liquid assets - Inventory) / Current liabilities

Average Days Cash Conversion Cycle = Average Inventory Days + Average Accounts Receivables Days - Average Payable Days

Indicator of Indebtedness = (Liabilities - Capital) / Assets

Indicator of Interest Coverage (Dynamic Solvency) = Operating Profit / Interest Expenses (third parties)

Correlation analysis was applied, where the correlation coefficient for the population uses the symbol ρ, and for the sample r. Correlation analysis was used, where the correlation coefficient for the population uses the symbol ρ, and for the sample r, while (k_i, y_i), i = 1, 2, 3...n is used to illustrate the sample, and the following expression:

$$r = \frac{\sum x_i y_i - n \cdot \bar{x} \cdot \bar{y}}{\sqrt{(\sum x_i^{\,2} - n \cdot \bar{x}^2) \cdot (\sum y_i^{\,2} - n \cdot \bar{y}^2)}}$$

The correlation coefficient r refers to the intensity and orientation of the interdependence of variables, in the spectrum of variable sizes from -1 to 1 (complete or negative correlation). The statistical significance of this coefficient is evaluated based on the t-value, where the resulting r is compared with the given tabular frames.The statistical

significance of this coefficient is evaluated through the t-value, whereby the obtained r is compared with the given tabular value. According to the findings (Radović-Marković, Hanić, 2018), the assessment of the significance of the interdependence of the variables X and I in the context of the research hypothesis is realized by verifying the null premiss, which assumes that the linear correlation coefficient is equal to zero, relying on the subsequent t-test statistic.

$$t = \sqrt{\frac{n-2}{1-r^2}}$$

Results and discussion

Over the past eight years, the sector and subsectors analyzed have demonstrated solid performance, particularly regarding revenue and employment. Revenues in the Sector: Manufacture of Food Products grew nominally by 60.8% between 2016 and 2023, though their share of total processing industry revenues decreased by 17.3%.

In the Subsector: Meat Processing and Preservation, revenues increased by 84.8%, raising their share by 14.8%. In the sub-sector Fruit and vegetable processing and canning: the dynamics of income is developing respectively with a trend of 45.4%, but the decrease in participation in the income structure of the sector by 10.5% is worrying. Similarly,the Subsector: Manufacture of Other Food Products experienced a 43.2% increase in revenues, yet their share dropped by 12.2%.

Employment in the Sector: Manufacture of Food Products grew by 26.5%, reaching 84,225 workers in 2023, contributing 18.2% to total industry employment. The Subsector: Meat Processing and Preservation saw a 26.5% increase in employment, making up 17.8% of the sector's workforce. The analysis of employment for the subsector Processing and Preserving of Fruits and Vegetables reflects an employment increase of 18.3%, contributing 12.4% to the sector's employment structure, while the subsector Manufacture of Other Food Products recorded an employment growth of 19.8%, contributing 14.1%.

Table 1. Overview of Key Liquidity Performance Indicators for Sector A0 in the Period 2016-2023

Categories	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**AP**	**M**	**SD**
LP	2,34	2,24	2,24	2,27	2,47	2,55	2,59	2,68	2,42	2,4	0,17
LE	1,57	1,44	1,42	1,42	1,55	1,53	1,48	1,67	1,51	1,5	0,08
GC	117	111	107	102	149	153,3	147,11	143,3	128,7	130,2	21,4
ZAD	1,12	1,14	1,12	1,13	1,11	1,9	1,08	1,05	1,2	1,1	0,28
DS	6,5	6,97	6,7	7,16	11,97	12,73	12,21	7,39	8,9	703	2,79

Source: Authors' calculations

Legend: Sector A0 – Manufacture of Food Products Sector, LP – Prospective Liquidity, LE – Effective Liquidity, GC – Cash Cycle, ZAD – Indebtedness, DS – Dynamic Solvency, AP - Arithmetic Mean , M- Median, SD- Standard Deviation

The results in Table 1 demonstrate stable liquidity throughout the analyzed period.

The above-standard and solid average values of the indicators of prospective and effective liquidity of 2.42 (standard deviation: 0.17) and 1.51 (standard deviation. 0.08), respectively, indicate a persistent static picture of the subsector's financial position. While, based on the average period of the cash cycle of 128.7 (standard deviation of 21.4), a noticeable dynamic intensity of liquidity indicated by COVID-19 can be observed.When it comes to the debt position, the leverage indicator value of 1.2, (standard deviation: 0.28) it is solid except that the steady persistence was ordered in the year of duration of COVID-19. While increased variability in the ability of companies to manage long-term liabilities, especially during COVID-19, is indicated by the average score of the dynamic solvency indicator of 8.9 (standard deviation of 2.79). It can be summarized that the liquidity dynamics of the respective sector is favorable, but caution is required due to the observed negative tendencies caused by COVID-19.

Table 2. Overview of Key Liquidity Performance Indicators for Sector A1 in the Period 2016-2023

Categories	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**AP**	**M**	**SD**
LP	2,47	2,46	2,4	2,39	2,8	2,62	2,73	2,87	2,59	2,55	0,18
LE	1,57	1,52	1,46	1,47	1,71	1,58	1,58	1,71	1,58	1,58	0,09
GC	93	83	64	62	103	92,2	98,56	95,43	86,40	92,6	14,54
ZAD	1,07	1,06	1,05	1,08	1,07	1,05	1	1	1,05	1,06	0,03
DS	6,54	7,09	8,69	10,53	12,48	10,64	14,16	9,16	9,91	9,84	2,42

Source: Authors' calculations

Legend: Sector A1 – Meat Processing and Preservation Sector

Stable liquidity is suggested by the results presented in Table 2 throughout the analyzed period.

The enviable dynamics of the average achievements of the perspective liquidity indicator of 2.59 (standard deviation: 0.18), and even slightly better performance of the effective liquidity indicator of 1.58 (standard deviation: 0.09) indicate the sustainability of the static dimension of the analyzed short-term solvency sub-sector. Contributing to this rating is the steady average value of the indebtedness indicator of 1.05 (standard deviation: 0.03), which completes the conditions for financial sustainability through debt management. The dynamic dimension of liquidity expressed by the average realization of 86.4 days of the duration of the cash cycle (standard deviation: 14.5) shows variability, and intensive changes in dynamics during the COVID-19. Variability in the company's capacity to manage long-term liabilities, especially after the COVID-19 crisis reflects an average achievement of the dynamic solvency indicator of 9.9 (standard deviation: 2.2).

In conclusion, liquidity is generally stable, though improvements in working capital and long-term debt management are advisable.

Table 3. Overview of Key Liquidity Performance Indicators for Sector A2 in the Period 2016-2023

Categories	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**AP**	**M**	**SD**
LP	2,52	2,57	2,75	3,11	3,22	3,08	3,13	3,15	2,94	3,1	0,28
LE	1,64	1,68	1,86	2,01	1,92	1,76	1,57	1,66	1,76	1,72	0,15
GC	146	156	187	173	214	172,1	218,1	219,2	185,7	180	28,7
ZAD	0,81	0,81	0,79	0,93	0,83	0,88	0,98	1,03	0,88	0,86	0,09
DS	4,43	7,67	7,6	8,69	12,26	13,11	10,09	5,41	8,66	8,18	3,06

Source: Authors' calculations

Legend: Sector A2 – Processing and Preserving of Fruits and Vegetables

Relative stability in liquidity over the period is highlighted by the analysis presented in Table 3.

From the aspect of static analysis of liquidity, expressed by indicators of average values of 2.94 (standard deviation: 0.09) prospective and 1.58 (standard deviation: 0.28) effective liquidity, it can be pointed out the consistency of financial vitality in the short term. While, from the aspect of dynamic analysis of liquidity, the average number of cash cycle days of 185.7 (standard deviation: 28.7) shows important dynamic oscillations that are noticeable with the emergence of COVID-19. Steady at 0.88, indebtedness maintains a low standard deviation of 3.06, signifying a stable debt level. Average dynamic solvency performance of 8.66 (standard deviation: 3.06), indicates heightened volatility in the company's capacity to manage long-term obligations, particularly during the COVID-19 period. In summary, indebtedness and liquidity remain stable, while dynamic solvency and the cash cycle experience significant fluctuations, suggesting some instability in the company's financial situate.

Table 4. Overview of Key Liquidity Performance Indicators for Sector A3 in the Period 2016-2023

Categories	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**AP**	**M**	**SD**
LP	2,91	2,57	2,56	2,71	2,81	3,31	3,29	3,38	3,1	2,8	0,3
LE	2,07	1,68	1,69	1,66	1,83	2,05	2,08	2,2	1,91	1,94	0,2
GC	186	183	152	172	232	286,2	206,1	229,1	206,4	196,1	42,4
ZAD	1,02	1,03	0,98	0,99	1,03	0,94	1,03	1,04	1,00	1,02	0,03
DS	16,69	13,88	11,57	10,61	13,03	15,03	16,68	7,03	13,3	13,4	13,39

Source: Authors' calculations

Legend: Sector A3 – Manufacture of Other Food Products

Relative stability in liquidity over the period is highlighted by the analysis presented in Table 4. averaging 3.1 prospective liquidity (standard deviation: 0,3) demonstrates moderate variability. The relative stability of liquidity over the period is highlighted by the analysis shown in Table 4. At an average of 3.1, prospective liquidity shows moderate variability, followed by a standard deviation of 0.3. Whereby, the performance of the effective liquidity expression of 1.91 (standard deviation: 0.2) contributes to the

favorable static assessment of the position of short-term financial trust. The relatively long and dynamic nature of the number of days of the cash cycle is 196.1 (standard deviation: 42.4), which intensified and corresponded with the period of COVID-19. The level of the average point of the indebtedness ratio of 1.02 (standard deviation: 0.3) corresponds to a stable debt position, while the level of the average point of the dynamic solvency ratio of 13.33 (standard deviation: 13.06) indicates intensive dynamics when it comes to capacity settlement of long-term obligations.

Overall, liquidity and indebtedness are stable, while the cash cycle and dynamic solvency exhibit higher variability, pointing to fluctuations in cash management and long-term financial stability. Further research should explore the relevance of traditional liquidity ratios in managing the financial health of agro-processing companies.

Table 5. Correlation analysis parameters for sector A0

Categories	**LP**	**LE**	**GC**	**ZAD**	**DS**
Pearson's Correlation Coefficient	1	0,763	0,9164	-0,9458	0,61079
Sig. (2 - tailed) value		0,0349*	0,0026*	0,0012*	0,1218
LP					
Pearson's Correlation Coefficient		1	0,6126	-0,7475	0,1227
Sig. (2 - tailed) value			0,109	0,041*	0,796
LE					
Pearson's Correlation Coefficient				-0,7284	0,8621
Sig. (2 - tailed) value				0,0493*	0,009*
GC					
Pearson's Correlation Coefficient					-0,3575
Sig. (2 - tailed) value					0,4068
ZAD					
Pearson's Correlation Coefficient					1
Sig. (2 - tailed) value					
DS					
N	8	8	8	8	8

Source: Authors' calculations

Legend: Sector A0 – Manufacture of Food Products, N – number of periods

To examine the interdependence of variables within Sector A0 – Manufacture of Food Products from 2016 to 2023, a correlation analysis was performed. This analysis identified the direction of relationships among five variables and evaluated their strength based on numerical parameters.

During the period, statistically significant results were found for Pearson's correlation coefficient for Sector A0 confirming notable correlations among various liquidity and indebtedness metrics. Specifically, significant correlations were established between perspective liquidity and effective liquidity (p=0.0349), perspective liquidity and the cash cycle (p=0.0026), perspective liquidity and indebtedness (p=0.0012), effective liquidity and indebtedness (p=0.041), cash cycle and dynamic solvency (p=0.0493), as

well as the cash cycle and indebtedness (p=0.009).Noteworthy positive correlations were identified, including ratios prospective liquidity and effective liquidity (r=0.744), ratios of prospective liquidity and the cash conversion cycle (r=0.894), and ratios of dynamic solvency and the cash conversion cycle (r=0.841), indicating statistically significant positive linear relationships. On the other hand, there is a negative correlation among ratios of perspective liquidity and indebtedness (r=0.945), ratios effective liquidity and indebtedness (r=0.747) and ratios cash conversion cycles.

These findings emphasize the need for companies to balance borrowing and liquidity management to ensure financial stability and mitigate risk.

Table 6. Correlation analysis parameters for sector A1

Categories	**LP**	**LE**	**GC**	**ZAD**	**DS**
Pearson's Correlation Coefficient	1	0,9305	0,8105	-0,6105	0,5324
Sig. (2 - tailed) value		0,0007*	0,0146*	0,1078	0,1742
LP					
Pearson's Correlation Coefficient		1	0,8512	-0,3547	0,2991
Sig. (2 - tailed) value			0,0073*	0,3885	0,04716
LE					
Pearson's Correlation Coefficient			1	-0,3721	0,3243
Sig. (2 - tailed) value				0,3641	0,4333
LE					
Pearson's Correlation Coefficient				1	-0,3335
Sig. (2 - tailed) value					0,4194
LE					
Pearson's Correlation Coefficient					1
Sig. (2 - tailed) value					
LE					
N	8	8	8	8	8

Source: Authors' calculations

Legend: Sector A1 – Meat Processing and Preservation Sector

The further direction of the analysis is oriented towards the diagnosis of the quality of relations between the established variables for Sector A1 - Sector for meat processing and preservation for the period from 2016 to 2023, and a correlation analysis was also performed. The analysis identified the direction of relationships among five variables, and conclusions were drawn regarding the strength of these relationships based on numerical parameters. The Pearson correlation coefficient for Sector A1 - Sector for meat processing and canning in this period confirms the key correlation between: the indicator of prospective liquidity and the indicator of effective liquidity (p=0.0007), the indicator of prospective liquidity and the cash cycle (p=0.0146), and effective liquidity indicator and cash cycle indicator (p=0.0073). A very powerful positive correlation among prospective and effective liquidity (r=0.9305) is the first significant relationship detected. Then the following relationship was detected, the character of which is

reflected by the significant correlation (r = 0.81) between the indicator of prospective liquidity and the days of the cash conversion cycle. While, the third-ranked relationship is characterized by a high degree of significance of correlation (r = 0.85) between the ratio of effective liquidity and days of the cash conversion cycle.

Table 7. Correlation analysis parameters for sector A2

Categories	**LP**	**LE**	**GC**	**ZAD**	**DS**
Pearson's Correlation Coefficient	1	0,3084	0,8039	0,6831	0,613
Sig. (2 - tailed) value		0,4805	0,0217*	0,0728	0,1251
LP					
Pearson's Correlation Coefficient		1	-0,0296	-0,2646	0,3488
Sig. (2 - tailed) value			0,9492	0,551	0,4195
LE					
Pearson's Correlation Coefficient			1	0,6309	0,2908
Sig. (2 - tailed) value				0,1068	0,4197
GC					
Pearson's Correlation Coefficient				1	-0,0347
Sig. (2 - tailed) value					0,9597
ZAD					
Pearson's Correlation Coefficient					1
Sig. (2 - tailed) value					
DS					
N	8	8	8	8	8

Source: Authors' calculations

Legend: Sector A2 – Processing and Preserving of Fruits and Vegetables

When it comes to the Subsector: Processing and canning of fruits and vegetables for the period from 2016 to 2023, the assessment is based on the findings of the correlation analysis.

This analysis determined the direction of relationships among five variables and drew conclusions regarding the strength of these relationships based on numerical parameters. In the Subsector: Processing and canning of fruits and vegetables in the period from 2016 to 2023, a significant connection was confirmed between the indicator of prospective liquidity and the indicator of the cash cycle (p=0.0217). Other relationships between variables show moderate or low correlation, and most are not statistically relevant (p-values greater than 0.05).

The first, and the only significant interdependence between potential liquidity and the money cycle reflects a strong positive correlation (r = 0.8039), which indicates that as a result of the analysis, a high-ranking significant relationship of a positive linear nature of the relationship is observable.

In other words, the findings suggest that changes in prospective liquidity strongly influence changes in the cash cycle.

Table 8. Correlation analysis parameters for sector A3

Categories	LP	LE	GC	ZAD	DS
Pearson's Correlation Coefficient	1	0,9385	0,7511	0,0255	0,0084
Sig. (2 - tailed) value		,00143*	0,0395*	0,977	0,9914
LP	8	8	8	8	8
Pearson's Correlation Coefficient		1	0,6095	0,1979	0,0983
Sig. (2 - tailed) value			0,1229	0,6627	0,8416
LE		8	8	8	8
Pearson's Correlation Coefficient			1	-0,2793	0,0954
Sig. (2 - tailed) value				0,5264	0,8472
GC			8	8	8
Pearson's Correlation Coefficient				1	0,0954
Sig. (2 - tailed) value					0,7522
ZAD				8	8
Pearson's Correlation Coefficient					1
Sig. (2 - tailed) value					
DS					
N	8	8	8	8	8

Source: Authors' calculations

Legend: Sector A3 – Manufacture of Other Food Products.

The findings were used to examine, on the basis of correlation analysis, whether there is interdependence among the observed variables within Sector A3 - Production of other food products in the period from 2016-2023. year. This evaluation identified the direction of relationships among five variables, and conclusions regarding their strength were drawn based on numerical parameters. Pearson's correlation coefficient for Sector A3 – Manufacture of Other Food Products during this period confirming a significant association between: prospective liquidity and effective liquidity (p=0.0014), as well as between prospective liquidity and the cash conversion cycle (p=0.0395). A very strong relationship between prospective and effective liquidity is suggested by the strong positive correlation (r=0.9385), indicating a statistically highly significant positive linear association. Similarly, a statistically significant positive linear relationship is confirmed by the powerful positive association between prospective liquidity and the cash cycle (r=0.7511). This implies that changes in prospective liquidity significantly influence changes in the cash conversion cycle, which aligns with expectations.

To summarize, the descriptive analysis results for the Sector – Manufacture of Food Products and its key subsectors for the 2016-2023 period show significant growth in both revenue and employment. While the sector generally demonstrates solid performance, questions arise regarding the sustainability of these results due to a declining relative share in the processing industry. A key limitation of the findings is the lack of detailed data on specific growth factors such as investments and technological advancements, which could impact the precision of the sector's dynamic analysis. It can be concluded that the sector and subsectors experienced growth during the analyzed period, but

a more comprehensive analysis, including performance factors, is necessary for a complete picture.

Summarizing the findings of the analysis of liquidity in the agro-spinning industry, a clear interdependence and positive correlation between: the indicator of prospective or effective liquidity and days of the cash cycle, but days of the cash cycle and indebtedness is observed. Then, on the other hand, establishes is a powerful negative association between the indicator of prospective or effective liquidity and days of cash cycle in relation to the indicator of indebtedness.

Furthermore, the results of the analysis correspond with the research of American authors related to the liquidity of hospital activity (Soumya Upadhyay, Smith, 2016) indicating a significant positive association among the indicator of prospective liquidity and number of days of the cash cycle. Similarly, (Berezhnitska, 2013) highlighted a very strong correlation between dynamic and static liquidity measures in family farms, which is consistent with our findings. This also aligns with previous research by (Čavlin, Tankosić, 2021), indicating a strong positive correlation between selected liquidity indicators in the agricultural and processing sectors, and a powerful negative linear association among relationship: perspective liquidity - indebtedness in the agricultural sector, and days cash conversion cycle - indebtedness in the Serbian trade sector. However, findings from (Žager, Ježovita, 2014) suggest no statistically significant association among the days cash cycle and indicators of liquidity and indebtedness, although there is a moderate positive association among between indicators of prospective liquidity and self-financing, as well as a weak positive relationship with interest coverage. Furthermore, (Bolek, 2013) reported a minimal correlation between indicators of dynamic and static liquidity metrics, but concluded that they are representative for the analyzed Polish, listed companies from non-financial activities. In contrast, (Kamath, 1989) indicates a negative relationship between the classic liquidity metric and cash cycle days, which contradicts the findings of this paper.

One of the key limitations of the correlation analysis conducted is the inability to definitively establish causality between variables, which may limit the reliability of the findings. While the results are consistent with previous studies, differing approaches and timeframes in other research may contribute to variations in findings. In conclusion, this study confirms the decisiveness of metrics for ensuring the balance between liquidity and indebtedness, which warrants the application of selected indicators for liquidity management in agro-processing enterprises.

Conclusions

In evaluating and managing the financial vitality of companies in the agro-processing industry, this research underscores the importance of analyzing liquidity ratios. The correlation analysis of prospective and effective liquidity, the cash cycle, and indebtedness during the period from 2016 to 2023 revealed significant associations among these variables. Strong positive correlations were particularly noted between

liquidity indicators and the cash cycle, while negative correlations were observed between liquidity and indebtedness. These findings clearly indicate that companies effectively managing liquidity can reduce their debt levels, thereby ensuring greater financial stability and long-term sustainability.

The results demonstrate the validity of using selected indicators in liquidity management within the agro-processing sector based on ratio analysis. Establishing a balanced relationship between liquidity and indebtedness enables companies to manage cash flows more efficiently, reducing the risk of insolvency. Additionally, the strong positive correlation between liquidity and the cash cycle emphasizes the importance of managing working capital, a critical factor for maintaining liquidity, especially in the agro-processing sector, which is subject to seasonal variations. The findings of the correlation analysis are statistically significant, providing empirical support for the initial hypothesis.

It should be noted that the limitation of this scientific study is the lack of detailed data on specific growth factors, such as investments and technological advancements, which could significantly impact the dynamics of liquidity and indebtedness. Furthermore, the seven-year period studied, including the COVID-19 crisis, may have partially influenced the results, highlighting the need for further research that incorporates a broader analysis over a longer time frame and additional indicators beyond liquidity.

In conclusion, the findings of the subject research confirm the primacy of effective liquidity management in maintaining the vitality of companies in the agricultural processing sector. Future research could explore a longer time frame and introduce additional variables, such as changes in raw material prices and global economic shocks, to further clarify the causal relationships among financial performances.

Conflict of interests

The authors declare no conflict of interest.

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ASSESSMENT OF THE WEIGHT OF FACTORS INFLUENCING FOOD LOSSES USING FUZZY MULTI-CRITERIA ANALYSIS

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ABSTRACT

The purpose of the paper is to show, through the selection of given criteria, which of them has the greatest impact on food losses in an agricultural-food company. For this purpose, an innovative expert method of multi-criteria decision-making, SiWeC (Simple Weight Calculation), and its fuzzy variant, was applied. The results show that the criteria "poor handling of products during transport" and "inadequate packaging and handling of products" have the greatest impact. Considering the already existing plan of the company to train this part of the work processes, the expert assessment confirms the results of the research. Also, the successful use of this method with the application of fuzzy logic was confirmed, and future research should be directed towards the development of new ways of researching the influence of individual factors on the entire process of supplying food to end consumers.

Introduction

Food loss occurs at various stages of the supply chain. A large number of participants in the supply chain of agricultural products represent potential food losers due to various factors affecting it. The actualization of this issue is becoming greater due to the emergence of complex technology of the food production process, which moves from the producer itself to the consumer. According to Chirostopfer (2005), supply chains for food and other products represent a network of interconnected business entities that work together with the goal of converting and distributing goods from raw materials to

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final products. Also, as concluded by Mokrane et al., (2023), globalization and changes in consumer preferences increase the distance between the places of food production and consumption, which in turn affects the length, complexity and number of participants in the food supply chain. In addition, by increasing the number of participants in the chain, as well as the path through which food moves from the place of production to the place of consumption, various resources are consumed, and many environmental problems arise (harmful impact on biodiversity, climate change, occurrence of greenhouse gases, water and land pollution). (Damnjanović et al., 2022) This is a universal problem, that is, it affects both developed and less developed countries in the world. Food production resources that are ultimately never used are being polluted. (Živković et al., 2021; Luković et al., 2023) Because of all this, there is great concern about food loss among many authors who conduct research on this topic, as well as among other members of the social community (Gruber et al., 2016; Niu et al., 2022; Krunić et al., 2023; Laba et al., 2022; Kumu et al., 2012).

Food products, that is, food has its own specificities in relation to other types of goods. It is a question of a set of various circumstances that influence its sustainability and the occurrence of loss, such as the specific characteristics of the product, its seasonal character, shelf life, perishability, the distance between the place of production and the place of consumption, etc. One of the prominent factors is sustainability. According to Petljak (2021), the global food chain contributes the most to the emission of greenhouse gases. They arise in all stages of the chain, from the production of food itself to the disposal of the same food at the end. Reset (2020) states that annually around 1.3 million tons of food are thrown away in the world, before that food is consumed. In this way, a loss of about 1 billion dollars is created annually, or 12% of the world's gross domestic product (GDP). According to an earlier FAO study (2013), it is estimated that around 8% of global greenhouse gas emissions are related to food loss and waste, which in turn leads to the loss of biodiversity itself.

Many authors have dealt with the issue in question in their earlier research. Thus, Petljak (2021) proposes innovative solutions when it comes to food losses and wastage in the fruit and vegetable supply chain. The same author concludes that food waste represents a missed opportunity to feed the global world population. In their research, Gustavsson et al., (2011) distinguishes, with regard to the type of product, the level of development of the food chain, and the level and degree of development of a country, patterns of food loss and wastage. Kummu et al., (2012) believes that in countries with a developed economy, more than 40% more food, that is, fruits and vegetables, is lost, requiring greater traceability in the aforementioned sector. The same authors believe that the rate of food loss and wastage is on average about 20-22% of the total produced grains, compared to 39-44% of fruits and vegetables and 33% of root vegetables, as well as 24% of seafood (Lipinski, 2013).

Jeremić et al., (2024) investigate international perspectives in food losses and waste along the entire supply chain. They conclude that food loss and waste is a global phenomenon characteristic of all countries, as well as of all food products in the supply

chain. According to them, this phenomenon is caused by numerous factors that differ depending on the sector of the supply chain in which they occur. Furthermore, as the authors conclude, one of the key characteristics of this phenomenon is a wider range of implications that can be classified into the following three groups: social, economic and ecological. Some authors, based on the Eurostat database (2023), provide data for individual European Union member states when it comes to food wastage. Namely, they point out that Germany (18.70%), France (15.01%) and Italy (14.20%) are leading among EU countries when it comes to this phenomenon. Also, when it comes to the supply chain in the agricultural sector, other authors also dealt with the problem of food loss in their earlier research (Gile, 2013; Ghosh et al., 2015; Xue et al., 2017; Pantić et al., 2022; Papargyopoulou et al., 2014)

Considering the impact of a large number of factors on the loss and wastage of food, that is, agricultural products, the question of using a characteristic methodology to assess their impact arose. This certainly opened up space for the application of multi-criteria assessment and decision-making as an adequate methodological tool.

In order to make a decision that best meets the decision-making objectives, it is necessary to include as many criteria as possible in order to look at all the possibilities of certain alternatives. This kind of decision-making is multi-criteria decision-making (Ristić et al., 2024), because the decision is made by applying several criteria (Rahman and Muhammad, 2024). In this type of decision-making, it is necessary to first determine the importance of certain criteria, and then choose which of the alternatives best meets the set goals. If one of the criteria is more important, it has a greater influence on the final decision. When determining the importance of criteria, different methods are used (Stević et al., 2022).

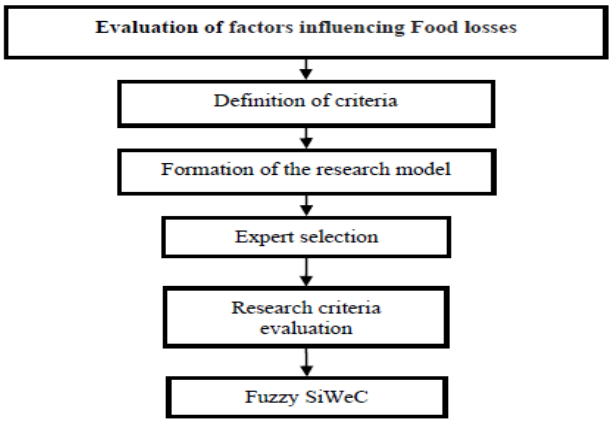
The previous researches are not rich in examples of the application of these methods in concrete cases of assessment of factors that affect the loss of food (agricultural products), therefore this confirms the justification and popularization of the application of such a method in a concrete case. Many earlier studies included multi-criteria analysis, but in the food industry they mainly focused on selecting the most favorable suppliers (Puška et al., 2024; Nedeljković, 2022; Gharakhani, 2012; Govindan, 2015; Jarosz, 2019; Stević, 2019), as and on their sustainability (Puška et al., 2022; Puška et al., 2021; Puška et al., 2023; Joshi et al., 2020; Ghosh et al., 2020; Baki, 2022; Durmić et al., 2020; Nancu, 2022; Nicolae et al., 2023), and in this way this research could gain importance due to its application in a completely new field.

According to the previous main goal of the work, the statement of the factors that influence food losses in its production with the successful application of innovative methods of multi-criteria decision-making. In accordance with the above, in the following work we will present the results obtained by applying the given methodology, and based on them draw certain conclusions and recommendations for future research.

Methodology

The application of the chosen work methodology required a research plan, which can be seen in the following figure 1. In the first step, based on the experience of earlier research, the impact criteria for the assessment itself were formulated. Their overview is given in table 1 below. Based on the given criteria, a survey form was created and filled out by the selected experts. The expert assessment was given by 6 experts in the subject area, and the research model was constructed on the basis of this. After the necessary calculations, we evaluated the given criteria and determined the weights of each of them using the applied method. The last step concerned drawing conclusions based on the previously performed weight assessment of the observed criteria.

Figures 1. Research methodology



Source: Authors

The selected criteria shown in the following table 1 represent common ways of losing products obtained by certain technological processes in one agricultural plant or farm. In general, they can be divided into losses caused by weather conditions and the human factor. The idea was to reduce them to the smallest possible extent after their importance was established.

Table 1. Evaluation criteria

Id	Criteria	Criteria type
C1	Bad weather	Cost
C2	Pests and diseases	Cost
C3	Inadequate handling of the production process	Cost
C4	Untimely harvest	Cost
C5	Lack of managerial skills in production	Cost
C6	Restriction of agricultural technique	Cost
C7	Failure to meet quality standards	Cost
C8	Inadequate storage conditions	Cost
C9	Poor handling of products during transport	Cost
C10	Inadequate packaging and handling of products	Cost

Source: Authors

In order to obtain more precise evaluations of individual criteria, we used *fuzzy* logic in the research. *Fuzzy* logic makes it possible for ratings not to be exact, but to be lower or higher, thus defining *fuzzy* numbers into which linguistic values are transformed. Each *fuzzy* number has its central value and additional values, where the first *fuzzy* number is always less than or equal to the central value, while the third *fuzzy* number is always greater than or equal to the central value. Situations where two *fuzzy* numbers are equal are at the smallest and largest value. The first *fuzzy* number cannot be smaller than the smallest value, and this value has the central value. The third *fuzzy* number cannot be greater than the largest value, because this value is precisely the central value. In this way, *fuzzy numbers* were defined and the membership function was formed. This function enables descriptive ratings (linguistic values) to be transformed into numerical ratings (*fuzzy* numbers). (Durkalić et al., 2019; Puška and Bosna, 2024) The application of the given methodology was done on the basis of the linguistic scale presented in the following table 2.

Table 2. Linguistic evaluations and fuzzy membership functions

Linguistic Values	Fuzzy numbers
Very low (VL)	(1, 1, 2)
Low (L)	(1, 2, 4)
Medium low (ML)	(2, 4, 6)
Medium (M)	(3, 5, 7)
Medium good (MG)	(5, 7, 9)
Good (G)	(7, 9, 10)
Very good (VG)	(9, 10, 10)

Source: Puška et al., 2024

In this work, we use the multi-criteria decision-making method SiWeC and its fuzzy variant. The method is new and was developed by Puška et al., (2024) in a study that concerned the selection of sales channels for agricultural products. This method belongs to the method for subjectively determining the importance of criteria and determines the weights of criteria based on linguistic evaluations. With this method, employees do not have to compare criteria with each other or rank them according to importance, but simply determine the importance of these criteria using linguistic values. Based on these values, the criterion could have a very high importance or a very low importance, and based on that, these evaluations were formed. In addition, this method differentiates the experts involved in the research based on their evaluation. If one of them gave almost the same grades, the importance of his grades is less compared to those who gave different grades. This is because not all criteria can have the same importance, but there must be a difference between them. Because of all this, this method was chosen to determine the importance of the criteria. (Puška and Bosna, 2024).

The steps of the fuzzy SiWeC method are given below:

Step 1. Experts determine the importance of each criterion.

Step 2. Linguistic values are transformed into fuzzy numbers, represented as:

$$\tilde{x}_{ij} = \left(x_{ij}^{l}, x_{ij}^{m}, x_{ij}^{u}\right)$$

where $\mathbf{x}_{\mathbf{ij}}^{\mathbf{l}}$represents first, $\mathbf{x}_{\mathbf{ij}}^{\mathbf{m}}$second, and x_{ij}^{u}third fuzzy number.

Step 3. The fuzzy numbers are normalized as:

$$\tilde{n}_{ij} = \frac{x_{ij}^{l}}{max\ x_{ij}^{u}}, \frac{x_{ij}^{m}}{max\ x_{ij}^{u}}, \frac{x_{ij}^{u}}{max\ x_{ij}^{u}}$$

where $max\ x_{ij}^{u}$is the maximum value across all criteria.

Step 4. Calculation of standard deviation ($st.dev_j$).

Step 5. The normalized ratings are weighted using the standard deviation values:

$$\tilde{v}_{ij} = \tilde{n}_{ij} \times st.dev_j$$

Step 6. The sum of the weighted values for each criterion is calculated:

$$\tilde{s}_{ij} = \sum_{j=1}^{n} \tilde{v}_j$$

Step 7. The fuzzy values of the criteria weights are computed as:

$$\widetilde{W}_{ij} = \frac{s_{ij}^{l}}{\sum_{j=1}^{n} s_{ij}^{u}}, \frac{s_{ij}^{m}}{\sum_{j=1}^{n} s_{ij}^{m}}, \frac{s_{ij}^{u}}{\sum_{j=1}^{n} s_{ij}^{l}}$$

Step 8. Defuzzification of the weights criteria

$$w_{j\ def} = \frac{w_{ij}^{l} + 4 \times w_{ij}^{m} + w_{ij}^{l}}{6}$$

Results and Discussions

The results were obtained by analyzing the subject agricultural company for the supply of apple products located in the territory of the city of Novi Sad. Apple and apple products represent an important nutrient in the diet of the population and a base for processing, after which various food products are obtained. This agribusiness enterprise was taken as an obvious example of food supply resulting from the production and processing of agricultural products. Playing an important role in the local food supply chain, the company belongs to the category of medium-sized enterprises and has about seventy employees, of whom 3 are agricultural engineers and 3 are food technology engineers. The rest of the workers are mostly secondary school graduates (agricultural technicians), while a certain number are also seasonal workers in the production and processing sector. Also, a few workers are employed in the administrative building,

which includes the sector for general and legal issues as well as the premises of the general manager, that is, the director of the company. The company tries to follow the current standards in the quality of production and storage. In the coming period, their goal is to expand the storage facilities, as well as to modernize the methods of handling the transportation and storage of products, as well as to additionally train existing workers in other segments of the work process. For now, they are achieving good cooperation with local professional and educational institutions and advisory services, from where experts were chosen for the evaluation of the very criteria from the impact on losses.

Production is carried out on about 10ha and on properties located in a couple of locations near a populated place. Raw materials for processing are additionally provided from leased areas. In their range, they produce several varieties of apples, the most common of which is the "Ajdared" variety. It is a variety that was created by crossing several old American apple varieties and is the leading apple variety in our region. It has a juicy taste and is very popular with consumers. The company has all the necessary machinery for production as well as storage space. The market is mostly on the territory of our country, although certain quantities also end up on foreign markets. The processing sector consists of premises for the production of apple juice and concentrate with all adequate equipment and human staff. The space is located on an area of about 1000m^2.

After reviewing the company in question, the results of an expert assessment of the impact of the criteria on losses in the process of production, storage and handling of the product were presented. At the beginning, a linguistic evaluation of the criteria was given. (table 3)

Table 3. Experts' evaluations of the criteria importance

Expert	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**
Expert 1 (E1)	VG	MR	MR	M	MG	MR	MG	MR	MR	VG
Expert 2 (E2)	MG	VG	MR	VG	MR	VG	M	MR	VG	VG
Expert 3 (E3)	MR	MR	VG	MG	MG	MG	MR	VG	VG	MR
Expert 4 (E4)	MG	MG	M	M	M	MG	MG	MR	MR	MR
Expert 5 (E5)	MG	VG	MR	MG	VG	VG	MR	MG	VG	MG
Expert 6 (E6)	VG	MG	MR	MR	MR	MR	VG	MR	MR	VG

Source: Authors

After converting the linguistic values of the experts' assessment based on the previously presented scale (table 2), a fuzzy decision matrix was formed (table 4), which was followed by the calculation of the weighting coefficients of the given criteria according to previously established mathematical statements (formulas) of the SiWeC method of multi-criteria decision-making. (table 4) Given that the obtained weights are not used in the selection of possible alternatives, it was necessary to perform a defuzzification of the weights of the last step in the calculation, where the final values of the observed criteria were obtained in this way.

Table 4. Fuzzy decision matrix

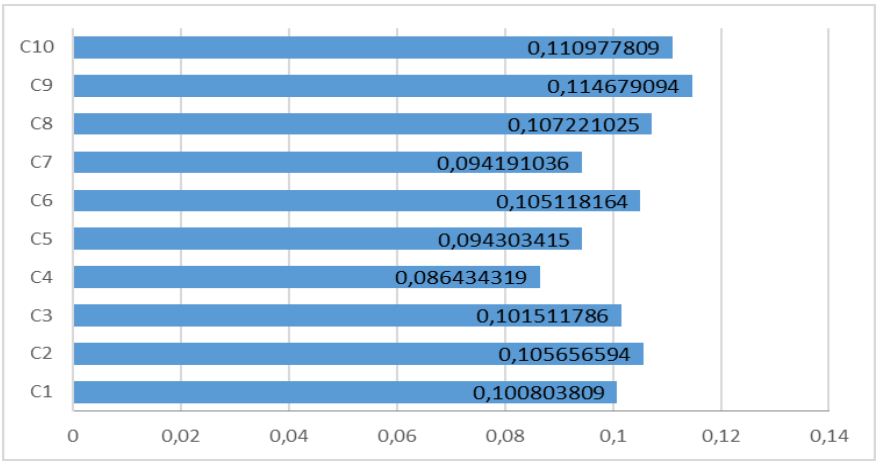
	C1	C2	C3	C4	C5…	C10
E1	(9,10,10)	(7,9,10)	(7,9,10)	(3,5,7)	(5,7,9)	(9,10,10)
E2	(5,7,9)	(9,10,10)	(7,9,10)	(9,10,10,)	(7,9,10)	(9,10,10)
E3	(7,9,10)	(7,9,10)	(9,10,10)	(5,7,9)	(5,7,9)	(7,9,10)
E4	(5,7,9)	(5,7,9)	(3,5,7)	(3,5,7)	(3,5,7)	(7,9,10)
E5	(5,7,9)	(9,10,10)	(7,9,10)	(5,7,9)	(9,10,10)	(5,7,9)
E6	(9,10,10)	(5,7,9)	(7,9,10)	(7,9,10)	(7,9,10)	(9,10,10)

Source: Authors

The finally obtained calculation results, which are visually represented by Figure 1, show us that criterion 9 has the greatest weight (*Poor handling of products during transport*) and criterion 10 (*Inadequate packaging and handling of products)* have the greatest weight. In addition to them, influential criteria such as *"Inadequate storage conditions"*, *"Restriction of agricultural techniques"*, as well as the criterion *"Pests and diseases" are highlighted*. The criterion that has the least influence is *"Untimely harvest"*. We can find that there is generally a product handling problem in the company that should be reduced in the future.

The research results coincide with an earlier study by Gustavsson et al., (2011), where it was observed that food losses occur most often in the distribution (transport) phases. We also find confirmation in the research of Petljak (2021), which concludes that food losses in the production of fruit and fruit processing occur in all segments of the supply chain (from production to end consumers). Also, the same author emphasizes losses in product storage, which stand out as an important factor in losses in this research as well. Namely, as the author points out, during storage, significant losses occur due to inadequate storage infrastructure, and often also decisions made in the earlier stages of the supply chain, due to which the products have a shorter shelf life.

Figure 1. Rank of criteria weight



Source: Authors

Conclusions

From the above, it can be concluded that the occurrence of losses in supply chains, which concern food products, is more or less a problem at all levels of business. The agribusiness company in question in the case study, which is involved in food production, realizes certain losses. Factors influencing these losses were successfully evaluated by applying the innovative multi-criteria decision-making method SiWeC, using the fuzzy logic of expert decision-making. The greatest expert importance is given to the criteria concerning storage and poor handling of products during transport. Accordingly, the company should improve certain work operations in that domain in the coming period. Also, from the research side, the work represents a solid basis for the continuation of further research in connection with the development of new methods of importance for this type of problem.

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Conflict of interests

The authors declare no conflict of interest.

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CONSUMER RIGHT TO FOOD INFORMATION

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ABSTRACT

The main purpose of this article is the analysis of the structure and content of food information law in the European Union law, as well as the general assessment of the harmonization of Serbian law with EU law in the field of food information law. In order to achieve these purposes, the authors employed doctrinal comparative research, which encompassed both structural analysis of the laws at issue, and the analysis of specific pre-defined questions. The questions included the subjects responsible for the provision of food information duties, the content of these duties, as well as the methods and ways of formulating and presenting information to consumers. The authors also dealt with the current role for voluntary food information in EU law. In the concluding section of the paper, authors emphasized the importance of introducing the mandatory and uniform front-of-package labeling scheme.

Introduction

Consumer right to be informed has been one of the substantial consumer rights since the global development of the consumer rights movement and accompanying legislation (Twigg-Flesner, Schulze, Watson, 2018). This right has twofold importance in contemporary consumer law (Mihajlović, 2023). Firstly, it is a prerequisite for the achievement of other basic consumer rights (primarily the right to choose, and the right to compensation and legal protection). Secondly, the right to information has been used as the most important regulatory instrument in European Union consumer law, which allows for the indirect regulation of the content of consumer contracts (Bar-Gill, Ben-Shahar, 2013). The relevance of the consumer right to information as a widespread regulatory instrument has even more contributed to the significance of

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this consumer right (Howells, Twigg-Flesner, Wilhelmsson, 2018). As a consequence of the twofold role of the right to information in modern consumer law, the use of this right has proliferated in EU consumer legislation in the last decades (Hadfield, Howse, Trebilcock, 1998). This development is replicated in the consumer laws of the countries that are in the EU accession process, such as the case of the Republic of Serbia (Mićović, M., Mićović, A., 2022; Vujisić, 2011). However, the increased reliance of the European legislator on the right to information as the main regulatory technique has been followed by the long-standing critique on the effectiveness of this method and its real-life impact on consumers (Howells, 2005). The thrust of the critique lies in the consumers' limits to process and understand the large amount of information delivered to them in the pre-contractual stage. The critique mainly originates from behavioral economics research that aims to show the limited practical effects of overburdening consumers with much information (Helleringer, Sibony, 2017). The suggested alternatives are e.g. improvements in the design and presentation of information to consumers, attempts to summarize the most important information to consumers instead of providing theme long lists of information, reducing the information lists to the information that consumers actually need for their economic decisions, reflecting on the most adequate moment to provide consumers with information (this is not necessarily the moment which precedes the conclusion of the contract, etc.) [De Streel, Sibony, 2017]. Therefore, there is a discrepancy between the importance of the right to information in the legislative texts and its effects on the improvement of consumers' decision-making and enforcement of their basic rights.

Described discrepancy equally affects a specific area of food information law. Food information law encompasses the EU rules governing food information, and in particular labelling (MacMaoláin, 2015). These rules include both rules of a general nature applicable to all foods in particular circumstances or to certain categories of foods and rules which apply only to specific foods (FIR, Article 2, Paragraph 2(b)). The usage of the information as a regulatory tool is even more extensive in food information law (Gokani, 2024), while the European legislator in this field does not seem to recognize the limitations of this regulatory tool. The right to information in food law serves two main purposes. Similar to the general consumer law, it presents a 'handy' regulatory instrument which allows for the achievement of important EU internal market objectives. Hence, the primary purpose of food information law is to prevent barriers in trading between food providers originating from different EU Member States. This purpose is achieved by avoiding substantive regulation whenever possible (for instance, mandatory requirements on food ingredients), and introducing much lighter information rules (Delhomme, 2024). In addition to the internal market objective, the food information law serves as a tool for consumer empowerment. Namely, it aims to enable consumers to make informed choices in relation to the foods they consume. Recently, consumer empowerment as regards food law has begun to obtain broader meaning (Gokani, 2024). An empowered consumer is no longer only a consumer who can make informed choices based on the price and quality of the

food and his personal preferences (taste). An empowered consumer becomes an ethical and conscious consumer, who cares about the sustainability effects of the purchased food, as well as a consumer who cares about the effects of the food on his health, that is who considers dietary and nutritious effects of food products. There seems to be changing expectations of European citizens. They tend to demand healthier food, local products, food that is produced in a more environment-friendly way, they pay attention to animal welfare, etc. (Laaninen, 2017). It follows that food information law at the current moment should broaden its goals and focus more on the recent developments and needs of average consumers (Alemanno, Garde, 2013).

As a consequence of changes in consumer needs and perceptions, EU food information law is currently under revision. This revision was announced in the EU 'Farm to Fork Strategy' in 2020. The main subject of this paper is the analysis of the structure of the EU food information law, and its most relevant provisions. Particular reference will be made to the expected changes after the process of revision of current EU rules. In addition to EU law, the authors will analyze Serbian food information law, aiming to make a general assessment of its harmonization with the relevant EU provisions.

Materials and methods

The authors aim to answer the following overarching research questions: 1) What is the structure and the content of EU food information law, and 2) Is Serbian law generally harmonized with EU food information law? In order to answer these questions, the authors primarily conducted doctrinal comparative research.

The doctrinal comparative research was split into two phases: 1) structural analysis - investigation on the existence and functioning of the system of rules and mechanisms that creates a specific legal structure within EU and Serbian law, and 2) analysis of specific questions pre-defined as the most important ones for the overarching research questions. The list of these questions is as follows: a) which subjects are obliged to provide food information to consumers, b) what the content of information duties is, i.e. which food information should be presented to the consumers (mandatory food information), c) what is the method of delivering the food information, d) in which way the food information should be formulated and presented to consumers, e) what is the legal regime for voluntary food information (with special emphasis to the front-of pack-labeling).

As the authors entirely employed the legal methodology in their research, the materials used in the analysis include the following sources of EU law: 1) Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety – General Food Law Regulation (hereinafter: GFLR),[3] 2) Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food

3 Official Journal of the European Communities, L 31/1, 1.2.2002.

information to consumers – Food Information to Consumers Regulation (hereinafter: FIR),[4] 3) Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods – Food Claims Regulation (hereinafter: FCR).[5] Besides listed sources of EU secondary law, the authors in their work analyzed the following sources of Serbian law: 1) Law on Food Safety (hereinafter: LFS),[6] 2) Rules on Declaration, Labeling, and Advertising of Food (hereinafter: Declaration Rules),[7] 3) Rules on Nutrition and Health Claims (hereinafter: Claims Rules).[8]

Results and Discussion

In the following text the results of the research will be discussed following the two main steps in the research and the relative prominence of the specific research questions posed in the second phase of the research.

Structure of Food Information Law

The general structure of the entire EU food law is quite straightforward (Lydgate, Anthony, 2022). The literature review showed that the food legislation can be divided into public powers of implementing the law, and the legislation addressing food businesses (Van der Meulen, 2013). The legislation addressing food businesses may be grouped into three categories: legislation on the product, legislation on the process, and legislation on the presentation of the food products (Van der Meulen, 2013). The later legislation encompasses different rules on food information and labeling. The entire body of EU food law is based on the principle *lex special derogat legi generali* (Gokani, 2024). This is particularly true for the EU food information rules.

Some general principles and objectives of food information law are contained in GFLR (Pettoello-Mantovani, Olivieri, 2022). Twofold purpose of food information law is clearly visible in the introductory article of GFLR, which provides for the overall aim of this Regulation. It is the assurance of a high level of protection of human health and consumers' interest in relation to food, as well as ensuring the effective functioning of the internal market (GFLR, Article 1, Paragraph 1). It further states that food law shall aim at the protection of the interests of consumers and shall provide a basis for consumers to make informed choices in relation to the food they consume (GFLR, Article 8). Finally, as a matter of general principle, it prohibits any form of misleading labelling, advertising, and presentation of food or feed (GFLR, Article 16). These broad general principles are further implemented in several more specific regulatory instruments. In

4 *Official Journal of the European Union*, L 304/18, 22.11.2011.

5 *Official Journal of the European Union*, L 404/9, 30.12.2016.

6 *Official Gazette of the Republic of Serbia*, No. 41/2009 and 17/2019.

7 *Official Gazette of the Republic of Serbia*, No. 19/2017, 16/2018, 17/2020, 118/2020, 17/2022, 23/2022, 30/2022 and 61/2024 – other Rules.

8 *Official Gazette of the Republic of Serbia*, No. 51/2018, 103/2018 and 110/2023

the first place, FIR is the most important source of EU food information law, containing numerous provisions discussed in the further sub-sections of this paper. Most important for the issue of structure of food information law is the distinction made in FIR between mandatory and voluntary food information. Even though the former information presents the thrust of FIR, the latter have gained more importance in current policy debates (Hersey et al., 2013), and are expected to be part of future revision of food information law. Besides FIR, which contains general principles on fair information practices, voluntary food information used in commercial communications of food business operators is subject to rules and principles contained in FCR. FCR deals with health claims and nutrition claims, thereby presenting a specific food law addition to the general consumer law principles originating from the Unfair Commercial Practices Directive (hereinafter: UCPD) [Vaqué, 2015]. Finally, the EU food information law recognizes several more specific measures related to particular sorts of food, such as organic food, genetically modified food (Vujisić, Mihajlović, 2014), food supplements, and food dedicated to specific groups (Purnhagen, Schebesta, 2019). Detailed analysis of these specific measures exceeded the subject of this article.

When it comes to Serbian food information law, its structure does not deviate from the described organization of EU law in that regard. Serbian LFS, similar to the GFLR, provides for the general principles and objectives, which are further regulated in two most important sources of food information: Declaration Rules and Claims Rules. Therefore, Serbian law follows the general structure of EU food information law.

Subjects of food information duties

A specific trait of EU food law is assigning numerous duties to food business operators concerning both food safety and food information (Schebesta, Purnhagen, 2024). Food business operators are responsible for compliance with mandatory food law provisions, while competent authorities handle situations of non-compliance (Van der Meulen, 2013). According to Recital 30 of the GFLR, a food business operator is best placed to devise a safe system for supplying food and ensuring that the food it supplies is safe. Simiral to the food safety issues, the main entity responsible for compliance with food information duties in EU law is the food business operator under whose name or business name the food is marketed (FIR, Article 8, Paragraph 1).

A food business operator is the natural or legal person responsible for ensuring that the requirements of food law are met within the food business under their control (GFLR, Article 3(1)). Food business operators are natural or legal persons involved in various stages of manufacturing, processing, packaging, storage, transportation, distribution, or sale of food products (Dudeja, Singh, 2016). In practice, food business operators can be farms, factories, supermarkets, restaurants, wholesale distributors, online food retailers, etc. Consequently, the role and impact of food business operators on packaging, labeling, safety, and the integrity of food can vary.

FIR recognizes these different roles and adjusts the level of control duties accordingly, depending on the actual impact of the operator on food information. Operators who do

have such an impact must ensure the presence and accuracy of the food information in accordance with applicable food information law and relevant national provisions (FIR, Article 8, Paragraph 2). In addition to the positive obligations for these food business operators, FIR prescribes certain negative obligations for those who do not impact food information. These operators should refrain from supplying non-compliant food if they know or presume non-compliance (FIR, Article 8, Paragraph 3) and from modifying the information accompanying food if such modification would mislead the final consumer or reduce consumer protection and the possibilities for the final consumer to make informed choices (FIR, Article 8, Paragraph 4).

Finally, if the food business operator responsible for food information is not established in the Union, the importer bears the compliance obligations (FIR, art. 8, par. 1).

Serbian law generally follows the principle that food business operators are responsible for providing food information to consumers. Declaration Rules in that regard, based on the relevant provisions of FIR, distinguishes between food business operators that affect and those that do not affect the content of food information (Declaration Rules, Article 6). Yet, Declaration Rules adds another line of distinction between different food business operators. Namely, when it comes to the information concerning non-packaged food, unlike the case of packaged food where the general rule implemented from FIR applies, the subject responsible for delivering information is food business operator who packs food at the place of selling food to the final consumer (Declaration Rules, Article 6, Paragraph 2.).

The content of food information duties

The essence of FIR is its requirement concerning twelve mandatory particulars that must be indicated on food. The list of mandatory particulars is as follows: the name of the food; the list of ingredients; any ingredient or processing aid listed in Annex II or derived from a substance or product listed in Annex II causing allergies or intolerances used in the manufacture or preparation of a food and still present in the finished product, even if in an altered form; the quantity of certain ingredients or categories of ingredients; the net quantity of the food; the date of minimum durability or the 'use by' date; any special storage conditions and/or conditions of use; the name or business name and address of the food business operator; the country of origin or place of provenance; instructions for use where it would be difficult to make appropriate use of the food in the absence of such instructions; with respect to beverages containing more than 1,2 % by volume of alcohol, the actual alcoholic strength by volume; a nutrition declaration (FIR, Article 9, Paragraph 1).

The list is followed by detailed technical rules dealing with each mandatory particular from the list, and respective Annexes that expand or limit the extent of mandatory information duties for specific food products subject to exemptions (Purnhagen, Schebesta, 2019). These additional rules have a considerable effect on the achievement of consumer information and empowerment. For instance, glass bottles for reuse, small packaging (<10cm2), and beverages containing more than 1.2% by volume of alcohol

do not need to display all mandatory particulars. The exemption of alcoholic beverages has been strongly contested for years, keeping in mind its effects on health and mortality (Gokani, 2024). Also, a nutrition declaration is unneccessary for foods listed in Annex V of FIR, while foods listed in Annex III must show additional mandatory particulars. On the other hand, non-prepacked foods are exempt from the mandatory particulars at the EU level, apart from allergens labelling (FIR, Article 44). Therefore, despite the existence of uniform rules on 12 mandatory particulars, there are many specific requirements related to specific sorts of food which make a considerable difference in the content of food information. Additionally, FIR leaves a certain level of discretion for the Member States to expand the list of mandatory particulars for specific types or categories of food justified on the grounds explicitly provided for in FIR (FIR, Article 39). These national measures may further increase the differences in the content of food information between different national laws and different sorts of food. Such expansion of the list of mandatory particulars exists in Serbian law, which requires food business operators to provide a list with fourteen mandatory particulars (in addition to EU law, the declaration must contain the designation of the series or food lot, and category of the quality or class of the food, if food, in accordance with special laws, is subject to categorization or classification) [Declaration Rules, Article 8, Paragraph 1].

The issue of food information duties content has perhaps been the most debated topic in food information law. The relevance of this issue for consumer empowerment through information justifies its longstanding presence in policy and academic debates. It is expected to be part of future revisions of food information law.

Three specific issues should be considered in future analyses of the content of food information duties.

1. **Information Overload**: The extensive list of mandatory particulars could easily lead to the problem of information overload, which has been well-known in consumer law and behavioral economics literature for years (Bawden, Robinson, 2020). Ways of facilitating the processing and understanding of information from the list for the average consumer must be studied and implemented in the legislation. While the problem of information overload may be addressed through provisions on the formulation and presentation of information to consumers, the importance of the list of mandatory particulars should not be neglected. Finally, and most importantly, when considering the need for mandatory food information and to enable consumers to make informed choices, account should be taken of the widespread need for certain information to which consumers attach significant value, or any generally accepted benefits to the consumer (FIR, Article 4, Paragraph 2).
2. **Obesity and Health Information**: The list of mandatory particulars also touches upon the recent debate on the need for food laws and policies to contribute to the fight against obesity, which causes numerous health issues for European citizens (Aouati et al., 2024). For example, the list could include

nutrition information per portion and/or information on the recommended portion size. The lack of an obligation for food operators to specify the exact amount of ingredients in food products negatively impacts raising consumer awareness of the nutritional features of their food intake (Gokani, 2024). According to FIR, the list of ingredients must include all the ingredients of the food, in descending order of weight, as recorded at the time of their use in the manufacture of the food (FIR, Article 18, Paragraph 1). Hence, consumers may be aware that the product contains some healthy ingredients, but they do not know the exact amount of those ingredients in the product. Even the sporadic existence of such an ingredient could justify its appearance on the label, despite its insignificant effect on the overall quality of the food product.

3. **Sustainability Goals and Food Waste**: Sustainability goals also influence food information law, just like other areas of EU law. It has been recognized that misunderstanding and misuse of date marking ('use by' and 'best before' dates) as mandatory elements of food labels in Europe lead to food waste (European Commission, 2020). Namely, consumers often wrongly perceive food with the 'best before' mark as unsuitable for use after the expiration of that date. Therefore, clarification and clear distinction between the two forms of date marking are needed.

Method of providing food information

Regarding the method of providing food information to consumers, FIR distinguishes between on-premises selling (e.g., in supermarkets and shops) and distance selling. In both cases, it further differentiates between the rules applicable to prepacked food and non-prepacked food. The latter distinction results from exempting food business operators responsible for non-prepacked food from the obligation to provide the full list of mandatory particulars.

In the on-premises selling scenario for prepacked food, mandatory food information must appear directly on the package or on a label attached thereto (FIR, Article 12, Paragraph 2). FIR recognizes the possibility of expressing certain mandatory particulars by other means. Although FIR does not specify what could constitute 'other means of expression,' it prescribes strict conditions for their introduction. The prerequisite for their use is determining criteria for using 'other means of expression.' These criteria are to be defined by the European Commission through a delegated act, provided that evidence of uniform consumer understanding and widespread use of 'other means' by consumers justifies their application (FIR, Article 12, Paragraph 3). The Commission has not used the legislators' permission to adopt such means. Thus, it has indirectly opted for the mandatory use of packaging or labels as the only relevant method of providing food information.

Regarding non-prepacked food, FIR leaves it to the Member States to adopt national measures concerning the means through which the particulars or elements of those particulars are to be made available and, where appropriate, their form of expression and

presentation (FIR, Article 44, Paragraph 2). This is logical expansion of their discretion concerning the minimum content of information duties about non-prepackaged food. Namely, they may also expand the minimum information requirement prescribed by FIR (informing consumers only about potential allergens stemming from non-prepacked food).

In the distance selling scenario, although it is clear that any food supplied through distance selling should meet the same information requirements as food sold in shops, it is necessary to clarify that in such cases, the relevant mandatory food information must also be available before the purchase is concluded (FIR, Recital 27).

For prepacked foods offered for sale by means of distance communication, the responsible food business operator is required to provide food information to consumers at two different moments. Firstly, they must make all mandatory food information (other than the date of minimum durability) available before the purchase is concluded (FIR, Article 14, Paragraph 1). The mandatory food information must either appear on the material supporting the distance selling (e.g., webpage or catalogue) or through other appropriate means clearly identified by the food business operator without any additional costs for the final consumer (European Commission, 2024). Secondly, at the moment of delivery, the responsible food business operator must provide all mandatory particulars, including the date of minimum durability.

For non-prepacked foods, the method of providing information remains the same as for prepacked food, requiring the provision of information at two different moments: before the purchase is concluded and at the moment of food delivery. However, the content of the information duties at these two moments differs compared to prepacked food. Before the purchase is concluded, the food business operator is required to provide only allergen information unless national measures require the provision of all or some of the mandatory particulars (FIR, Article 44). Furthermore, at the moment of delivery, the responsible food business operator must make available the allergen information and any other particulars required by national law (FIR, Article 14, Paragraph 2).

As a matter of comparison, it is worth mentioning that Serbian law fully and literally implements the provisions of FIR analyzed above. It does not broaden the list of means of expression of mandatory particulars, explicitly recognizing that the mandatory particulars must be printed on the package or labels attached to the packaging (Declaration Rules, Article 10, Paragraph 2). On the other hand, it expands the list of mandatory particulars that non-prepackaged food is supposed to contain (Declaration Rules, Article 14, Paragraphs 1 and 2).

Formulation and presentation of food information

The importance of formulating and presenting information to consumers is multifaceted, as evidenced by numerous empirical and behavioral studies. It is becoming increasingly important in the era of widespread use of digital technologies (Mihajlović, 2023; Lučić, 2023). Legal literature also points out that information formulated using unfamiliar

and complex words can motivate consumers to 'knowingly fail to read the presented information' (Schaub, 2017). For those reasons, both EU consumer law and Serbian law contain rules that regulate the presentation and formulation of information.

As regards the formulation of food information, FIR requires that information shall be accurate, clear and easy to understand for the consumer (FIR, Article 8, Paragraph 2). This requirement resembles rules existing in the general consumer law on the trader's obligation to provide the consumer with the mandatory information in a clear and comprehensible manner (Consumer Rights Directive, Article 5, Paragraph 1). Some authors consider this requirement 'a bit ironic', having in mind the quantity of the different pieces of information that trader provides to the consumer (Howells, Twigg-Flesner, Wilhelmsson, 2018). This claim is even more true in the context of food information law. The mandatory particulars in food information law shall be indicated with words and numbers. They may additionally be expressed by means of pictograms or symbols (FIR, Article 9, Paragraph 2).

The presentation of foods, in particular their shape, appearance or packaging, the packaging materials used, the way in which they are arranged and the setting in which they are displayed must not be misleading (FIR, Article 8, Paragraph 4[b]). Mandatory food information shall be marked in a conspicuous place in such a way as to be easily visible, clearly legible and, where appropriate, indelible. It shall not in any way be hidden, obscured, detracted from or interrupted by any other written or pictorial matter or any other intervening material (FIR, Article 13, Paragraph 1). Gokani (2024) criticizes the fact that the visibility requirement did not become a noticeability requirement. Therefore, making the information visible does not mean that the information will be actually noticed by an average consumer.

In addition to general standards of presentation, several technical requirements further specify those standards. In order to ensure clear legibility of food information, minimum font size applies to the mandatory particulars. The mandatory particulars shall be printed on the package or on the label in characters using a font size where the x-height is equal to or greater than 1.2 mm. In the case of packaging or containers whose largest surface area is less than 80 cm2, the x-height of the font size shall be equal to or greater than 0.9 mm (FIR, Article 13, Paragraphs 2 and 3). The name of the food, the net quantity and with respect to beverages containing more than 1.2% by volume of alcohol, the actual alcoholic strength by volume, shall appear in the same field of vision (FIR, Article 13, Paragraph 5). The name of the substance or product causing allergies or intolerances as listed in Annex II shall be emphasised through a typeset that clearly distinguishes it from the rest of the list of ingredients, for example by means of the font, style or background colour (FIR, Article 21, Paragraph 1). Nutrition declaration shall be presented in clear format and, if space permits, in tabular format with the numbers aligned and where appropriate, in the order of presentation provided for in Annex XV. Where space does not permit, the declaration shall appear in linear format (FIR, Article 34).

Voluntary food information

As a consequence of long-standing critiques of traditional forms of presenting and formulating information to consumers, there have been numerous reform proposals on the content of information duties, the methods of providing information, and their formulations and presentations to the consumers. Instead of back-of-package labeling, which has been promoted as the main source of consumer food information, the front-of-pack labeling methods gained more attention in the academic and policy debates on the specific importance has front-of-pack nutrition labeling that is 'interpretive', i.e. 'that communicates an evaluative judgment on the health or nutrition effects of food products (Gokani, 2022). Nutri Score labeling system, developed in France, seems to be the best example of such interpretative nutrition labeling (Lučić, 2021). Gokani and Garde (2023) deem this labeling system as the only viable option for a mandatory, harmonized front-of pack-labeling scheme in the EU. At the moment, current EU legislation considers such schemes voluntary information, which is subject to requirements prescribed in FIR (Article 36). Those schemes must not mislead the consumer, be ambiguous or confusing for the consumer and must, where appropriate, be based on the relevant scientific data (FIR, Article 36, Paragraph 2). At the same time, when such a scheme attributes an overall positive message (for example through a green colour), it also fulfils the legal definition of a 'nutrition claim' (European Commission, 2020b). According to FCR (Article 2, Paragraph 2(4)), a nutrition claim is any claim which states, suggests or implies that a food has particular beneficial nutritional properties due to the energy, the nutritients or other subtances it contain or does not contain. Finally, voluntary food information must not be displayed to the detriment of the space available for mandatory information (FIR, Article 37).

Conclusions

Both EU law and Serbian law pay particular attention to the consumer's right to food information. Serbian law is generally harmonized with EU law in this regard, as it implemented the most important EU legislative instruments that deal with consumer food information. The content of the right to be informed about food has been subject to numerous provisions embedded in different legislative texts. In some of those laws, the right to information is regulated on more abstract level, while the others provide many detailed technical rules. A common trait for all these laws is the failure to duly consider the shortcomings of using information as a regulatory technique widely discussed in the academic literature. A step forward would be the harmonization of front-of-pack labeling schemes and the adoption of one universally applicable scheme across the EU.

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Conflict of interests

The authors declare no conflict of interest.

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CHARACTERISTIC OF TRADITIONAL GASTRONOMY IN THE FUNCTION OF CREATING TOURIST LOYALTY TOWARDS THE DESTINATION

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ABSTRACT

Gastronomy has the power to attract tourists as a tourist attraction and make them loyal to it. Toward discussing their research, the authors first base their hypothesis on the argument that traditional gastronomy creates loyalty toward the destination. In order to test the initial hypothesis, it was necessary to answer the question, "In what way does gastronomy create a sense of loyalty toward the destination"? The results revealed that there was a unique formula in which the degree of loyalty of tourists toward travel destination directly depends on the factor of a "gastronomic experience." The higher this factor was rated, the more the degree of loyalty toward the destination increased. Mostly, it is done by tradition, culture, authenticity, uniqueness, ambiance, and quality of food, beverages, and services. That is, the original and unique gastronomic experience of the destination which is first and foremost introduced by traditional gastronomy.

Introduction

Customs and traditions from ancient times played their prime role in holding the identity of the people (Tan & Nguyen, 2024). If we were to describe peoples' customs and traditions as a rich and inexhaustible treasure that should be opened, discovered, known, and thus saved from oblivion — the priceless values that

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make up the beauty of the spirit of a people, then this must, first and foremost get ways that make all this possible (Cleave, 2018). Indeed, according to Hashimoto (2008), it remains one of the best approaches to reveal and understand the culture and tradition of a people by eating their authentic traditional food (Zaitul & Rina, 2021). These are the old traditional cuisines as something which are followed, marked and celebrated constantly as inherited from one generation to another and to be preserved from being forgotten (Stewart & Maffei, 2011).

Traditional cuisine is something that in modern-day has gained an extremely important place. Considering it as "healthy" food and prepared according to the recipe of "our grandmothers," gastronomy is viewed as a solid bond that connects culture and tradition with the modern world (Naumov & Nair, 2024). Linking through history enables connection and helps with the national identity of the country. Also, traditional gastronomy has psychological determinants because it has a different meaning for each person (Vitković, 2008; Vitković, 2015; Agyeiwaah et al., 2019).

Such recipes are highly subjected to change and variation. Therefore, it is most important to track their originality to the eldest roots possible and let the guests know it has kept that authenticity (Cai et al. 2021). As one of the latest considerations by scientists approaching gastronomy as a science, rural tourism is put forth as an intermediate base between traditional gastronomy and another way of perpetuating its principles of preserving traditional recipes in the best way possible (Choe & Kim, 2018). These tourists are those "seeking a real experience; at the same time, they may give their grain of sand in its maintenance."

There are different views on the role of food in tourism, as Tikanen (2007) pointed out: a) Food as a tourist attraction defines gastronomy as a strongly attracting feature with a powerful contractile zone. Concerning what the needs of tourists can be met with a great culinary experience, whether food or drink, it is them. These researchers state it is a motive for tourists that independently lures travelers who become loyal to destinations by gastronomy as a top experience and b) Food as a constituent element of the tourism product — an approach that establishes that food and beverage constitute an inextricable part of travel and tourism destinations. Tourists need to eat and drink, and this dimension treats gastronomy as an additional kind of tourism motivation. Even as such a motivation that originally did not bring tourists to a tourism destination, like here, can have an impact on the perceptions later on and create loyalty toward the destination as such if the experiences are blowing expectations away (Cimbaljević et al., 2023, Inđić et al., 2023; Luković et al., 2024).

In this paper, gastronomy is viewed as a tourist attraction. The research was within the geographical bounds of Vojvodina. Autors started from hypothesis H' that traditional gastronomy creates loyalty of tourists towards the destination. In order to confirm the initial hypothesis, it was first necessary to understand and answer the question: "How does gastronomy create a sense of loyalty to the destination?" The results showed that the most responsibility for loyalty to the destination fell on the factor of "gastronomic experience." This work concluded with the fact that tourists visit tourist destinations only to enjoy their traditional and authentic cuisines, which might not be available in their regions. In this regard, Vojvodina proved to be an ideal gastronomic attraction

Literature review

Culinary tourism can define as an exploration of culture and history through food which leads to the creation of memorable experiences (Ab Karim & Chi, 2010; Pantović et al., 2023). In this way it connects and permeates through other types of tourism through gastronomy (De Jong & Varley, 2017). Various terms describe various forms of tourists' motivation by food and drink travel, among them are separated: culinary tourism (Wolf, 2004; Wolf, 2006; Ignatov, Smith, 2006; Recuero-Virto, N., & Valilla Arróspide, 2024); gastronomic tourism (Hjalager, Richards, 2002; Roslindo Kuhn et al., 2024); tasting tourism (Boniface, 2003; Lee, 2023) and food tourism (Hall et al., 2003; Getz et al., 2014; Milanović et al., 2023; De Jong & Varley; 2018; Rachao et al., 2019, Vlajković et al., 2023; Gafu et al., 2024).

Among all expenditures during the trip, the tourists are the least willing to cut down the budget intended for food (De Rosa et al., 2019). This means that tourist consumption of food makes an important share in the incomes of local restaurants, kebab houses, bakeries, and MPs, in the agricultural and food industry, and thus in the economy of the destination. This refers not only to the consumption of gastronomic products, which as such are offered to tourists in their final form, this is also about the consumption of agricultural and food products in the region (Niavis et al., 2020).

This relationship is one of dependence, manifesting itself in four different forms, according to Hjalager and Corigliano (2000): Food has incorporated into tourism marketing and management over recent years by many governments. Food plays an important role in many destinations as a lure for the eye in brochures, videos and television programs. Especially where over 50% of new products and experiences are heritage-based, destinations are actively exploiting the opening of historic food factories and visitor centers. Festivals and events

have marked food as the central attraction that lures not only tourists but also locals (Devi, 2015).

Quan and Wang state four recommendations in the respect of developing food as a destination attraction (Quan, Wang, 2004), rural areas could promote the gastronomy of certain rural areas; destinations rich in food could turn into major tourist spots; the food from a destination can form part of a bigger tourism activity and food or gastronomic tourism may be used to boost the attractiveness of the destination. In today's market, the primary function of a restaurant is not only to provide food but also to give tourists an experience. Changes are something very essential in this modern world for running a restaurant because, in these competitive fields every restaurant has to make an attempt to make a serious impression on their customers with something special, and that special can be given from a different food experience provided in a unique atmosphere (Boley & McGehee, 2014; Barjaktarović, 2023; Pantić et al., 2021; Stoiljković et al., 2023; Eom & Han, 2019).

After doing a study, Henderson states that food has become one of the synonyms for Singapore — the majority of the people in Singapore think that food is the most appealing factor that will draw in visitors (Henderson, 2004). Therefore, in the Singaporean food became the most one in the promotional strategy in the marketing plan. Singapore arranges many annual food events and they use this as a major means to attract tourists. Among the festivals, Singapore Food Fair and World Gourmet Summit take leading positions; they introduce local food and cultural life from Singapore's perspective to the world. The government is raising the level of food health safety that can make sure the food delivered is healthy and safe to eat by both residents and tourists (Jones-Crank 2024). With great seriousness in developing food tourism, Singapore has developed a guide to Muslim dishes which is very important for the Muslim tourists.

This is how it has always been in the European framework, where the image of France has been about food and wine. Regardless of being in their domestic market or cultivating an international market, it is the reputation of food products, vineyards, or restaurants that have conventionally dominated national as well as regional marketing strategies. Very diverse regional food and cuisine have managed to become highly important and have turned into a tool used by French regions to distinguish themselves on the international stage (Liu, 2024). Nevertheless, the bigness of the French regions will further capitalize on this reputation of agricultural and food products to position itself as a traditional, rural authentic region (Frochot, 2003; Brad et al., 2018). It, moreover, is barely ever the image of restaurants and starred chefs by Michelin.

In 2007 Italy counted 130 wine routes 420 wine producing areas and 2 million people working in the gastronomic and wine tourism sector (Vecchio et al., 2024). These forms of tourism attract over 4 million foreign tourists annually with a turnover of about 2,500 million euros. Soressi, 2007 considered this not satisfactory. Hjalager and Corigliano compare Denmark with Italy and describe in these countries the basic features of the gastronomic cultures (Hjalager, Corigliano, 2000). In Denmark, food production differences dominate economically, while the strength of agriculture and food processing industries is, in many cases, an image quality compromise. This is in contrast with Italy since, according to Su and Horng (2012), the dominance of tradition is noticeable in their policy on food production and distribution.

Government departments in Great Britain have acknowledged the nexus that exists between tourism and food as well as movement by opening an agency that will help introduce the regional culinary sectors. In England and Wales, a government-backed organization, Food From Britain (FFB) includes the encouragement of the development of the British specialties and pies sector as part of its mission (Sharples, 2003).

The research methodology

The survey was conducted among the guests of the restaurant in Banstol. The place is a hive for a local cuisine-old-style dishes prepared with the old recipe of Srem, handed down from generation to generation. It is a place where all products used in preparing food are organic. The survey covered the period from March 2023 to August 2024. The responses were collected by a random sampling system. The number of respondents was 363 in total, out of which nearly 217 were domestic tourists and the others were foreigners.

The respondents were asked to rate 15 attributees:

- Portions are generous,
- I like the quality of the meat,
- The organic production certificate can be seen on the menu,
- It is a farm, so everything can be seen where and how it is grown,
- The organoleptic qualities of the food are excellent,
- The taste is unique,
- I have not tried anything similar,
- You can feel the spirit of the space and tradition,

- The food is traditional according to the recipe that was once used,
- You can feel it and the harmony of taste is unrepeatable,
- The ambience in which the food is served contributes to the taste of the food,
- I like the traditional dishes from which the food is consumed,
- I like the sound of the tambourine as traditional background music,
- I like that we are served by women dressed in traditional folk costumes,
- Everything we eat can be traced from "field to table". It is priceless.

These attitudes had to be scaled. One is a low score, and five is high satisfaction. These attitudes are dished up to tourists with the objective of identifying which, in their loyalty, has the strongest linkage for or to any given tourist destination. The attitudes were subjected to factor analysis before final selection was made.

In their work, the authors started from the starting hypothesis H that traditional gastronomy creates loyalty of tourists towards the destination. In order to prove the initial hypothesis, it was necessary to answer the question: "How does gastronomy create a sense of loyalty to the destination?". The results singled out one factor from all the opinions offered: "gastronomic experience".

Result and Discussion

Most of the respondents were from Serbia (217/57%). Respondents were also from abroad in Bosnia-Herzegovina (49/12.9%), Italy (42/11%), Slovenia (33/8.7%), and the Czech Republic (22/5.8%). Among them, 178 (46.7%) were male respondents and 185 (48.6%) were female respondents.

The initial factor analysis (see Table 1) yielded a model that categorizes the variables into one distinct factor, collectively accounting for 94.912% of the variance.

Table 1. Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14,237	94,912	94,912	14,091	93,942	93,942
2	,358	2,384	97,296			
3	,156	1,041	98,337			
4	,059	,392	98,729			
5	,042	,281	99,011			
6	,039	,261	99,272			
7	,030	,201	99,472			
8	,021	,142	99,614			

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
9	,014	,090	99,705			
10	,013	,085	99,790			
11	,011	,076	99,865			
12	,010	,069	99,935			
13	,004	,027	99,962			
14	,004	,024	99,986			
15	,002	,014	100,000			

Extraction Method: Maximum Likelihood

Table 2 displays very high loadings for all 15 variables, which first of all means complete belonging to the factor of "gastronomic experience." The authors consider this actually the answer to the question "How does gastronomy create a sense of loyalty to the destination?" Therefore, what depends on the feeling of loyalty is the unique gastronomic experience that destinations provide for tourists. Because each destination has its own "story" and with that one special gastronomic stamp or "gastronomic experience" belonging to it, this stands to reason.

Table 2. Factor Matrix[a]

	Factor 1
	"Gastronomic experience"
v1	,996
v2	,975
v3	,961
v4	,989
v5	,957
v6	,949
v7	,971
v8	,961
v9	,956
v10	,987
v11	,958
v12	,944
v13	,996
v14	,973
v15	,965

Extraction Method: Maximum Likelihood

a. 1 factors extracted. 12 iterations required.

Complete uniqueness in the responses, regardless of gender and the country of origin of the tourists (Table 3), confirms the hypothesis H that traditional gastronomy creates destination loyalty. A significant formula has been developed illustrating how to determine tourist loyalty towards tourist destinations.

Table 3. Goodness-of-fit Test

Chi-Square	df	Sig.
4589,331	90	,000

Based on the results that can be seen in table 4, the formula for determining loyalty among tourists toward tourist destinations is directly proportional to high ratings given by tourists for every offered item. The higher the ratings (average rating is around 4), the more loyal the feelings toward the destinations.

Table 4. Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Portions are generous	363	3	5	3,97	,041	,774	,599
I like the quality of the meat	363	3	5	4,02	,041	,774	,599
The organic production certificate can be seen on the menu	363	3	5	4,05	,041	,787	,619
It is a farm, so everything can be seen where and how it is grown	363	3	5	3,99	,041	,779	,608
The organoleptic qualities of the food are excellent	363	3	5	4,05	,041	,778	,605
The taste is unique	363	3	5	4,07	,041	,787	,620
I have not tried anything similar	363	3	5	4,01	,041	,774	,599
You can feel the spirit of the space and tradition	363	3	5	4,04	,041	,775	,600
The food is traditional according to the recipe that was once used, and you can feel it	363	3	5	4,05	,041	,783	,613
The harmony of taste is unrepeatable	363	3	5	4,00	,041	,785	,616
The ambience in which the food is served contributes to the taste of the food	363	3	5	4,05	,041	,773	,597

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
I like the traditional dishes from which the food is consumed	363	3	5	4,08	,042	,791	,626
I like the sound of the tambourine as traditional background music	363	3	5	3,98	,040	,767	,588
I like that we are served by women dressed in traditional folk costumes	363	3	5	4,02	,040	,767	,588
Everything we eat can be traced from "field to table". It is priceless	363	3	5	4,04	,041	,782	,611
Valid N (listwise)	363						

The authenticity of the cuisine is what makes the Vojvodina dish very specific and excellent gastronomy experience. The Vojvodina cuisine is an amalgam of quirks belonging collectively towards the diverse plurality of people who have lived in the area for centuries. Tourists love coming here, and they love returning here. Vojvodina cuisine is rich, multifarious, and flavored. One feels tradition and love through its preparation and serving. As noted by the interviewees, organoleptic properties for Vojvodina cuisine are superb. It is food that engages all the senses.

One of the most important characteristics of national cuisine is based on the raw material preferences. In almost all households in this area, food of animal origin (fresh and dried meat of domestic and wild animals, offal, fish, eggs, milk and dairy products), and some local fruits and vegetables are produced (Kalenjuk Pivarski, et al., 2023). On the whole, Vojvodina is quite rich in the uniqueness of gastronomic recipes enhanced by the flavor of the Hungarians and Austria-Hungary.

In the Vojvodina cuisine, as the most important parts are the grain dishes, whether it is made from whole grain, bought, or ground into flour, all dishes consist of dough; then it's dumplings (gomboce), doughnuts, buns salty and sweet, scones, muffins, and rolls. Namely, from the very rich choice of vegetables, which Vojvodina has never been lacking in, a large number of various vegetable dishes created cuisine characteristic for Vojvodina (Kalenjuk Pivarski et al.,, 2018). In the daily food in Vojvodina, there is always a vegetable dish, either in the form of different vegetable soups, different stews, porridge, and puree, pureed, stewed, baked, or roasted single or mixed vegetables. More than in other parts of the country, in Vojvodina are more commonly used carrots, parsley, celery roots, and other roots, which are also prepared differently and in this manner used to prepare various other soups (Grubor et al., 2022).

Only “sarma” is remarkable among the prepared dishes belonging to the category of cabbage, but otherwise, beans may be singled out since they are prepared in about ten different ways. Traditionally, even in ancient times, plant-based foods were also used for the preparation of preserved food-winter foods, pickled in jars (peppers, cucumbers, green tomatoes, pumpkins, etc.). Also prepared were desserts: compote from apricots, peaches, plums, pears, and quinces, melons, apples, plums, cherries, sour cherries; marmalade from plums, apricots, pomegranate, quince, and grape; quince or peach marmalade; jelly from sour cherries, and cherries; watermelon. Juices: boiled tomatoes, apricot juice, raspberry, and strawberry, peach, quince, etc. Although “winter fruit” is still only a custom today when there is a whole variety of fruit and vegetables throughout the year, it is kept mainly by the older Vojvodina households (Kalenjuk Pivarski et al. 2022).

The basic original meat dishes from Vojvodina are those at which the meat products will be used as slices or chopped down (Kalenjuk Pivarski et al., 2017). Breading and deep frying relate more to the traditional portrayal of meat in Vojvodina. Frying is certainly not the healthiest way of cooking, but it provides a certain juiciness and softness to the meat. Thus, the most frequently fried items are chicken white meat and pork leg steaks (Banjac et al., 2016). Offal, which once upon a time was considered as foods for poor people because it was much cheaper than meat, has many uses. The black and white liver, heart, and the spleen were used; those of the small and big gut, as well as stomach, were disposed of. But generally throughout Vojvodina, under the heavy Central European culinary influences, sausages are made from spiced pig offal (Grubor et al., 2022).

Besides different types of meat and meat products in Vojvodina cuisine, there are also many other animal foodstuffs. In the first place this is milk and dairy products-meaning various hard and soft cheeses, sour cream, sour milk, yogurt, whey, butter, etc. Formerly, butter was manually prepared at individual farmsteads for personal needs (Kalenjuk Pivarski et al.,, 2018). Poultry farming is an activity that the people of Vojvodina have practiced since time immemorial. Primarily they were engaged in chicken, later also in geese and ducks, and much less in turkey. Therefore, eggs have comprised an inseparable part of the cuisine of Vojvodina for centuries. Their consumption was increasing along with the consumption of bakery products, especially biscuits and little tarts, whose structure has a special place (Banjac et al., 2016).

Other pre-dispositions of food regarding good taste as ultimate include some of the following. The way of serving, the traditional costume of the waiters, music in the background of the restaurant, the interior of the restaurant with its furniture, and some decorations speaking of old times. Very important quality of food, in addition to its taste, is whether the ambiance integrates the restaurant well into space.

The responses we received from the respondents, wherever they are from and whatever gender they are, inarguably proved that gastronomy is and can be a tourist attraction with very clearly defined contract zone.

Conclusion

Research implies that destination loyalty is achieved by a formula where loyalty is directly proportional to high ratings given by the tourists across a set of statements circled around the factors of "gastronomic experience." In this way, food may become a central motive in the development of a given destination, which may, in turn, be beneficial to the overall economic progress. Vojvodina reveals itself as a destination with potential for the development of food tourism. Particularly in its rural parts. Official support for the food concept within tourism and creation of different developmental opportunities through projects are evidence of real and potential support of this concept by the state's highest-top policymakers.

Tourism expenditure on food is one of the categories normally quoted, in total probably the backbone of many national and sub-national economies. Prices of food and beverage account for an approximate one-third share of the total expenditure (Gao & Wu, 2017; Fust´e-Forn´e & Jamal, 2020; Marinello et al., 2023). From this, there should be no problem recognizing why this type of tourism should be given special consideration. Tourism is multifaceted and may also represent an extra employment provider for food producers and the industry (Martínez et al., 2019). The demand made by tourists is thus a promising opportunity for market expansion, product innovation, and diversification. In sum, investments in the agri-food sector keep on producing; hence, the sector grows as a result of tourism (Randelli & Martellozzo, 2019; Popescu et al., 2019; Nancu et al., 2023).

Unquestionably, the gastronomic form of tourism is most important to the further development of the rural areas of Vojvodina and Serbia as a whole. But each region of Serbia contributes its specifics into the common culinary and beverage pot of the country. Gastronomy Tourism is also associated with several economic impacts. In this respect, tourism plays a significant role as an activity that can foster rural development and rescue agrarian economy under threat of degradation (Okazaki, 2008), then protecting current workplaces and giving birth to new ones. These would match a policy of sustainable tourism development and rise in scope of place-based development of gastronomic tourism appeal related to the countryside, which can work fine for local agricultural communities and small investors. In other words, food tourism may even come to the rescue of the environment by discouraging food transportation, in any case, from very far. This relates not only to matters concerning the economy and business but also brings in the social and environmental aspects, which are of concern to authorities and to firms placing great emphasis on socially responsible business.

Gastronomic tourism would lead to an increase in demand for agricultural-food products and gastronomic specialties; the building of brands which can mean visibility on the market by themselves, marketing information for producers and suppliers themselves (direct insight into consumer tastes), educational opportunities for visitors and the local population in the form of various workshops, and organized festivals and events, regional and local distribution of consumption, as well as the maintenance of old crafts and traditions in general. This would achieve the most important development target of rural gastronomy tourism, which is the prevention of rural depopulation.

Conflict of interests

The authors declare no conflict of interest.

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ANALYSIS OF THE ROLE OF MANAGEMENT IN THE PRIVATIZATION OF THE "PORT OF BELGRADE" AND THE COOPERATIVES IN VOJVODINA

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ABSTRACT

The paper examines the role of management and the economic consequences during the purchase of state and cooperative enterprises (combines), and states that the consequences are enormous. Also, the paper discusses in more detail the privatization of cooperative combines (enterprises) in Vojvodina. That process began in its most extreme after the elections held in September 2000. In addition, the paper analyses the problem of construction land on the example of "Port of Belgrade", i.e. the combination of crime, tycoons and politicians in the aforementioned privatization.

Introduction

In the introductory part, we emphasize that the paper examines and analyses the theoretical and practical aspects of the purchase and change of ownership of "Port of Belgrade" and the combines in Vojvodina, as well as aspects of the fight against corruption, i.e. the formulation and implementation of a successful strategy for the fight against this "social diseases", in order to reduce the economic and social consequences of this extremely negative phenomenon.

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In this context, the role of company management and the role of state authorities in suppressing corruption, as well as in the state system of collective security, is of particular importance.

The growth in popularity of corruption as a research topic (regardless of the level and type of research into this phenomenon) has occurred in the last twenty years, and its study is a significant international, socio-pathological and legal phenomenon that has a historically long tradition, especially intensified in the second half of the 20th century. Corruption as a modern political phenomenon strongly opposes all achievements of human civilization. In addition, corruption affects the free market, reduces the level of general and personal security and protection of assets, as well as the development of society, creating distrust of citizens towards the government and its bodies, blocks reforms, reduces willingness to invest, causes financial damage, destroys economy, and harms the country's international reputation (Đukić, 2016).

Modern society is organized on the basis of various rules aimed at defining relationships between people. Those legalities can be formal and informal. Formal regularities are generally easy to determine, while informal ones are more difficult, or difficult to observe, even when they are based on formal regularities. It is very important to understand this at the initial phase of analysing the phenomenon of corruption, which rests on informal legalities, but firmly relies on formal ones, stems from them and uses them (Đukić. 2023).

The transition period is the time of change of formal rules and change of institutions. However, with these changes occurring relatively quickly, often with a single legislative decision, informal rules change slowly, although they adapt to the newly emerging formal rules. Informal corruption relations from the period of socialism, in the age of transition, evolve and change their face together with formal rules. These relations follow the redistribution of goods and power. It is easy to understand, because corruption is a phenomenon — which tends to function according to the principle: "Do ut des" (lat.), — "I to you, you to me" (Đukić, 2016).

Transitional changes in many countries brought new laws on property rights, the fiscal system, etc., which were almost copied from the legislation of Western countries. As external influences work differently in different countries, the economic results resulting occurring from these laws are quite different from those in the countries where they originated. Although the rules are the same, the behaviour of the participants and the method of application and its implementation are different (Đukić. 2023).

In order to consider corruption as the most dangerous form of organized crime, as stated by Professor Mijalkovski, it is advisable to bear in mind the position of the ancient Greek philosopher Aristotle, which reads: "The greatest crimes are not committed to obtain what is necessary but what is superfluous", because the corrupt are (not) people (officials, public officials) without scruples, who abuse the trust shown (Mijalkovski: 2012).

The main goal of the work presented in this paper is to investigate the consequences of the purchase of construction land and the "Port of Belgrade" company, that is, the combines in Vojvodina, as well as the role of the companies` management and state authorities in suppressing this serious problem.

Methods

In this paper, the basic methods of knowledge were used, which include: analysis, concretization, specialization, generalization, etc. In addition, general scientific methods were used, including: statistical method, modelling method, hypothetical-deductive method and comparative method. Also, data collection methods were used, including: observation methods, research methods (interview, survey), document analysis method, case study methods, etc.

A practical role of management

In practical terms, there can be as many different management disciplines as there are types of organizations. This, of course, does not mean that every field of human activity to which management is applied is also a separate scientific discipline. The basic task of the management of every organization is to increase the vitality of the organization, i.e. its ability to survive in different circumstances, along with the prosperity and growth of the organization (Đukić, 2021).

For a better understanding of this issue, we will touch upon the concept of safety management at this point. The term safety management in a broader sense means deciding on the security goals of the organizational system, on ways and means to avoid unfavourable influences coming from the environment or the organizational system itself, or to reduce their harmful influence (Dragišić, 2014).

Security management does not make strategic decisions, but significantly influences their adoption by providing top management with information and assessments on the basis of which strategic goals are defined and operational decisions are made. (Djukić, 2021).

In this regard, in security organizations, special attention is paid to different theoretical sources of organization and management, as well as the possibility of applying different management theories in solving organizational problems (Stevanović, 2012).

In addition, there are economic enterprises that are of great importance for the safety of the community in which they operate, either because of the importance of their products and services for the normal life of the local or wider community, or because of the dangerous forces contained in their facilities and whose damage would cause major disasters (Đukić, 2021).

Public and strong personal interest

Corruption is a typical reciprocal activity, because it is based on the "I to you, you to me" principle, and it works through a network of relationships that need to be fought against

with the help of a network of courts, police and non-governmental organizations. The essence is in discretion and secrecy, because everything is done in secret. It's usually a one-on-one game. That is why it is difficult to discover. And it's even harder to prove. The risk of detection is reduced, because it is mutual, effective and extremely efficient. The result of corruption is always certain and unreservedly certain: "I to you - you to me - now and here" (Milivojević, 2002).

It can also be stated that corruption can still "oil the economic machine" in some situations, and that is when a bad or kleptocratic state administration imposes harmful regulation and thus sets obstacles to normal business (Begović, Mijatović, 2007).

In this regard, the consequences of all types of corruption, especially in the economy, are great, so we can say that crime is becoming an economic branch (Đukić, 2021:599).

The eminent theoretician Peter Eigen vividly portrayed corruption by the following: "Where politics, that is, the public sector and the economy are mixed, where the public and strong personal interest are vaguely intertwined, it is only a step towards corruption" (P. Eigen, 1999).

The case of state cooperatives in Vojvodina

In this place, we will analyse the cases of state cooperatives and high-quality agricultural land in Vojvodina, which was the most characteristic in the area of the entire Republic of Serbia.

We note that in the process of privatization of agricultural enterprises, numerous illegalities were committed when it comes to state and cooperative property, primarily due to unclearly defined regulations regarding land ownership (Đukić, 2016).

Table 1. State cooperatives, state and cooperative agricultural land

Number of privatized agricultural enterprises	**253**
Privatized state and cooperative agriculture lands	**More than 400,000 hectares**
Number of cancelled contracts	**60**
The number of dismissed agricultural workers	**More than 65,000**

Source: The anti-corruption Council of the Government of the Republic of Serbia

In this way, after privatization, the buyers changed the form of ownership in the Real Estate Cadastre, that is, registered private ownership on cooperative and state property. The real estate cadastre service of the Republic Geodetic Institute changed the form of ownership from public and cooperative to private ownership based on sales contracts and the Agency's confirmation of the price paid (Report of The anti-corruption Council, 2011).

Through the analysis of sales contracts, it was determined that all this indicates that the privatization of agricultural companies and combines was not well implemented, that is, that privileged individuals were enabled to acquire real estate, especially land, under extremely favourable conditions (Đukić, 2015).

The Anti-Corruption Council recommended that the Directorate for Agricultural Land of the Ministry of Agriculture obtain from the Republic Geodetic Institute and the Cadastre Service of certain municipalities where immovable properties are located, data on changes in the cadastral status on that land after privatization, as well as on changes in ownership of state and cooperative property, as it would be determined whether registrations of ownership rights on state and cooperative property were made to buyers of social capital, based on the privatization contract, and whether the registrations changed the form of ownership (Đukić, 2015).

"For example, there are opinions that agricultural land as a general good of public interest could not and cannot be the subject of privatization" (Popov, 2013:35).

In order to convey this kind of privatization even better, and to make this legal gibberish even more complex, the privatization concept is contrary to the basic legal principle of derivative, translational acquisition of rights - *nemo plus iuris ad alium transferre potest quam ipse habet*. (Avramović N, Stanković M. 2020)

In this place, we will deal in more detail and analyse the cooperatives (companies) that bought and own agricultural land in Vojvodina and Serbia. However, this only applies to the land that they bought. But there are also lands that were bought by their close associates and family members (Report of The anti-corruption Council, 2011).

Table 2. The largest owners of agricultural land in Serbia

Owner – Company	Area in hectares
„Irva grupa"	30.000
„Delta"	25.000
„MK komerc"	24.000
„Matijević"	16.000
„Viktorija grupa"	6.000

Source: The anti-corruption Council of the Government of the Republic of Serbia

According to research by UNICEF and OCHA (the UN Office for the Coordination of Humanitarian Affairs), the mortality rate during the sanctions did not increase significantly, primarily due to domestic agriculture and pharmaceutical production, thanks to which Serbia was not dependent on imports (Economic sanctions, Health, and Welfare in the Federal Republic of Yugoslavia, 1999-2000). As the Serbian pharmaceutical industry was almost completely destroyed in the process of privatization, and agriculture became the terrain of big capital speculation, it is clear that the process of privatization is fundamentally directed against the interests of the population to ensure their existence through the creation of a sovereign, self-sustaining society (Đukić, 2016: 290).

An illustrative example is "Ratkov", where 160 hectares of state agricultural land were registered for privatization, and the official data of the Republic Geodetic Institute say that there were 413 hectares (Đukić, 2016).

One of the characteristic examples is the agricultural property "Zobnatica" (next to Bačka Topola), where in addition to the land, there is about 163,000 square meters of business space, which includes a hippodrome, a pond, and numerous facilities (Report of The anti-corruption Council, 2011).

The problem of construction land on the example of "Port of Belgrade"

The company "Port of Belgrade", which uses 220 hectares, was privatized in 1998 under the then-current Law on Property Transformation, when 60 percent of the share capital was distributed to employees free of charge. At the time when the concentration of ownership in "Port of Belgrade" was carried out, shares could only be traded on the stock exchange and in a situation where the buyer exceeded the threshold of 25 percent of ownership of the company. In that case, the buyer had to request approval for the purchase from the Securities and Exchange Commission, and that way of acquiring shares is called a takeover bid. In April 2005, the Institute of Economic Sciences was hired to make a new assessment. In June, the institute gave preliminary results, according to which the book value of the capital was three and a half times lower than the real value. (Đukić, 2019).

The buyer of the shares, the company "Worldfin", is registered at the same address as the company which a few days later came into possession of the shares of the company "C market". In this takeover offer, "Worldfin" states that is a newly formed company and therefore there are no balance sheets or other financial reports. According to the decision on registration in the court register, the value of the basic capital of this company was 31,000 euros. "Worldfin" buys "Port of Belgrade" for 40 million euros. (Đukić, 2019).

Table 3. The ratio of "Worldfin" capital value and the price for which it was purchased

The value of the basic capital of the company "Worldfin"	31.000 EUR
The price for which "Port of Belgrade" was bought	40.000.000 EUR

Source: The anti-corruption Council of the Government of the Republic of Serbia

Although the General Plan of Belgrade from 2003 stipulates that the "Port of Belgrade" will remain an economic zone until 2021, three years after the adoption of the GUP, the Directorate for the Construction Land and Building of Belgrade on December 27, 2006 publishes a Public Call for the preparation of a previous feasibility study. The anti-corruption Council in its report addressed to the Government of Serbia points out that it is obvious that the change of land use and the relocation of the "Port" was previously agreed upon, and that the Directorate should justify and implement the reached agreement. (Đukić, 2019).

In 2010, the anti-corruption Council filed a criminal complaint against the owner of the company "Worldfin" from Luxembourg, but also against 16 others who participated in illegal actions related to the takeover of "Port of Belgrade". The head of the Privatization Agency was M. Đ. (from July 15, 2004 to October 5, 2006), who came

to that position at the suggestion of the then Minister of Privatization, P.B. (DSS). By the way, after leaving the agency, M. Đ. appeared in "Večernji novosti". At that time, the president of the Securities Commission was M.Š.. Due to the privatization of "Port of Belgrade", Serbian businessman M.B. was interrogated on January 29, 2013 at the Ministry of Interior. In a short statement, he pointed out that he thinks that after six hours he managed to explain to the police everything about the takeover of "Port of Belgrade" shares and to point out the reasons why the appearance of alleged illegalities in the secondary privatization process of "Port" is real (Đukić, 2019).

It is obvious that it is a combination of crime, tycoons and politicians (political parties), where state property was damaged and Serbia was put in a position to be left without ports. In this case, there is an illegal concentration of ownership to the detriment of the state and small shareholders, and the Ministry of Economy and other state institutions participated in this. This is a simulated business, because the buyer are only interested in the land, so in that case it was not about the purchase of the port in order to continue the activity of that company, but about the purchase of the port`s land for other purposes (Đukić, 2023).

Table 4. The connections in the privatization of "Port of Belgrade"

company "Worldfin"	Ministry of Economy
	Privatization Agency
	Stock Fund
	Securities Commission

Source: Authors research

In addition, at the request of the new owners, the General Urban Plan of Belgrade was changed, which led to a situation where the port is not viewed as an infrastructure facility built by the state, but as a land in which the new owners are interested (Đukić, 2023).

Are we witnessing the end of the "Port of Belgrade" affair, whose privatization is one of the list of 24, whose review is requested by the EU? Port claims that the court verdict in the dispute with the former small shareholders established that its managers did not commit any illegal actions. However, Port of Belgrade was marked by the anti-corruption Council as an example of the connection between tycoons and people from political circles in the implementation of work to the detriment of the state (Đukić, 2023).

The Anti-Corruption Council stated as early as 2008 that everything that happened in the way of selling the Port of Belgrade pointed to large-scale corruption and that this transaction damaged not only the budget of Serbia and the former shareholders, but also all taxpayers, because it was carried out by taking the old book value 2.5 times lower than the current one. (Djukić, 2021).

At that time, the official president of the Anti-Corruption Council - the late Barać Verica - told RTS that "there are doubts about the connection between tycoons and people from political circles in the implementation of the work, to the absolute detriment of the state interest. There is so much illegality and synchronized action of state authorities.

You will see, for example, that the state institutions made all the decisions accepting the illegal and inappropriate offer of "Worldfin" on the same day" - she said.

Conclusion

Based on everything presented, declaratively, privatization aimed to strengthen the economy, i.e. economic growth. The new owners would very often launder the money acquired in an illegal way through privatization.

It is important to point out that during the illegal purchase of "Port of Belgrade", the criminal police of the Ministry of Interior and the judicial authorities carried out certain actions and prosecuted the cases.

And finally, comprehensively, corruption as a serious form of criminal activity is an ineradicable phenomenon. However, the fight against corruption must be a permanent process using all available means, with two ultimate goals: reducing it to a lower, tolerable and acceptable level and permanently maintaining what has been achieved, especially in those areas where it causes the most damage.

State institutions and the strategy of the state with a healthy economic policy play a key role in that struggle. That is why these institutions must be strong and uncorrupted. Only then is the fight effective, and only in that case no one individually is stronger.

Conflict of interests

The authors declare no conflict of interest.

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IMPACT OF CERTAIN DEMOGRAPHIC CHARACTERISTICS ON CONSUMER ATTITUDES ABOUT ORGANIC AGRICULTURAL AND FOOD PRODUCTS IN THE REPUBLIC OF SERBIA

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ABSTRACT

The main objective of this paper is to examine the attitudes and opinions of respondents about organic agricultural and food products, as well as motives for buying this type of products, depending on their gender, education and age, because it is assumed that they have the strongest influence on consumer attitudes. Data were obtained through survey questionnaires, on the territory of the Republic of Serbia. The research was conducted on a random sample of 369 respondents. The Chi square independence test was used to study the set assumptions. The results of the research indicated that the analysed demographic factors had certain influence on the opinion and attitudes of the respondents about ecological agricultural and food products, as well as on the motives for their use.

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Introduction

Numerous papers have been published analysing the behaviour of buyers of organic products. By studying these works, it can be concluded that there is no general agreement on the factors that unambiguously determine the profile and pattern of behaviour of buyers of organic products (Brčić - Stipčević and Petljak 2011). This could be explained by the fact that researches have been conducted in different conditions and in countries of different level of development (Pillai 2012). Certain authors believe that most of the papers in this area are based on research conducted in developed countries, especially in the USA, less in developing countries (Morel and Kwakye 2012). Research on the attitudes and opinions of organic food consumers in the Republic of Serbia, in the opinion of some researchers, is very scarce (Vehapi 2014). This situation certainly requires that the relationship between individual socio-demographic variables and the purchase of organic products be further examined, and thus contribute to a better understanding of the overall picture of the impact of certain socio-demographic variables on customer behaviour when buying organic products in each of the observed areas, territories, states, or any type of other geographical, economic, or political entities. This is also suggested by the research of other authors in this field, e.g. Kranjac et al. (2017), whose study was also based on the hypothesis that the profile of organic food consumers depends on their socio-demographic characteristics.

Materials and methods

The research data was collected on the basis of a survey, conducted during 2017, in several cities in the territory of the Republic of Serbia (Belgrade, Subotica, Novi Sad, Niš, Leskovac, Loznica, etc.), on a random sample of 369 respondents. The data was collected mainly directly through face-to-face interviews with respondents, partly on the streets, partly in front of food stores or in front of faculty buildings. In order to gain the most complete insight into the research problem, i.e. to design or make a concept and test the questionnaire for the realization of field research, and thus to better prepare the survey, the interview method was first used. The survey was conducted on the basis of a questionnaire consisting of 9 "closed" type questions (Appendix 1). Respondents completed the questionnaire on their own, which took about 10 minutes on average. Most of the respondents answered all the questions. Conclusions on the significance of the difference in the frequency of choosing the offered answers to the questions were made based on the results of the χ^2-test. A χ^2-test of independence was used to examine whether the layout of answers to the questions depended on the gender of the respondents, their age and their education, because it was assumed that they had the strongest influence on consumer attitudes. All conclusions were made in relation to the standard significance levels of 0.05 and 0.01. The following software packages were used for statistical data processing: Microsoft Excel by Microsoft, Statistics by StatSoft, Inc., Tulsa, OK, USA.

Results and discussions

Total of 369 persons were included in the research, 45.60% male, and 54.40% female. According to the results of the χ^2 test (χ^2=2.813, p=0.093), there was no statistically significant difference in the representation of the sexes in the examined sample. Regarding the age distribution of the interviewed persons, it differed statistically very significantly (χ^2=180.986; p<0.001). Most of respondents were under 24 years old (41.64%), followed by the 25-34-year-old group (29.86%), then the 45-64-year-old group, which represented 15.89% of the sample, and the 35-44-year-old group made up 10.41% of the sample. Respondents older than 65 years were the least represented in the sample, 2.19%. Therefore, the younger population predominated, given that almost three quarters of respondents (71.50%) were under 35 years old. The surveyed persons were not evenly distributed by education level (χ^2=74.190; p<0.001). In the sample, the most respondents were with a secondary vocational education (47.99%), followed by respondents with higher professional education (39.94%), and the least number of respondents with a university degree (12.07%). The number of respondents with secondary vocational education and university education did not differ statistically significantly from each other (χ^2=2.562; p=0.109), but it differed very significantly in relation to the number of respondents with completed higher education (χ^2=74.761; p<0.001 and χ^2=51.200; p<0.001).

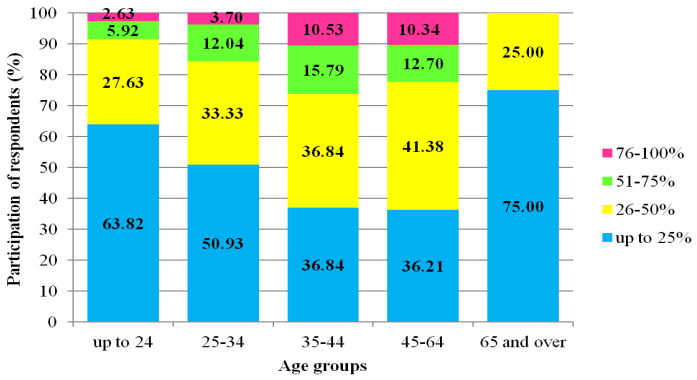
1. Very significantly higher number (287), of 365 respondents, **believed in certified organic food** (χ^2=119.674; p<0.001). 77.11% of 166 male respondents, and 79.70% of 198 females, believed in certified organic food, so the results of the independence test (χ^2=0.220; p=0.639) indicated that **gender** did not statistically significantly affect the belief in certified organic food. It was also concluded that the structure of the answer to this question did not depend statistically significantly on the age of the respondents (χ^2=4.694; p=0.320). As the respondents older than 64 answered positively in 50% of cases, and from other age groups in more than 76% of cases, and that only 8 respondents were in the oldest group, to verify the conclusion, Fisher's test of exact probability was used to compare the structure of the oldest and other groups. Obtained probabilities: 0.070; 0.056; 0.196 and 0.189 confirmed that the response structures of the oldest and other groups did not differ statistically significantly. Also, 76.51% of 167 respondents with secondary education, 88.10% of 42 respondents with higher professional education and 83.45% of 139 with university education, believed in certified organic food. According to the results of the independence test, χ^2=4.025 and p=0.134, the belief in the certified organic food did not depend statistically significantly on the education of the respondents.

2. Very significantly higher number of respondents (211 out of 368) **believed that organic food was free of pesticide residues, additives and mycotoxins** (χ^2=7.924; p=0.005). The study showed that 51.20% of male and 61.20% of female respondents belived that organic food was free of pesticide, additive and mycotoxin residues. The results of the independence test indicated that gender did not statistically significantly affect the opinion of the respondents (χ^2=3.557; p=0.059). Also, 56.58% of respondents under the age of 24, 61.47% of respondents aged 25-34, 44.74% of respondents aged 35-44, 65.52% aged 45-64 and 37.81%

of respondents aged 65 and over believed that organic food was free of pesticides, additives and mycotoxins. The results of the independence test (χ^2=6.121; p=0.190) indicated that the opinion did not depend statistically significantly on the age of the respondents. Also, 57.49% of the respondents with secondary education, 54.76% with higher professional education and 61.15% with university education believed that organic food was free of pesticide residues, additives and mycotoxins. Education did not statistically significantly affect their opinion (χ^2=0.714; p=0.700).

3. When asked **what price they would pay for organic products compared to the same conventional products,** 366 respondents produced answers. The frequency of choosing offered answers differed statistically very significantly (χ^2=245.202; p<0.001). Up to 25% higher price for organic products compared to the same conventional ones would be paid by 53.01% of respondents, price higher by 26-50% would be paid by 32.24% of respondents, 51-75% higher price would be paid by 9.84% of respondents and 76-100% higher price would be paid by 4.92% of respondents. Statistically, significantly more respondents would pay up to 25% higher price compared to the number of respondents who would pay: higher price by 26-50% (χ^2=18.513; p<0.001), higher price by 51-75% (χ^2=108.539; p<0.001) and higher price by 76-100% (χ^2=146.113; p<0.001). Also, statistically very significantly higher number of respondents would pay price higher by 26-50% compared to the number of respondents who would pay: higher price by 51-75% (χ^2=43.662; p<0.001) and price higher by 76-100 (χ^2=73.529; p<0.001). The share of respondents who would pay price higher by 51-75% and by 76-100% differed statistically significantly (χ^2=6.000; p=0.014) in favour of those who would pay price higher by 51-75%. In regard to the gender, male respondents, 59.64% were willing to pay up to 25% higher price for organic products, 27.71% of male respondents were willing to pay price higher by 26-50%, 7.23% respondents were willing to pay price higher by 51-75% and 5.42% of respondents were willing to pay price higher by 76-100%. In case of female respondents, the ratio was 47.98%: 36.36%: 12.12%: 3.54%. According to the independence test (χ^2=7.305; p=0.063), gender did not statistically significantly affect how much more the buyer would pay for organic products. The age of respondents had statistically significant effect on how much they were willing to pay more for organic products (χ^2=25.677; p=0.012). The highest number of respondents under the age of 34, as well as those aged 65 and over, were willing to pay up to 25% higher price for organic products (Figure 1). The oldest respondents were not willing to pay more than 50% higher price for organic products. Respondents aged 34 to 64 were willing to pay a price higher by more than 25%. The response structure of the youngest respondents did not differ statistically significantly from the response structures of respondents aged 25-34 years (χ^2=5.506; p=0.138) and 65 and older (χ^2=0.851; p=0.837), and differed statistically very significantly in relation to the response structures of respondents from the age group 35-44 years (χ^2=12.910; p=0.004) and 45-64 years (χ^2=15.678; p=0.001).

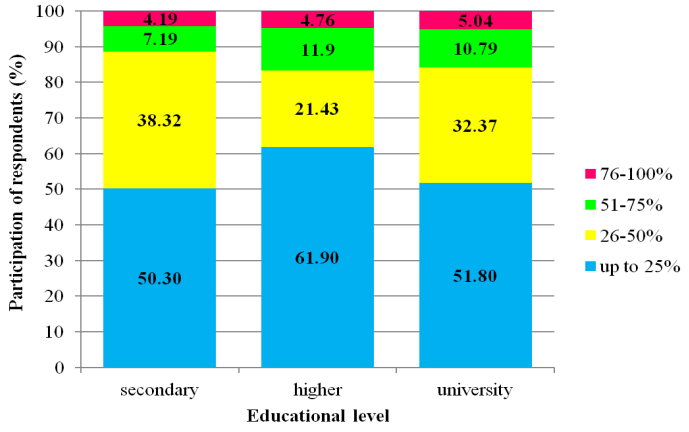
Figure 1. Structure of responses of respondents from different age groups according to by how many percent higher price they were willing to pay for organic products compared to the same conventional products



Source: Authors' calculations

The structure of answers of the respondents from the age group 25-34 did not differ statistically significantly from the answers of the respondents from the older age groups (respectively: χ^2=3.973; p=0.264, χ^2=5.224; p=0.156 and χ^2=2.238; p=0.524). Respondents aged 35-44 and 45-64 responded in the same way (χ^2=0.357; p=0.949), and the structure of their responses did not differ from the response structure of the oldest respondents (χ^2= 4.585; p=0.205 and (χ^2=4.858; p=0.182). The education of the respondents did not statistically significantly affect how much more they were willing to pay for organic products (χ^2=5.435; p=0.489). Regardless of education, the majority of respondents were willing to pay up to 25% higher price for organic products, and the least respondents were willing to pay price higher by 76-100% (Figure 2).

Figure 2. Structure of responses of respondents of different educational level according to by how many percent higher price they were willing to pay for organic products compared to the same conventional products

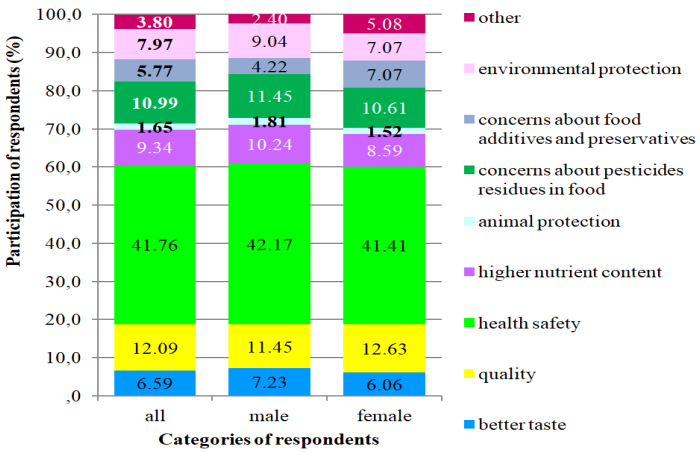


Source: Authors' calculations

4. Of the 364 respondents who answered the question **"Do you think you are sufficiently informed about organic food?"**, the number of those who believed that they were sufficiently informed about organic food (106, i.e. 29.12%) was statistically very significantly lower (χ^2=63.473; p<0.001). Also, 28.31% of male respondents and 30.10% of female respondents believed that they were sufficiently informed about organic food. According to the independence test, gender did not statistically significantly affect the opinion of respondents regarding their knowledge about organic food (χ^2=0.066; p=0.797). Among respondents under the age of 24, 15.13% believed that they were sufficiently informed about organic food. In case of respondents aged 25-34, 41.67% were of the same opinion, in the category 35-44 years 34.21% believed that they were sufficiently informed about organic food, 40.35% of the respondents in the group 45-64 believed that they were sufficiently informed about organic food and in case of respondents over 65 years of age 12.50% believed that they were sufficiently informed about organic food. Based on the results of the independence test (χ^2=27.781; p=0.001), the age of the respondents had statistically significant effect on the opinion on information about organic food. Considering that 24.10% of respondents with secondary education believed that they were sufficiently informed about organic food, 30.95% of the respondents with higher-professional education, and 37.41% of those with university education, results of the independence test (χ^2=6.365; p=0.041) indicated that the education of the respondents had statistically significant effect on their attitude towards level of information about organic food. Further examination revealed that, according to how informed the respondents were, only respondents with secondary and university education differed statistically significantly. (χ^2= 5.749; p=0.016).

5. The frequency of choosing offered answers to the question **about motives for buying organic food** (Figure 3) differed statistically significantly in the whole sample (χ^2=375,831; p<0.001), as well as especially in male (χ^2=178.494; p<0.001) and female (χ^2=198.546; p<0.001) respondents.

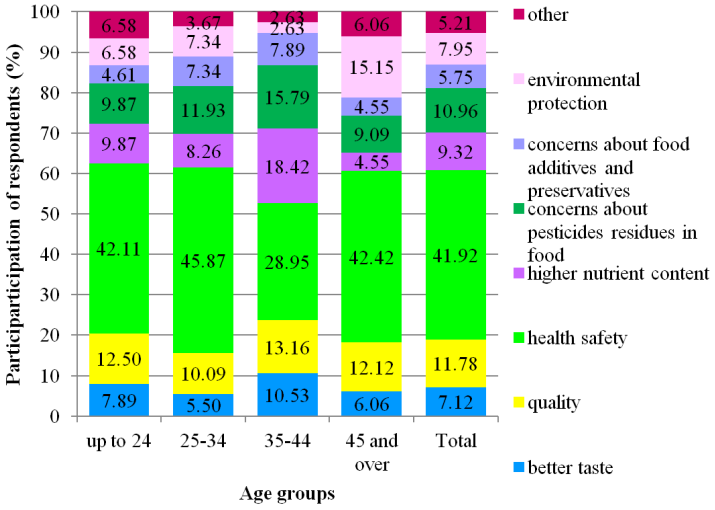
Figure 3. Representation of motives for purchasing organic food for all respondents and especially individual genders



Source: Authors' calculations

Survey participants who answered this question (367) were most often motivated to buy organic food by health consideration/safety (41.69%). Statistically very significantly higher number of respondents cited health safety as a motive for buying organic food compared to other offered motives (respectively: χ^2=90.106; χ^2=60.310; χ^2=75.727; χ^2=135.906; χ^2=66.161; χ^2=100.138 and χ^2=84.484; p<0.001) Animal protection was a motive for the purchase of organic food that was mentioned the least (1.63%), with a statistically very significantly rarely cited motive compared to all other offered motives (respectively: χ^2=12.500; χ^2=28.880; χ^2=135.906; χ^2=19.600; χ^2=25.130; χ^2=8.333 and χ^2=15.114; p<0.01). In relation to quality, respondents attributed statistically significantly less importance to better taste (χ^2=4.629; p=0.031) and statistically very significantly less to the presence of food additives and preservatives (χ^2=8.138; p=0.004). Since the results of the independence test indicated that gender did not statistically significantly affect **the motivation leading to the purchase of organic food** (χ^2=4.023; p=0.855), the conclusions about the relationship between motives in the whole sample are valid for both genders. **Motivation leading to the purchase of organic food** was not statistically significantly affected **by the age of the respondents** (χ^2 =19.03; p=0.583), Figure 4.

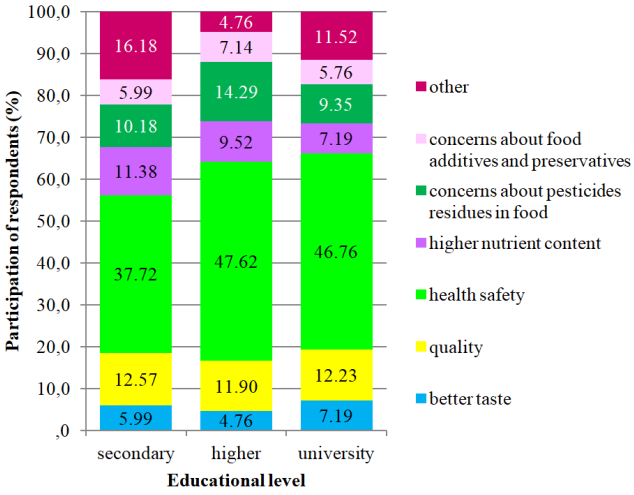
Figure 4. Structure of response0s of respondents of different ages according to the motives leading to the purchase of organic food



Source: Authors' calculations

Motivation leading to the purchase of organic food was not statistically significantly affected **by education** (χ^2=8.13; p=0.774) (Figure 5).

Figure 5. Structure of responses of respondents of different levels of education according to the motives leading to the purchase of organic food



Source: Authors' calculations

6. Statistically, significantly higher number of respondents (258) claimed they bought organic food (χ^2=62.468; p<0.001). Respondents most often bought organic food in health food stores (42.13%), then in green markets (31.10%) and supermarkets (22.83%), and least often in hypermarkets (3.94%). **The distribution of respondents by place of purchase** differed statistically very significantly (χ^2=79.134; p<0.001). Respondents bought organic food significantly more often in supermarkets than in hypermarkets (χ^2=33.882; p<0.001) and less often than in health food stores (χ^2=14.552; p<0.001). In hypermarkets, statistically significantly less organic food was bought in relation to green markets (χ^2=53.494; p<0.001) and health food stores (χ^2=80.419; p<0.001). Statistically significantly more respondents bought organic food in health food stores compared to the number of respondents who bought organic food in green markets (χ^2=4.215; p=0.040). Also, 71.52% of male and 69.54% of female respondents stated that they bought organic food. According to the results of statistical testing (χ^2=0.086; p=0.769), male and female respondents bought organic food equally. Male respondents most often bought organic food in green markets (34.75%), then in health food stores (33.90%), supermarkets (27.97%) and rarely in hypermarkets (1.69%). Female respondents most often bought organic food in health food stores (46.72%), then in green markets (27.74%), supermarkets (18.25%) and least often in hypermarkets (5.84%). Remaining respondents, 1.7% of male and 1.46% of female respondents, bought organic products in several places. By comparing the response structures, it was found that gender did not statistically significantly affect the choice of place of purchase of organic food (χ^2=8.99; p=0.061). Organic products are bought by 59.87% of respondents under the age of 24, by 77.78% of respondents from the age group 25 to 34, 71.05% from the age group 35 to 44 and 84.62% aged 45 and older. The results of the independence test (χ^2=17.330; p<0.001) indicated that age groups differed statistically significantly in the participation of respondents who bought organic food. This difference

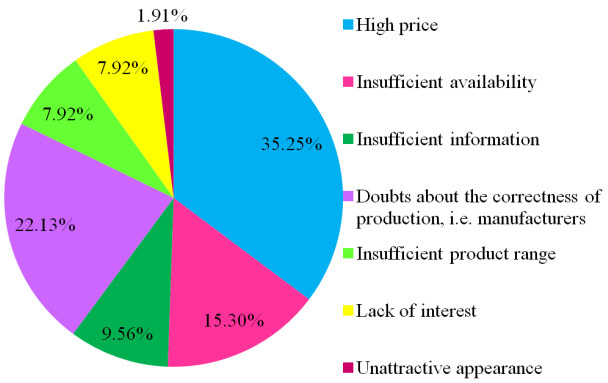
was a consequence of a very significant difference between the youngest respondents and respondents aged 25 to 34 years (χ^2=8.407; p=0.004), as well as respondents aged 45 years and older (χ^2 =11.570; p<0.001). Our study showed that 27.47% of respondents under the age of 24, claimed they bought healthy food in supermarkets, 36.26% in green markets and 29.67% in health food stores. Respondents aged 25 to 34 stated that they bought healthy food in supermarkets in 21.43% of cases, in green markets in 20.24% of cases, and in health food stores in 50.00% of cases. Persons in the age group 35 to 44 years most often bought healthy food in health food stores (51.85%), followed by supermarkets (25.93%) and green markets (18.52%). Of the respondents aged 45 and over, 43.64% claimed they bought healthy food in green markets and health food stores, and 12.73% in supermarkets. Several answers to this question were given by 6.59% of respondents aged up to 24 years, 8.33% of respondents aged 25 to 34 years, 3.70% respondents aged 35 to 44 years and 00.00% respondents 45 years of age and older. By comparing the response structures of respondents from four age groups, it was established that the age of respondents statistically significantly affected the choice of places/locations for the purchase of organic food (χ^2=21.680; p=0.0099). Further testing by two age groups found that respondents up to 24 years of age differed statistically significantly in the place of purchase of healthy food from respondents aged 25 to 34 (χ^2=9.332; p=0.025) and respondents aged 45 and over (χ^2=9.418; p=0.024). Also, statistically very significant difference was found in the place of purchase of organic food between respondents aged 25 to 34 and 45 and over (χ^2=12.440; p=0.006). Also, 70.66% respondents with secondary education claimed they bought organic food, 78.05% of respondents with higher-professional education and 69.57% with university education. The test results, χ^2=1.137 and p=0.566, indicated that the decision of the respondents to buy organic food did not depend on the level of education. Respondents with secondary education most often bought organic food in green markets (39.83%), and those with higher-professional education (56.25%) and university education (46.88%) in health food stores. Also, 33.90% of respondents with secondary education bought organic food in health food stores and 22.03% in supermarkets. Of the respondents with higher-professional education, 21.88% bought healthy food in supermarkets and 18.75% in green markets. Among respondents with a university education, 25.00% bought organic food in green markets and 20.83% in supermarkets. Other respondents claimed they bought organic food in several locations. The choice of places for the purchase of organic food did not significantly depend on the education of the customer (χ^2=10.81; p=0.094).

7. Statistically very significantly higher number of respondents, 251 of 366 who answered the question, **found it difficult to find organic products** (χ^2=50.536; p<0.001). Given that 68.67% of male and 69.19% of female respondents found it difficult to find organic products, the independence test showed that the opinion on whether it was difficult to find organic products did not depend statistically significantly on the gender of the respondents (χ^2<0.001; p=0.994). Also, 61.18% of respondents up to 24 years of age, 66.97% of respondents 25-34 years of age, 84.21% of respondents 35-44 years old, and 81.03% of respondents 45-64 years old claimed that it was difficult to find organic products, as well as 62.50% of respondents 65 years of age and older. The results of the independence test

(χ^2=12.590; p=0.013) indicated that the age of the respondents had statistically significant effect on the attitude about whether it was difficult to find organic products. Among respondents with secondary education, 67.66% believed that it was difficult to find organic products. This was perceived in the same way by 71.43% of respondents with higher-professional education, and 71.22% of those with university education. The education of the respondents did not statistically significantly affect the position on whether it was difficult to find organic products (χ^2=0.534; p=0.766).

8. When asked **why they did not buy organic food**, the respondents were offered the following answers: due to high prices, insufficient availability, insufficient information, doubts about the correctness of production, i.e. manufacturers, insufficient product range, lack of interest in them and unattractive appearance of products (Figure 6). The frequency of responses was statistically very significantly different (χ2=194.268; p<0.001). The high price of organic food was the predominant reason for not purchasing the organic products, since the number of respondents who chose this answer was statistically very different from the number of respondents who chose other reasons (respectively: χ^2=28.805; χ^2=53.878; χ^2=10.971; χ^2=63.291; χ^2=63.291 and χ^2=109.441; p<0.001). Insufficient availability was statistically more significant reason for not purchasing organic products than insufficient information (χ^2=4.846; p=0.028), statistically less significant reason than suspicion in the correctness of production, i.e. producers (χ^2=4.562; p=0.033), and statistically highly significant reason compared to the insufficient range of products (χ^2=8.576; p=0.003), lack of interest in them (χ^2=8.576; p=0.003) and unattractive appearance (χ^2=38.111; p<0.001).

Figure 6. Share of respondents according to the reasons why they did not purchase organic food

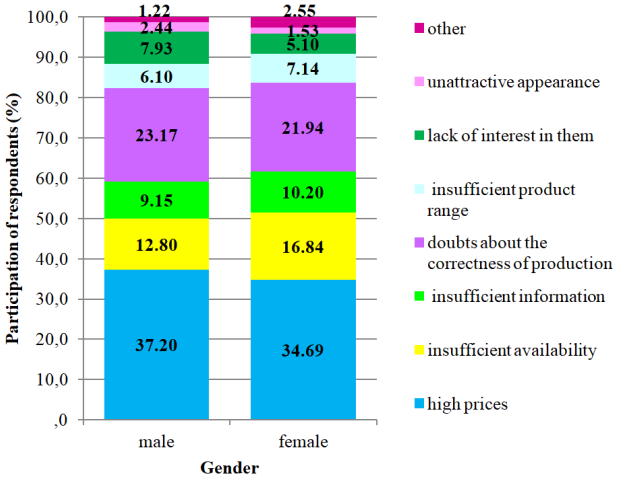


Source: Authors' calculations

For the respondents, insufficient information was much less important than doubt/ reservations about the correctness of production (manufacturers) (χ^2=18.241; p<0.001) and much more important than unattractive appearance (χ^2=18.667; p<0.001). Statistically significantly higher number of respondents stated an insufficient

assortment/range of organic products and lack of interest in them compared to the unattractive appearance as a reason not to buy them (χ^2=13.444; p<0.001). Gender did not statistically significantly affect **the opinion of respondents regarding the reason for not buying organic food** (χ^2=3.741; p=0.809), (Figure 7).

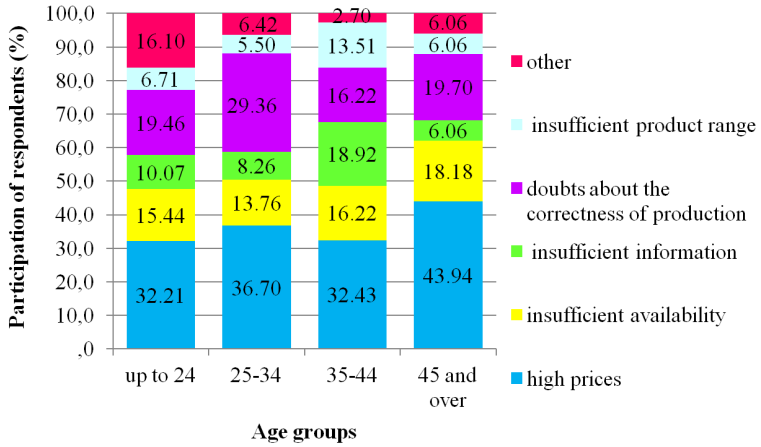
Figure 7. Structure of responses of respondents of different gender in regard to the reasons for not purchasing organic products



Source: Authors' calculations

The age of respondents did not statistically significantly affect **their attitude regarding the reason for not buying organic food** (χ^2=23.33; p=0.077) (Figure 8).

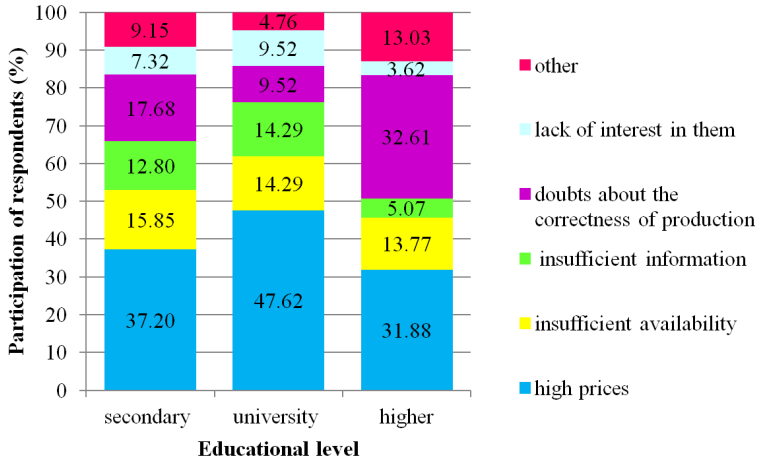
Figure 8. Structure of responses of respondents of different ages in regard to reasons for not purchasing the organic food



Source: Authors' calculations

Education level statistically significantly influenced **the attitude of respondents regarding the reason for not buying organic food** (χ^2=24.060; p=0.007), (Figure 9).

Figure 9. Structure of responses of respondents of different education levels according to reasons for not purchasing the organic food



Source: Authors' calculations

The response structures of respondents with secondary and higher-professional education did not differ statistically significantly (χ^2=3.411; p=0.637), but they differed very significantly from the structure of responses with university education (χ^2=15.330; p=0.009 and χ^2=16.570; p=0.005).

9. Statistically very high number (300, i.e. 82.19%) of 365 respondents who answered this question believed that **the organic food market** in Serbia was underdeveloped (χ^2=151.301; p<0.001). The study showed that 82.53% of male and 81.82% of female respondents believed this. The results of the independence test (χ^2=0.002; p=0.969), showed that gender did not statistically significantly affect the respondents' attitudes. Also, 80.26% of respondents under the age of 24, 84.% aged 25-34, 84.21% aged 35-44 and 81.03% aged 45-64 believed that the organic food market in Serbia was underdeveloped, as well as 87.50% of respondents 65 years of age and older. The results of the independence test (χ^2=1.063; p=0.900) indicated that the age of the respondents did not statistically significantly affect their attitude. Also, 82.04% of the respondents with secondary education, 80.95% with higher education and 83.45% with university education believed that the organic food market in Serbia was underdeveloped. The respondents' education did not statistically significantly affect their attitude (χ^2=0.182; p=0.913).

The results obtained in the research are completely consistent with some researches cited in the paper by Anić et al. 2015, which were conducted in the field of purchasing organic products, and which also show that there are no significant differences between female and male consumers in attitudes towards the protection of the environment, as well as behavioural differences in the purchase of organic products (Schultz et al. 1995;

Konstadinos et al. 2010; Shahnaei 2012; Pillai 2012; Brčić-Stipčević et al. 2013). In contrast, the research of some other authors indicates certain differences in behaviour between male and female consumers. These differences may occur as a result of different sample sizes, different sample structures in relation to certain demographic parameters, as well as differences in the temporal and spatial components of sampling. For example, according to some earlier research conducted at the end of the last century, female and male consumers differ in their attitudes and behaviour when shopping (Underhill 1999). Female respondents from Generation Z were often recognized as main buyers of organic food (Vehapi and Mitić 2021). Namely, traditionally observed, it is a common opinion that men do not like to go shopping, that they are very impatient when they participate in shopping and buy less than women, while, unlike them, women like to go shopping, have higher expectations and they do most of the shopping for the household (Underhill 1999; Mitchell and Walsh 2004). The division in the results of the mentioned research could be partly explained by the fact that traditional values and attitudes began to gradually disappear and some new social values are formed. This trend is especially present in developed countries. Namely, over time, women became more and more involved in the labour market, their income was increasing, so they had less and less time to shop. Because of that, men had to devote more and more time to jobs that women did not manage to do, which, among other things, meant shopping. The differences in the behaviour of male and female consumers when buying organic products was also stated by researchers in the more recent studies. In their studies, these researchers have concluded that, compared to male consumers, female consumers prefer organic products, they have more positive attitude towards them, they recycle products more, they are willing to pay a higher price for organic products, they tend to make recommendations to friends and buy more organic products (Diamantopoulos et al. 2003; Memery et al. 2005; D'Souza et al. 2007; to Paço et al. 2009; Konstadinos et al. 2010; Banytė et al. 2010; Morel and Kwakye 2012; Ranogajec et al. 2013). Understanding the influential factors that determine consumers' decision to purchase organic food can help all stakeholders to raise awareness of organic product characteristics and organic food production, consumption, pricing and market potential determination (Vapa-Tankosić et al., 2018). However, it is stated that the education of the respondents has a statistically significant effect on the opinion regarding their information about organic food, as well as on the reasons why they do not buy organic food. Research indicates that consumers with a higher level of education have more knowledge about environmental issues and their protection (Diamantopouloset et al. 2003; Memery et al. 2005; D'Souza et al. 2007; do Paço et al. 2009; Banytė et al. 2010). Although there are studies showing that caring for the environment is not a sufficient motive for educated consumers to buy organic products, quite a number of studies show that more educated consumers are more concerned about the environment (Royne et al. 2011), they are more inclined to recycle products (Diamantopoulos et al. 2003; Konstadinos et al. 2010), they care more about eating "healthy" food (Radojević et al. 2021), and they are more inclined to apply a lifestyle based on the consumption of organic products and they are more inclined to buy organic products (Konstadinos et al. 2010). Similar research was conducted in our neighbouring

Republic of Croatia. They have showed that buyers of organic food products have a higher level of education (Brčić-Stipčević and Petljak 2011, Brčić-Stipčević et al. 2013, Cerjak et al. 2010). It is also stated that the age of the respondents has a statistically significant effect on the price they would pay for organic products in relation to the same conventional products, and statistically very significant effect on the opinion regarding their information about organic food, also where they buy organic food, and on their opinion on whether they find it difficult to find organic products on the market. As shown by the results of research by other authors, the age of respondents has some influence on changes in consumer attitudes (Royne et al. 2011), their willingness to recycle products, as well as the purchase of organic products (Konstadinos et al. 2010). However, in contrast, there are studies that suggest no relationship between respondents' age and their behaviour when buying organic products, and that further research is needed to confirm the relationship of this kind (Royne et al. 2011, Pillai 2012; Cerjak et al. 2010, Brčić-Stipčevič et al. 2013). Research suggesting this association shows that younger consumers are more sensitive to environmental problems, as well as that they are buyers of organic products (Memery et al. 2005; D'Souza et al. 2007). Other research shows the opposite, i.e. that older consumers are more prone to product recycling (Diamantopoulos et al. 2003; to Paço et al. 2009; Banytė et al. 2010; Konstadinos et al. 2010). Older consumers show more concern for the environment and for eco-labels on products (D'Souza et al. 2007). Younger consumers, aged 18 to 24, are less likely to buy organic products (Morel and Kwakye 2012), while so-called "green consumers" are between 30 and 44 years old (Banytė et al. 2010). The research by Ranogajec et al. 2013, also suggests that older people within the household are in charge of the decision to purchase organic food products.

Conclusions

From the results obtained in the study, it can be concluded that significantly higher number of respondents bought organic food most often in health food stores and green markets, stated health safety as a motivation, believed in certified organic food, and that it was free of pesticide residues, additives and mycotoxins, stated that it was difficult to find organic products on the market, and that the organic food market in Serbia was underdeveloped. With the increase in the prices of organic food the share of respondents who were willing to pay decreased. The age of the respondents had a statistically significant effect on how much more the respondents were willing to pay. Statistically very significantly less respondents thought they were sufficiently informed about organic food. With a higher level of education, the attitude of respondents believing that they were sufficiently informed about organic food increased. The percentage of respondents who believed that they were sufficiently informed about organic food was the highest in the group from 25 to 64 years of age. As the reason why they did not buy organic food, the highest number of respondents stated the high price, followed by the suspicion/doubt about the correctness of the manufacturers, insufficient availability, and insufficient information. The analysis showed that gender did not statistically significantly affect the opinion of the respondents regarding any of the questions asked in the survey questionnaire. Still, the

education of the respondents has a statistically significant effect on the opinion regarding their information about organic food, as well as on the reasons why they do not buy organic food. The age of the respondents also has a statistically significant effect on the price they would pay for organic products in relation to the same conventional products, and statistically very significant effect on the opinion regarding their information about organic food, and where they buy organic food, and also on their opinion on whether they find it difficult to find organic products on the market.

The derived conclusions indicate that, in order to improve the organic food market, certain measures should be taken. Among other things, it is necessary to ensure that organic food is permanently available to consumers in all sales facilities. At the same time, it is necessary to take certain measures in order to lower the prices of organic food and raise the level of awareness and knowledge of consumers about organic food (quality, importance, labelling, etc.). It is also necessary to influence the reduction, or if possible, the elimination of any doubts about the correctness of organic food producers. The results of this research can be helpful in making business decisions for all interested parties involved in the supply chain of food products, especially of organic origin.

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Conflict of interests

The authors declare no conflict of interest.

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ANALYSIS OF THE GROSS ADDED VALUE OF AGRICULTURAL PRODUCTION IN THE REPUBLIC OF SERBIA

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ABSTRACT

This research analyzes the structure and economic impact of agricultural production in Serbia, focusing on gross value added (GVA). The aim is to identify the branches of agriculture that contribute the most to overall production value and quantify their impact on GVA. Basic descriptive statistics and multiple linear regression analysis were used to determine the individual contributions of agricultural sectors. The study covers data from the Statistical Office of the Republic of Serbia for the period 2007–2022. Results show that agriculture significantly influences the national economy, especially through crop and livestock production, with crop production, particularly cereals, having the largest impact on GVA. The conclusions suggest that shifting to more intensive agricultural methods and optimizing livestock production could improve economic outcomes. Policy recommendations include strategic investments in specific sectors to enhance efficiency and economic contributions. Integrated agricultural practices are also suggested to further strengthen the sector's overall performance.

Introduction

Agricultural production as the carrier of the primary sector includes production activities aimed at the production of foodstuffs and raw materials for further processing within the industry. Agricultural activity provides the basis for the development of

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other sectors of the economy, and thus the economy of a country. De Lauwere et al. (2018) state in their research that, considering its specificities, agricultural production represents an important sector of every economy around the world. Some authors (Gelgo et al., 2023) emphasize that agricultural sector has a significant role in poverty reduction enabeling the poor to have food and income from this economic activity. Alshem, Ghader (2022) argue that the agricultural sector is two to four times more effective than other sectors in raising the incomes of the poorest populations. They point out that 40% of people living in poverty experience income growth that is, on average, three times higher when GDP growth is driven by agriculture compared to growth from other sectors of the economy.Wang et al. (2020) debate that improving environmental performance, financial development and agriculture value-added would lessen the positive impact that economic globalization has on CO_2 emission. Agriculture is an important economic sector in the European Union (Burja, Burja 2016; Giannakis, Bruggeman, 2015; Morkunas et al., 2018; Mergoni et al. 2024) and it plays a special role in ensuring food security, employment in rural areas and biodiversity insurance, as well as in the preservation and protection of the natural environment (Delabaere, Serradilla, 2004; Janker, Mann, 2020; Burja et al., 2020).

Bearing in mind the fact that agricultural production stands out for its significant sensitivity to various factors during the production process, the agricultural sector is characterized by an unequal position in relation to other economic activities. The specificities of agricultural production derive primarily from its biological character, which is reflected in slower capital turnover, reduced productivity, and lower income for farmers (Božić et al., 2011). Production uncertainty and the low income for agricultural producers affect the lower attractiveness of engaging in this economic activity, and thus contribute to the continuous confrontation of rural areas with the problems of depopulation and senility. Therefore, every developed country strives to establish a stable agricultural sector that will ensure the food security of the population, provide raw materials of appropriate quality for further processing, but also make this sector sufficiently attractive in terms of business activity, especially for the younger population.

To achieve the stated goals, it is first necessary to determine the position of agricultural activity in relation to other economic activities, with special reference to the influence of individual branches on the total value of agricultural activity. According to Andreescu (2021) GDP consists of Gross Value Added (GVA) by sectors, import duties and Value Added Tax. If we take this into account the value of agricultural activity is most often expressed through the indicator of the gross value added of agriculture (GVA), which has been analyzed by numerous authors.

Kołodziejczak (2020) analyzed GVA values in 17 European Union countries, in the period from 2000 to 2018. The analysis was carried out for the agricultural sector, the industrial sector, and the service sector. Based on the results, the author concluded that in developed countries the smallest GVA is in the agricultural sector, in relation to the industrial sector and the service sector. The GVA of agriculture in developed countries,

in the observed period, was below 2%. Harizanova-Metodieva, Harizanova-Bartos (2021) dealt with the analysis of factors affecting GVA in the agricultural industry of Bulgaria. The authors investigated factors influencing the GVA of agricultural enterprises in the period from 2000 to 2017. Based on the ARDL model, they came to the conclusion that investments in agriculture and human capital stand out as the most important influencing factors.

According to Volk et al. (2019), agriculture remains a crucial sector for the national economies of all Western Balkan countries, including Serbia. In 2017, the share of total gross value added (GVA) from the agriculture, forestry, and fishing sectors was approximately 22.7% in Albania, 7.1% in Bosnia and Herzegovina, 10.9% in North Macedonia, and 9.6% in Montenegro. In Croatia, agriculture contributed 3.6% to the total GVA. Nikolić et al. (2017) and Dimitrijević et al. (2023) compare the agricultural sector's contribution across Western Balkan countries, noting that agriculture is a key driver of economic development in the region. Their multi-criteria analysis reveals that Albania stands out with the highest contribution of agriculture to economic growth, as it consistently recorded significantly higher values across the observed criteria. In contrast, the other countries in the study demonstrated a considerably smaller agricultural impact on their economic development.

Alhshem, Ghader (2022) analyzed the participation of GVA of agriculture in the GDP of Asian countries (Russia, China, Kazakhstan, Saudi Arabia, Indonesia, India and Iran). The data were analyzed for the period from 2006 to 2021, and the authors concluded that the smallest oscillations in the share of GVA of agriculture in the total GDP were observed in Russia, where GVA amounted to an average of 4%, while in China there was the largest decline of agriculture GVA, i.e. from the initial 10.63%, this indicator dropped to 7.26%. The authors also observed that the largest contribution of GVA of agriculture to GDP was observed in India, where it averages about 17%.

The authors state that these trends in the GVA contribution of agriculture to the gross domestic product of different countries indicate the importance of changing the share of agriculture in GDP for the country's economic development. Grujić-Vučkovski et al. (2023) also conducted an analysis of the influence of different agricultural branches on the share of GVA of agriculture in the total GDP. They analyzed the values in the period from 2007 to 2020 in Serbia and concluded that to the creation of gross added value in agriculture crop production contributes the most, followed by livestock production, while the agricultural services sector has the smallest share. The results were confirmed by the regression model, which showed that crop and livestock production have a statistically significant influence on the GVA of agricultural crops. Obradović, Gojković (2023) analyzed the impact of various indicators on the gross added value of agriculture in the countries of Central and Southeastern Europe. The analysis covers the period from 2011 to 2020. Using a multiple regression model, the authors concluded that investments in agriculture, research and development expenditures have a significant impact on the gross added value of agriculture.

The research subject in this paper is macroeconomic indicators of agricultural activity in the Republic of Serbia. Specifically, the structure of the value of agricultural production was analyzed, as well as the realized gross added value of agriculture, which represents the balance sheet item of the total production account at the annual level. Also, the goal of the research is to describe the structure of the value of agricultural production in the Republic of Serbia and to identify the branches that contribute the most to the realization of the total gross added value of agricultural production.

Materials and methods

The importance of agricultural production for the overall economic activity of the Republic of Serbia can be evaluated in different ways. However, the quality of the conducted analysis is largely determined by the available data. In the conducted research, the official data of the Statistical Office of the Republic of Serbia (SORS) served as the main source of data. In particular, the data related to the realized gross added value, in total and by activity, were separated, where a special focus is directed to the activity of agricultural production.

Similar to how a company's profitability is the primary measure of its financial success, gross value added (GVA) in an industry is used to measure economic performance (Cai, Leung, 2020). Gross value added (GVA) as an integral element of the total realized gross domestic product (GDP) represents the difference between the production value of a certain activity and intermediate consumption. In other words, when GVA is increased by the tax on products and reduced by the value of realized subsidies, the value of GDP for a certain economic activity is obtained (Krstić, Šoškić, 2015). Unfortunately, in its annual reports, SORS only reports the realized value of GVA by activity, while taxes and subsidies are reported collectively for all activities. Therefore, it is impossible to present the GDP of a specific economic activity, so for the needs of a more detailed analysis of economic activity at the macro level, it is necessary to observe the GVA.

As the value of production is an integral element of the calculated value of GVA, the value of agricultural production is separately set aside. Initially, the analyzed value of production was divided into vegetable and livestock production. Then, in accordance with the structure of individual production, the influence of individual branches of production was analyzed. As part of plant production, the value of produced agricultural crops, vegetables, fruits, as well as the value of viticulture production was observed. Within animal husbandry, the values of cattle production (meat and milk), pig farming, poultry farming (meat and eggs) and others were specially observed.

Bearing in mind the different time dimensions of the available data related to the value of production on the one hand and the realized GVA on the other hand, for the sake of equalizing the time horizon, the extracted data were analyzed for the period from 2007 to 2022.

Building on the previous discussion, two key hypotheses can be defined as the foundation of this research:

H1: Plant production has a statistically significant influence on the gross value added (GVA) of agricultural production in the Republic of Serbia;

H2: Animal production has a statistically significant influence on the GVA of agricultural production in the Republic of Serbia.

When examining the influence of certain types of agricultural production, i.e. branches of agricultural production on the realized value of agricultural GVA, regression and correlation analysis was used. Specifically, the multiple linear regression model was evaluated, which in its general form can be written as follows (Mutavdžić et al., 2023):

$$\hat{Y}_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_p X_{pi} + \varepsilon_i \ .$$

$\hat{Y}_i$ represents the estimated value of the dependent variable. In accordance with the objective of the research when evaluating the regression models, the total value of GVA of agricultural activity was observed as a dependent variable. Independent variables in the model are marked with X_{1i}, X_{2i}, … , X_{pi}, where p is the number of independent variables in the model so that: $i = 1,2, \dots, N$. The parameter β_0 represents the free term, while the parameters β_1, β_2,…, β_p are estimated regression coefficients. Finally, ε_i represents the random error of the model.

Before evaluating the model in accordance with the methodology, the fulfillment of the assumptions was checked on the basis of which the conclusion is made whether it is meaningful to evaluate the desired regression model. In particular, the presence of harmful multicollinearity, heteroscedastic variance and autocorrelation was checked. The presence of multicollinearity was checked based on the *VIF* and *TOL* indicators. If the *VIF* indicator value is less than 10 and the *TOL* indicator value is greater than 0.1, it will be considered that the data are not burdened by multicollinearity. Also, the presence of homoscedastic variance of the residuals was checked with *Breusch-Pagan* test, while autocorrelation was checked with the *Durbin-Watson* test. A *p*-value greater than 0.05 suggests acceptance of the null hypothesis when conducting the Breusch-Pagan test, which assumes the presence of homoscedastic variance of residuals. On the other hand, a Durbin-Watson test value close to 2, indicates the absence of harmful autocorrelation.

In addition to the above, the basic indicators of descriptive statistics were also used for the purposes of the analysis. Also, it is important to point out that all values are presented in constant prices, where the last year 2022 was taken as the base year. Fixed prices are recalculated based on the price index of agricultural products and presented in EUR for comparability at the international level.

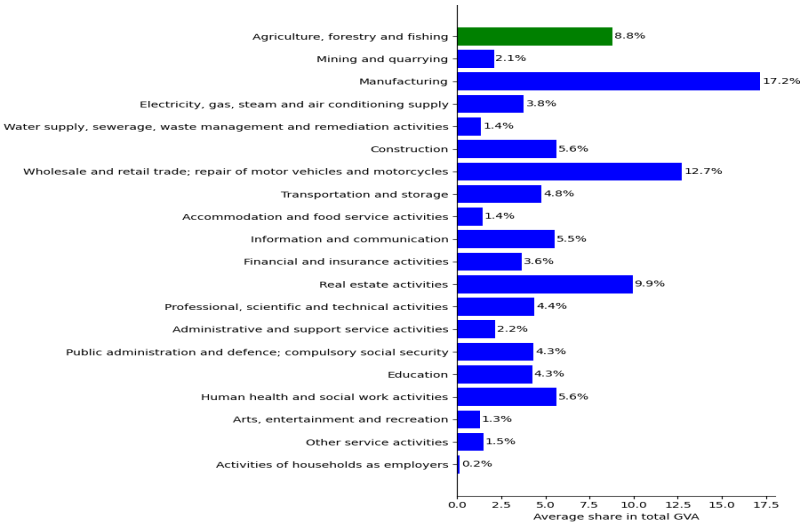
Results and discussion

The share of the value of agricultural activity within the total economic activity indicates the degree of economic development of a country. Countries where agricultural production takes a significant part in the total realized value of GVA are

considered underdeveloped or, at best, developing countries. On the other hand, one of the basic characteristics of the developed countries of the world is the relatively low participation of the value of agricultural activity in the total realized GVA, which is a consequence of the dominance of other activities that are more profitable (Mitrović et al., 2017). Related to this, Alhshem, Ghader (2022) discuss the agricultural value added as a percentage of GDP in various countries, comparing the performance of this metric across the selected nations. In this regard, the analysis began by looking at the position of agricultural activity in relation to other economic activities of the Republic of Serbia.

Figure 1 shows the average participation of individual economic activities in the total realized GVA of the Republic of Serbia for the period from 2007 to 2022. It is noticeable that the value of agricultural production participates with 8.8% on average for the observed time period, which represents the fourth activity in order of contribution to the total realized GVA. Processing industry (17.2%), trade (12.7%) and real estate business (9.9%) have a larger share than agricultural activity. Here it is important to point out that the dominant participation of the processing industry additionally points to the indirect contribution of the agricultural sector, bearing in mind that raw materials from agricultural production are used to a significant extent within this activity. According to Ristanović et al., (2022), the same is true for the trade sector, which can be additionally substantiated by the fact that agricultural products participate with 19.0% in the total value of exports for the observed period. In addition to the aforementioned participation, the importance of agricultural production for the total GVA can also be expressed through the share of the employed working-age population within jobs related to agricultural production, which is 13.9% according to the latest data for 2022 (author's calculation based on SORS data, 2008 -2023).

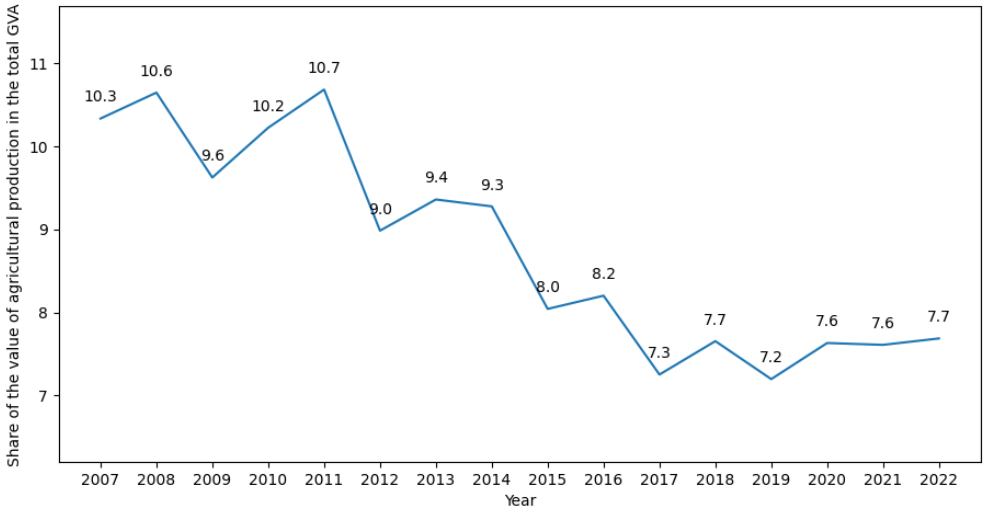
Figure 1. The average share of the value of economic activities in the total GVA for the period 2007-2022



Source: Authors' calculations

Observing the participation of the realized value of agricultural production in the total realized GVA, as shown in figure 2, it is noticeable that the participation is decraesing from year to year. The rate at which the participation decreases is 1.9% on an annual basis. In the initial years, participation amounted to more than 10%, while in the last years it amounted to less than 8%. The decrease in the share of the value of agricultural production in the total realized GVA can also be interpreted as a consequence of the faster growth of the value of other economic activities due to the increase of investments in certain economic activities (Voicilas et al., 2010).

Figure 2. The share of the value of agricultural production in the total GVA for the period 2007-2022



Source: Authors' calculations

For the sake of comparison, the average share of the realized value of agricultural production in the total GVA of the countries of the European Union (EU) is only 2% (Jarosz-Angowska et al., 2022), while in the countries of the region it is at a relatively similar level (Grujić-Vučkovski et al., 2022). The mentioned difference in comparison to EU countries additionally indicates the still significant contribution of agricultural activity in the Republic of Serbia to economic activity as a whole.

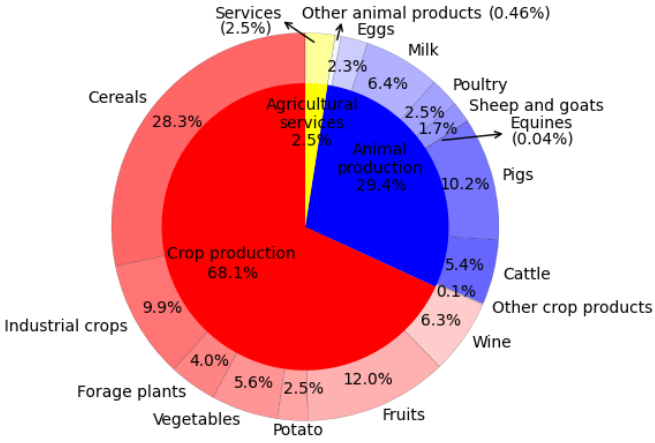
When compared to other Western Balkan countries, Serbian agriculture shows a slightly lower contribution to overall GVA. Croatia is the only country with a lower contribution, which can be attributed to its dominant tourism sector, as Croatia is the sole EU member among the Western Balkan nations.

Bearing in mind that agricultural production directly or indirectly participates in the creation of the total realized GVA, it is interesting to look at the value structure of agricultural production. Figure 3 shows the average participation of individual branches of production in the total realized value of agricultural production for the period 2007-2022.

It is noticeable that plant production contributes the most considering that it participates with 68.1% in the total realized value of agricultural production for the observed period. Within crop production, the value of produced cereals is particularly noteworthy, as it participates with 28.3% in the total realized value of agricultural production. In addition to the share of the value of produced cereals, it is necessary to point out the share of industrial plants, fodder plants and potatoes, which is 9.9%, 4.0% and 2.5% respectively. In this way, the share of the value of arable production in the total realized value of agricultural production is reached, which is as much as 44.7%. The importance of the common presentation of the value of field crops is reflected in the fact that it is primarily an extensive production. When it comes to intensive production, the share of the value of fruit production is 12.0%, while the average share of the value of viticulture is at the level of 6.3% of the total value of agricultural production.

On the other hand, livestock production participates with a total of 29.4% in the total realized value of agricultural production. Within animal husbandry, cattle breeding and pig breeding stands out. The total value of cattle breeding, which includes the production of beef and milk, accounts for 11.8%, while the share of the value of pig farming is at the level of 10.2%. The share of poultry farming, which includes the production of poultry meat and eggs, is 4.8% on average, while the share of other lines of livestock farming is almost negligible. Finally, in addition to plant and livestock production, the value of agricultural services, which amounts to 2.5%, also participates in the formation of the total value of agricultural production.

Figure 3. The structure of the value of agricultural production for the period 2007-2022



Source: Authors' calculations

With the presented structure of the value of agricultural production in the Republic of Serbia in mind, in the continuation of the analysis, a regression model was evaluated

based on which the impact of crop and livestock production on the realized value of agricultural GVA was examined. In this regard, before the evaluation of the model, a check of the assumptions was carried out, based on which conclusion is made whether it is meaningful to evaluate the desired regression model. Specifically, the presence of harmful multicollinearity was checked based on the *VIF* and *TOL* indicators. Then, with the *Breusch-Pagan* test, the presence of homoscedastic variance of the residuals was checked, while the presence of harmful autocorrelation was checked with the *Durbin-Watson* test.

The values of the *VIF* indicators for the independent variables used in the multiple linear regression model indicate the absence of harmful multicollinearity. Namely, the average value of the *VIF* indicator is 9.5350, which is less than the limit value of 10. Similarly, the *TOL* indicator is 0.1049, so the value of this indicator is also desirable, bearing in mind that it is higher than the limit value of 0.1.

Given that the multicollinearity was assessed at an acceptable level, the results of the *Breusch-Pagan* and *Durbin-Watson* tests are presented in Table 1. The value of the *Breusch-Pagan (BP)* statistic of 0.1505 (p=0.9275), indicates acceptance of the null hypothesis assuming that the variance of the residuals is homoscedastic, which is the desired scenario. Additionally, the *Durbin-Watson (DW)* statistic, which is 1.5759, is close to the threshold value of two, which unequivocally indicates the absence of harmful autocorrelation. In accordance with the obtained results of the performed tests, it can be concluded that it is meaningful to evaluate the multiple linear regression model, where the dependent variable is the GVA value of agriculture, while the independent variables are the value of plant production and the value of livestock production.

Table 1. Checking the fulfillment of the assumptions for the evaluation of the regression model

Test	The null hypothesis	Test statistics	p-values	Results
Breusch-Pagan heteroskedasticity test	Homoscedastic model variance	BP = 0.1505	0,9275	H_0 is accepted
Durbin-Watson autocorrelation test	Absence of first-order autocorrelation	DW = 1.5759	-	H_0 is rejected

Source: Authors' calculations

The evaluation of the multiple linear regression model where the dependent variable is the GVA of agricultural activity, and the independent variable is the value of plant and livestock production is presented in table 2. The evaluated model shows high statistical significance considering the value of the F-test which is 862.00 (p=0.0000). This is supported by the fact that the corrected coefficient of multiple determination is at the level of 99.4%.

It is noticeable that the value of plant production shows a highly statistically significant influence on the realized value of agricultural GVA for the period 2007-2022. In other words, with an increase in plant production by EUR 1, it is to be expected that the GVA

of agricultural activity will increase by EUR 0.5688. On the other hand, the variable related to livestock production is statistically significant, but only at the threshold of significance α=0.07. Therefore, the importance of livestock production on the total realized value of the GVA of agriculture must be taken with caution.

Table 2. Evaluation of model 1 (Y=GVA of agriculture, X_1=value of crop production, X_2=value of livestock production)

Parameter	*Variable*	*Coefficient*	*Standard Error*	*p-value*
β_0	*Const*	0.8186	54.1720	0.9880
β_1	*Plant_production*	0.5688	0.090	0.0000
β_2	*Animal_production*	0.5138	0.244	0.0640
R-squared		0.9950		
Adjusted R-squared		0.9940		
F-statistics		862.00		
Prob. (F-statistics)		0.0000		
Standard Error		59.3654		
No. Observations		12		

Source: Authors' calculations

Considering the previously defined hypotheses, it can be concluded that the first hypothesis is confirmed, as plant production has been shown to have a statistically significant impact on the GVA of agricultural production. In contrast, the second hypothesis can only be partially accepted, as the variable for livestock production reaches statistical significance at a marginal threshold of α = 0.07.

With the highly statistically significant contribution of plant production to the multiple linear regression model, where the dependent variable is the GVA of agriculture, it is meaningful to analyze the contribution of individual lines of plant production to the realized value of the GVA of agricultural activity. In this regard, a multiple linear regression model was evaluated, where the dependent variable is the GVA of agricultural activity, while the values of crop, fruit and viticulture production were observed as independent variables (table 3). The variable related to the value of vegetable production was excluded from the model considering that this variable is highly correlated with the variable related to the value of arable production. Therefore, the model is burdened with the problem of multicollinearity, which was overcome by omitting the mentioned variable.

Table 3. *Evaluation of model 2 (Y=GVA of agriculture, X_1=value of cereal production, X_2=value of fruit production, X_3=value of wine production)*

Parameter	*Variable*	*Coefficient*	*Standard Error*	*p-value*
β_0	***Const***	78.0138	83.809	0.3790
β_1	***Crop production***	0.7614	0.1230	0.0000
β_2	***Fruit production***	0.9663	0.4000	0.0420
β_3	***Viticulture***	0.2714	0.5790	0.6520
R-squared		0.9930		
Adjusted R-squared		0.9900		
F-statistics		371.40		
Prob. (F-statistics)		0.0000		
Standard Error		73.8095		
No. Observations		12		

Source: Authors' calculations

The estimated multiple linear regression model is statistically significant as a whole (F=371.40; p=0.0000). Also, the corrected coefficient of multiple determination is 99%. It is noticeable that the value of agricultural production shows a highly statistically significant influence on the realized value of the GVA of agricultural activity. Namely, with an increase in the value of agricultural production by EUR 1, an increase in the total realized GVA of agriculture by EUR 0.7614 can be expected. In addition to agricultural production, statistical significance is also shown by the variable related to the value of fruit production, but only for the significance threshold α=0.05. In addition to the above, it is important to point out that the value of viticulture production does not show a statistically significant influence on the value of GVA agriculture in the evaluated model.

In the end, it is important to point out that a multiple linear regression model was also evaluated, where the variable related to the GVA of agricultural production was used as the dependent variable, while the variables related to the branches of livestock production were used as independent variables: the value of cattle production, the value of pig farming, poultry and the value of other livestock production. The model was not statistically significant so its results are not presented. Referring to the results of model 1, where the value of livestock production is statistically significant for the significance threshold α=0.07, it can be stated that the importance of livestock production at this moment should be viewed through the overall contribution, while individual branches of livestock production still do not have the strength to individually influence the total

realized value of agricultural GVA. In support of the above, the structure presented in figure 3, where the participation of individual branches of animal husbandry is at a much lower level than the branches of plant production, also speaks.

The Gross Value Added indicator plays a crucial role in evaluating the current state of any industry sector. As highlighted earlier, GVA in agriculture is particularly significant as it provides insights into both current trends and future potential. GVA serves as a key metric for offering essential quantitative economic information, helping to inform or assess policy interventions within specific sectors. Since different activities contribute varying levels of GVA, it is vital to identify the causes of these variations and the composition of economic activities in order to gauge their effect on productivity and economic growth. In essence, GVA is one of the most important indicators for assessing the economic performance of any industry or sector (Andreescu, 2021).

Feher et al. (2022) stated that this indicator largely reflects the level and trends of efficiency of economic activity in agriculture. But, on the other hand, the development of the agricultural sector depends on several factors - some can be easily influenced and some are beyond control. Mergoni et al. (2024) are investigating sustainable agricultural efficiency using GVA in agriculture and they point out that this indicator is considered as a desirable output in the assement of agricultural efficiency. Gelgo et al. (2023) examine the impact of institutional quality on agricultural value added in East Africa. Their findings suggest that higher per capita GDP, a smaller rural population share, and increased spending on education significantly enhance agricultural value added. The study underscores the critical role institutional quality plays in driving the growth of agricultural value added in the region.

Salimova et al. (2020) conducted a comparative analysis of the agricultural sector's GVA across various countries. The study aimed to determine the role of agriculture in contributing to GVA and to identify key areas for economic development through cross-country comparisons and insights. Similarly, Rajeb et al. (2012) explored how factors such as land use, irrigated area, pesticide consumption, forest coverage, fertilizer use, and improved seeds influence the GVA of the agricultural sector in Bangladesh. In line with these findings, Pacheco et al. (2018) note that several variables, including the GVA of agriculture, average household income, and the economically active population, positively impact agricultural diversification.

As the value of the GVA indicator has been unequivocally proven in scientific researchs, in accordance with the obtained results presented in the previous part, it can be stated that plant production contributes to the greatest extent to the total realized value of agricultural production in the Republic of Serbia. In a broader context, it can be concluded that plant production to the greatest extent profiles the value of agricultural activity as a whole, which especially confirms the statistically significant influence of the variable related to the value of plant production in the estimated regression model. The same conclusion was reached by Grujić-Vučkovski et al. (2023).

The significant influence of plant production, within which arable production stands out, indicates that the extensive method of agricultural production prevails in relation to the intensive method of production. This is also supported by the findings that Feher et al. (2022) had for the Romanian GVA in agriculture. In support of the above, the fact that the value of intensive forms of plant production participates in a significantly smaller percentage of the total realized value of agricultural production is shown in figure 2.

This conclusion comes to the fore especially considering that the value of livestock production shows a statistically significant impact on the realized value of agricultural GVA only for the significance threshold of $\alpha=0.07$, so the contribution of livestock must be taken with a certain amount of reserve. Bearing in mind that the successful organization of livestock production implies a vertical connection with plant production, the dominant participation of one line of production, in this case plant production, indicates an insufficient connection between the mentioned lines of agricultural production.

Considering the statistical significance of the variable related to animal husbandry in model 1, it is reasonable to expect that additional investments in animal husbandry will improve the agricultural activity as a whole. However, at this moment it is not possible to precisely determine which specific branches of livestock production would possibly contribute to the improvement of agricultural activity. At this level of research, it can be concluded that the improvement of agricultural activity with additional investments in animal husbandry is to be expected, but it cannot be stated which branches of animal husbandry would be the carriers of those improvements when no branch of animal husbandry has an individual influence on the value of GVA of agriculture in the Republic of Serbia.

The statistically significant impact of fruit production (model 2) indicates the possibility for additional improvement of agricultural production in the Republic of Serbia. Namely, with additional investment in fruit growing, the improvement of agricultural activity as a whole is to be expected. On the other hand, the value of viticulture production did not show a statistically significant impact on the realized value of agricultural activity. Therefore, one gets the impression that when it comes to plant production that additional investments must be focused primarily on fruit growing.

Feher et al. (2022) suggests that with the right conditions, such as restructuring agricultural production and allocating additional financial resources, Romania's GVA in agriculture can increase and approach the levels of other European countries. The same or similar can be stated for agriculture of the Republic of Serbia.

Conclusions

The research encountered several important limitations. From a methodological standpoint, a longer time series would have undoubtedly yielded more reliable conclusions about the contributions of individual agricultural production sectors to overall GVA. Unfortunately, the available data series did not allow for such in-

depth analysis. Furthermore, a more comprehensive interpretation could be achieved by analyzing panel data that encompasses a broader range of countries, such as EU countries or those in the Western Balkans. This approach would enable a more nuanced assessment of how specific production lines impact agricultural GVA, while also considering the influence of the international market.

Taking into account the presented research results, it can be stated that there is a possibility for additional improvement of the agricultural production sector, especially in terms of the realized gross added value of production. By moving from an extensive to an intensive form of production, better utilization of available inputs per unit of capacity and an increase in production productivity, and consequently better economic results, can be expected.

Here, the need for a vertical connection of agricultural and livestock production stands out, where a significant part of the dominant crop production would be an input for the livestock production that provides much better financial results on the agricultural market. In addition to the above, one of the possible directions of development is the intensification of agricultural production or a reorientation towards organic production, primarily vegetables and fruits.

The obtained results can be useful both for the creators of agricultural policy and for the needs of future research. It is known that the development of the agricultural sector as the primary sector is the first step towards the further development of the secondary and then the tertiary sector. Therefore, the identified factors that profile the sector of agricultural activity in the Republic of Serbia can be of particular importance. On the other hand, it is important to consider why certain branches of agricultural production in the Republic of Serbia, such as cattle breeding, pig breeding or viticulture, do not have a significant impact on the realized GDP of agriculture, if it is known that they provide a better economic result per unit of capacity than e.g. crop production, which absolutely dominates Serbian agriculture. The latter lights the way for future research. In line with the aforementioned, a promising topic for future research would be to examine the factors that could contribute to the intensification of agricultural production in the Republic of Serbia.

The research holds significant scientific and professional value by offering critical insights into the structure of agricultural production and its contribution to Serbia's GVA. These findings can serve as a foundation for policymakers to make informed, strategic investments in key agricultural sectors, improve production methods, and ultimately boost the country's economic outcomes, with a particular focus on the most influential sectors, such as crop and livestock production.

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Conflict of interests

The authors declare no conflict of interest.

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ASSESSING AND MANAGING TERRITORIAL CAPITAL FOR RURAL TOURISM DEVELOPMENT: FINDINGS FROM FIELD RESEARCH IN AZANJA (REPUBLIC OF SERBIA)

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ABSTRACT

This paper investigates the potential for rural tourism development in Azanja (Republic of Serbia) by analyzing its territorial capital - natural, social, cultural, economic and human capital. Results from field research conducted in 2024 encompassing 209 residents revealed that the main strength lies in Azanja's social capital, followed by natural and cultural capital. However, economic and human capital were identified as weak points, hindering rural tourism development. The results showed that rural tourism development in Azanja requires strategic investments and capacity building to overcome its economic and human capital limitations. Recommendations include fostering local entrepreneurship, providing financial incentives for tourism-related businesses, and implementing educational programs to enhance residents' knowledge and skills in tourism management and hospitality. By identifying the strengths and weaknesses of Azanja's territorial capital, this research provides a basis for formulating targeted strategies to enhance the region's appeal to tourists and foster sustainable rural tourism development.

Introduction

Rural tourism is a selective form of tourism that is increasingly gaining importance in the context of the ecological dimension of humans and space, and the growing awareness of the necessity of sustainable development (Kosar & Rašeta, 2003). Rural tourism encompasses all those manifestations of tourist value offerings that are based

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on the specifics of local rural communities and the rural way of life. As a specific form of tourism, rural tourism simultaneously relies on both local natural and anthropogenic potentials (Čikić & Jovanović, 2015). Rural tourism is a mix of agricultural products, eco-products, cultural resources, and numerous spatial contents that include various functions, such as economic, social, educational, environmental, recreational, and therapeutic activities (Lee & Kim, 2010). Four key elements that define rural tourism are: natural resources in the rural environment (rivers, lakes, mountains, forests, etc.), rural lifestyle (customs, events, gastronomy, music, dance, etc.), rural heritage (architecture, history, stories, myths, legends, memories, etc.), and rural activities (horseback riding, hunting, fishing, hiking, biking, rowing, etc.) (Bartoluci et al., 2016). Tourism in rural areas is one of the factors that can play a significant role in the renewal and development of villages, i.e., in stopping the negative trends of rural depopulation (Pivac et al., 2016; Ljubisavljević & Knežević, 2023).

The aim of this paper is to investigate and analyze the potentials for the development of rural tourism in Azanja (Republic of Serbia) by analyzing its territorial capital. Azanja is a village situated in the municipality of Smederevska Palanka, within the Podunavlje district, in northeastern Šumadija. It covers an area of 47.72 square kilometers and has a population of 3,256 (according to the 2022 census). The majority of the population in Azanja is engaged in agriculture. The land in this area is very fertile and almost entirely arable (Mitrović et al., 2015). It should also be noted that the percentage of cultivated and sown land in Azanja is high (about 99%). Field crops are mostly grown, primarily wheat, corn, and barley. In addition, some farms are also engaged in fruit growing and livestock breeding. Several craft, catering, and trade businesses are active in the village (a search of the register of companies and associations reveals a total of 16 active business entities in Azanja) (Dejanović, 2024).

In less urbanized areas, rural tourism is gaining popularity as a feasible tool for community resilience and economic growth. Still, despite its increasing popularity, there is a significant gap in the literature about the precise methods through which territorial capital can be efficiently evaluated and controlled to promote sustainable rural tourism. By offering a thorough examination of territorial capital in Azanja, this paper aims to close this gap. The findings from this research will contribute to a deeper understanding of territorial capital and provide valuable actionable insights for policymakers, local stakeholders, and researchers interested in maximizing the potential of rural tourism through effective territorial capital management.

Theoretical Background

The concept of territorial capital was first explained in detail in the publication "Territorial Outlook" published by the Organisation for Economic Cooperation and Development (OECD, 2001). This approach was quickly adopted as an essential element in creating regional and rural development policies within the European Union. By reviewing the relevant literature in the fields of regional economics, regional development, and spatial planning, it can be concluded that most authors have accepted

this approach, but some have also critically evaluated it (De Rubertis et al., 2019). Due to its practical construction, it is widely used in foreign and domestic research on rural areas and rural development. In practice, this approach is most often used in the form of a survey to collect data that should show the structure of territorial capital, i.e., its competitiveness and prospects for future development (Dejanović, 2024). A detailed explanation of each dimension of territorial capital is presented below.

Natural capital encompasses the natural resources available in a given area. It is everything that nature has endowed a region with (natural wealth and beauty). Researching this dimension involves a deeper understanding of the natural characteristics of a particular rural area, such as geographical location, relief, climate, soil, as well as hydrography, and the diversity of flora and fauna. The analysis of these characteristics should show the natural predispositions for the development of an area, i.e., to what extent natural resources can be used for tourism purposes (Ignatyeva et al., 2020). It should be emphasized that this analysis must also include an assessment of the preservation of the natural environment, as well as an assessment of the achieved level of natural resource management (as the degradation of natural resources significantly reduces the attractiveness of rural areas). Bearing this in mind, in some studies, the term "ecological capital" is used instead of "natural capital."

Social capital reflects the characteristics of social relationships within a local community or a specific area. It can be defined as a system of norms and social networks within the community that facilitate collective action and enable the achievement of shared (collective) goals (Saz-Gil et al., 2021). Additionally, social capital can be understood as a social resource that either facilitates or hinders an individual's access to other economic or natural resources. Social capital comprises social relationships that contribute to cooperation and coordination within the community (Putnam, 2000). Understanding the social capital of a rural area requires a deeper examination of how community spirit is manifested, partnerships are formed, associations are established, solidarity and reciprocity are demonstrated, trust is nurtured, collective decisions are made, and conflicts are resolved. Furthermore, social capital implies a concern for the public interest and service to the community.

Cultural capital can be understood as the sum of everything created by previous generations in a specific area (cultural-historical heritage) that can serve to generate future development. In this sense, cultural capital encompasses the intangible and tangible cultural-historical heritage of a social community in a given area (customs, stories, myths, legends, memories, music, dance, rituals, festivals, events, traditional costumes, gastronomy, architecture, cultural-historical monuments, etc.) (du Cros & McKercher, 2020). The ability of community members to utilize this heritage determines its development potential. Cultural capital is the driving force behind so-called "cultural tourism" (Ma et al., 2020). This type of tourism is motivated by culture, or cultural content such as festivals, events, folklore, art, or visits to museums and cultural-historical monuments.

Economic capital, as an element of territorial capital, reflects the level of economic development in a given area. More specifically, it demonstrates how and to what extent the local community generates income that enables both its existence and future growth (Huang et al., 2021). This economic foundation encompasses all production, service, and financial capacities within the area (means of production, communal infrastructure, accommodation and hospitality capacities, local budget, dedicated funds, credit lines, etc.). Undoubtedly, a stronger economic capital is a significant factor influencing regional development, including rural tourism. However, it cannot be viewed in isolation but rather in interaction with other forms of territorial capital. Moreover, the importance of economic capital varies depending on the development stage of an area. In the early stages of rural development, natural potential and physical resources primarily determine the competitiveness of the rural economy and its structure, with priority given to agriculture, fishing, and forestry. In later stages, potentials such as thermal springs, infrastructure, and technological advancements become the primary drivers of development (Kvrgić, 2018).

Human capital encompasses the demographic characteristics of inhabitants in a specific area and their ability (knowledge and skills) to utilize all other forms of territorial capital. In literature, it is most commonly defined as the set of knowledge, skills, competencies, and abilities acquired by individuals through education, training, and experience (Benos & Zotou, 2014). Almost all authors agree that human capital represents a key factor in economic growth and development, with a particularly emphasized role in endogenous growth models (Romer, 1986; Cvetanović & Despotović, 2014). In the context of this research paper, human capital is depicted through demographic data (population size, age and educational structure), as well as an assessment of how entrepreneurial and open to learning and acquiring new knowledge and skills people in rural areas are. Human capital is the foundation of rural development and competitiveness, as it considers the vitality and educational structure of the rural population, their entrepreneurial potential, and their readiness to embrace innovation. Rural areas capable of retaining their own and/or attracting external skilled labor gain a significant comparative advantage for sustainable development (Bogdanov, 2015).

Based on the presented dimensions, it is evident that territorial capital encompasses both tangible and intangible resources available in an area upon which its competitiveness is based. These resources, in essence, represent the potential for regional development.

Research methodology, materials, and methods

Based on the aim and goals of the paper, the following research questions (RQ) were defined in order to examine end analyze the current state of territorial capital development in Azanja:

RQ1: What level of natural capital development has Azanja reached?

RQ2: What level of social capital development has Azanja reached?

RQ3: What level of cultural capital development has Azanja reached?

RQ4: What level of economic capital development has Azanja reached?

RQ5: What level of human capital development has Azanja reached?

The field research was conducted using a questionnaire prepared and modified based on the research used by other authors in Serbia. These authors analyzed various aspects of the territorial capital of rural areas in Serbia in the context of the possibilities for developing rural tourism within the project "Rural Labor Market and Rural Economy of Serbia - Income Diversification and Poverty Reduction" (Bogdanov & Janković, 2013). Considering that the mentioned authors have already applied this approach in a thematically similar project, it is justified to utilize their experience in developing this study and questionnaire.

The prepared questionnaire consisted of two parts. The first part included three profiling questions regarding the respondent's gender, age, and educational level. The second part of the questionnaire comprised questions aligned with the territorial capital concept presented in the theoretical section of this paper. The questions were divided into several categories: (1) Natural capital (four questions); (2) Social capital (six questions); (3) Cultural capital (four questions); (4) Economic capital (eight questions); and (5) Human capital (four questions). The degrees of agreement were expressed on a five-point Likert scale (1 - strongly disagree, 5 - strongly agree). The questionnaires were anonymous and distributed exclusively in paper-based form in the period from March to April 2024.

The research included adult residents of Azanja (people who have a government-issued document that serves as evidence that Azanja is their residential location, i.e. who reside in this place). A total of 234 questionnaires were distributed, and 209 were validly completed. Statistical data processing was performed using Statistical Package for Social Sciences (SPSS). Based on the statistical analysis of collected data (mainly in the domain of descriptive statistics), research results reflect the opinions and attitudes of Azanja residents regarding the potential for rural tourism development.

Research results and discussion

The research encompassed a total of 209 respondents, of which 65.1% were male and 34.9% were female. The largest group of respondents fell within the age group of 41 to 50 years (29.2% of the total sample). Residents aged 31 to 40 years accounted for approximately 21% of the sample, while those aged 51 to 60 years constituted around 20%. The participation of the youngest category of respondents (up to 30 years old) was only about 12%. This sample structure reflects the age distribution of the entire population in Azanja (the average age of Azanja residents according to the 2022 census was 46.14 years). The majority of respondents had a secondary education level (62.2%), followed by primary education (21.1%), while higher and high education were represented in the sample with 16.7%.

The level of natural capital development in Azanja

The research findings (*Table 1*) indicate that 42.58% of respondents consider the natural beauty of Azanja to be very attractive to tourists, while a similar proportion (40.19%) consider it attractive. A considerably smaller percentage of respondents (9.57%) selected the option exceptionally attractive, and a minor fraction (7.66%) chose attractive to a lesser extent. Notably, none of the respondents indicated that the natural beauty of Azanja was not attractive. These results suggest that the residents of Azanja perceive their region as possessing natural beauty, although not to the exceptional level found in national parks or areas with extraordinary natural features.

Table 1. The attractiveness of Azanja's natural beauty

Answers	N	%
Exceptionally attractive	20	9.57
Very attractive	89	42.58
Attractive	84	40.19
Attractive to a lesser extent	16	7.66
Not attractive	0	0.00
Total	209	100.00

Source: Authors' calculations

The majority of respondents (42.58%) consider the diverse landscape (hills, valleys, plains, viewpoints) to be Azanja's most significant natural beauty. However, a nearly equal proportion of respondents (41.63%) believe that the diversity of flora and fauna is the Azanja's most important natural beauty. Considerably fewer respondents selected the other options. Interestingly, 6 respondents (2.87%) indicated that Azanja has no particular natural beauty to be proud of (*Table 2*).

Table 2. Azanja's natural beauties

Answers	N	%
Diverse landscape	89	42.58
Diversity of flora and fauna	87	41.63
Forests	14	6.70
Springs	11	5.26
Rivers	2	0.96
Nothing special	6	2.87
Total	209	100.00

Source: Authors' calculations

Of the total number of respondents, 10.05% consider the natural environment in the Azanja area to be exceptionally preserved. However, a significantly larger proportion of respondents, 43.54%, rate the natural environment as very well preserved. A substantial portion of respondents (38.76%) assert that the natural environment is preserved, while a total of 5.74% of respondents indicated that nature is preserved to a lesser extent (*Table 3*).

Table 3. Preservation of the natural environment in the Azanja

Answers	N	%
Exceptionally preserved	21	10.05
Very well preserved	91	43.54
Preserved	81	38.76
Preserved to a lesser extent	12	5.74
Not preserved	4	1.91
Total	209	100.00

Source: Authors' calculations

The vast majority of respondents (61.72%) strongly agree with the statement that Azanja has an exceptional geographical location and transportation connections with other towns and cities. Approximately 30% of respondents express agreement with this statement, while only 4.78% opted for a neutral stance. Furthermore, only 3.35% of respondents disagree, while none of the respondents strongly disagree with the statement that Azanja has an exceptional geographical location and transportation connections with other towns and cities (*Table 4*).

Table 4. Responses to the statement "Azanja has an exceptional geographical location and transport connections with other towns and cities"

Answers	N	%
Strongly agree	129	61.72
Agree	63	30.14
Neutral attitude	10	4.78
Disagree	7	3.35
Strongly disagree	0	0.00
Total	209	100.00

Source: Authors' calculations

The level of social capital development in Azanja

Less than one-fifth of respondents (19.14%) consider the residents of Azanja to be exceptionally hospitable, while 44.02% find them very hospitable. A significant portion of respondents (35.88%) chose the answer hospitable, and only 0.96% opted for hospitable to a lesser extent. No one rates the residents of Azanja as inhospitable (*Table 5*). Hospitality is exceptionally important for the development of rural tourism, as this type of tourism predominantly involves direct contact between the service provider and the customer.

Table 5. Responses to the question "How would you rate the hospitality of Azanja residents?"

Answers	N	%
Exceptionally hospitable	40	19.14
Very hospitable	92	44.02
Hospitable	75	35.88
Hospitable to a lesser extent	2	0.96
Inhospitable	0	0
Total	209	100.00

Source: Authors' calculations

Of the total number of respondents, 22.49% strongly agree with the statement that the relationships between the residents of Azanja are harmonious. A high degree of agreement was expressed by 58.85% of the respondents. However, 11.48% of respondents chose the neutral option. A smaller portion of the respondents included in the research (6.22%) show a disagreement with this statement, while only 0.96% express strong disagreement with the statement (*Table 6*).

Table 6. Responses to the statement "The relationships between the residents of Azanja are harmonious"

Answers	**N**	**%**
Strongly agree	47	22.49
Agree	123	58.85
Neutral attitude	24	11.48
Disagree	13	6.22
Strongly disagree	2	0.96
Total	209	100.00

Source: Authors' calculations

The majority of respondents (67.94%) believe that conflicts in Azanja are resolved quickly and easily, primarily through conversations and agreements. However, 29.19% of respondents hold a different view, stating that conflicts are resolved with difficulty and slowly, after long and strenuous discussions. Only 4 respondents (1.91%) think that Azanja residents are often unable to resolve conflicts on their own and require external assistance in the process. Additionally, there is 0.96% of respondents who believe that most conflicts are resolved through legal action (*Table 7*).

Table 7. Responses to the question "How are conflicts resolved in Azanja?"

Answers	**N**	**%**
Quickly and easily, mostly through conversations and agreements	142	67.94
With difficulty and slowly, after long and strenuous discussions	61	29.19
Someone from outside needs to help us resolve conflicts	4	1.91
Most conflicts are resolved through legal action	2	0.96
Total	209	100.00

Source: Authors' calculations

More than half of the respondents (56.46%) believe that decisions in Azanja are made based on a broad consensus of a wide range of stakeholders. On the other hand, a significant number of respondents (41.63%) believe that decisions are made by a small number of people, without wider consultation, while only 1.91% of respondents believe that others make decisions for them. Slightly more than half of the respondents think that there is democracy in Azanja when making decisions of common interest, but a significant number have a different opinion and believe that decisions in Azanja are made autocratically, based on the authority of a narrow circle of people (*Table 8*).

Table 8. Responses to the question "How are decisions made in Azanja?"

Answers	N	%
A wide range of stakeholders participate in decision-making	118	56.46
Decisions are made by a small number of people, without wider consultation	87	41.63
We wait for someone else to decide for us	4	1.91
Total	209	100.00

Source: Authors' calculations

The majority of respondents (38.76%) chose the answer that in most cases, residents of Azanja team up and cooperate to achieve common goals. A significant portion of respondents (35.41%) believe that the residents of Azanja always quickly and easily team up to achieve common goals. Considerably fewer (22.01%) chose the answer that sometimes they team up and cooperate. None of the respondents chose the answer that residents of Azanja never manage to team up and cooperate to achieve goals (*Table 9*).

Table 9. Responses to the question "How are partnerships formed between residents in Azanja?"

Answers	N	%
We always quickly and easily team up to achieve common goals	74	35.41
In most cases, we team up and cooperate	81	38.76
Sometimes we team up and cooperate	46	22.01
Only in individual cases	8	3.82
Almost never	0	0
Total	209	100.00

Source: Authors' calculations

Over half of the respondents (51.20%) believe that solidarity and community spirit in Azanja are at a very high level because they can almost always count on help. One-third of the respondents (33.01%) believe that solidarity and community spirit are mostly present in the local community, and only 0.96% believe it is a rare occurrence. None of the respondents indicates that there is no solidarity or community spirit in Azanja (*Table 10*).

Table 10. Responses to the question "How do you assess solidarity and community spirit in Azanja?"

Answers	N	%
At an exceptionally high level - I can always count on help from the community	31	14.83
At a very high level - I can almost always count on help from the community	107	51.20
Mostly - I can sometimes count on help from the community	69	33.01
Almost never - I can very rarely rely on help from the community	2	0.96
Never - There is no solidarity or community spirit in Azanja	0	0
Total	209	100.00

Source: Authors' calculations

The level of cultural capital development in Azanja

One-fifth of the respondents (20.10%) strongly agree with the statement that there are many cultural and historical monuments in and around Azanja that are interesting to tourists. Additionally, 45.45% of the respondents agree with the statement. However, slightly more than a quarter of the respondents (25.84%) took a neutral stance on this statement, and 8.13% shows disagreement. Only 0.48% of the respondents strongly disagree with this statement (*Table 11*).

Table 11. Responses to the statement "Azanja has many cultural and historical monuments that are interesting to tourists"

Answers	N	%
Strongly agree	42	20.10
Agree	95	45.45
Neutral attitude	54	25.84
Disagree	17	8.13
Strongly disagree	1	0.48
Total	209	100.00

Source: Authors' calculations

Over half of the respondents (54.55%) strongly agree with the statement that traditional festivals and cultural events organized in Azanja can be of interest to tourists, while 27.75% expressed agreement. A neutral stance was taken by only 7.65% of respondents, and a disagreement by 10.05%. None of the participants in this research strongly disagreed with this statement (*Table 12*).

Table 12. Responses to the statement "Traditional festivals and cultural events are organized in Azanja that can be interesting to tourists"

Answers	N	%
Strongly agree	114	54.55
Agree	58	27.75
Neutral attitude	16	7.65
Disagree	21	10.05
Strongly disagree	0	0
Total	209	100.00

Source: Authors' calculations

According to the research results (*Table 13*), a total of 56.94% of respondents agree with the statement that Azanja has preserved its customs and old crafts, with 15.31% of respondents strongly agreeing and 41.63% agreeing. However, a significant portion of respondents (25.36%) took a neutral stance on this statement, while 17.22% expressed a desagreement. Only 0.48% of respondents strongly disagree with the statement. These attitudes of the respondents indicate that Azanja has not preserved old crafts to a great extent.

Table 13. Responses to the statement "Azanja has preserved its customs and old crafts"

Answers	N	%
Strongly agree	32	15.31
Agree	87	41.63
Neutral attitude	53	25.36
Disagree	36	17.22
Strongly disagree	1	0.48
Total	209	100.00

Source: Authors' calculations

Only 18.18% of respondents consider the gastronomic offer in Azanja to be excellent, while 34.93% rate it as very good. A significant portion of the surveyed residents (31.10%) rate the gastronomy in Azanja as good, and 14.83% as satisfactory. Only 0.96% of respondents consider the gastronomic offer to be unsatisfactory (*Table 14*). The obtained results suggest that residents believe that Azanja, in this segment, does not have a competitive advantage for the development of rural tourism.

Table 14. Responses to the task "Rate the gastronomic offer in Azanja"

Answers	N	%
Excellent	38	18.18
Very good	73	34.93
Good	65	31.10
Satisfactory	31	14.83
Unsatisfactory	2	0.96
Total	209	100.00

Source: Authors' calculations

The level of economic capital development in Azanja

Of the total number, 10.53% of respondents rely entirely on agricultural income, while over a quarter (25.36%) of respondents are predominantly financed by agricultural activities (earning about 80% of their income from agriculture). The majority of respondents (43.06%) stated that half of their family budget comes from agriculture, and half from other activities. Only 1.91% of respondents do not earn income from agriculture but are fully financed from other sources (*Table 15*). Based on these results, it can be concluded that agriculture is of great importance to the residents of Azanja. Almost three-quarters of the residents are strongly connected to agriculture, as it provides them with over half of their income.

Table 15. Responses to the question "To what extent does agricultural income contribute to your family budget?"

Answers	N	%
100%	22	10.53
80%	53	25.36
50%	90	43.06
30%	25	11.96
Less than 30%	15	7.18
I do not earn income from agriculture	4	1.91
Total	209	100.00

Source: Authors' calculations

The results indicate that 41.63% of respondents express a willingness to supplement their income with income from tourism. However, as many as 44.02% of respondents were undecided or unable to answer this question. Therefore, they are unsure whether they should engage in rural tourism to earn additional income. Particularly interesting is the fact that 14.35% of respondents answered this question negatively (not willing to offer rural tourism services) (*Table 16*). Based on these research results, it can be assessed that the opinions and attitudes of the respondents on this question are divided.

Table 16. Responses to the statement "Are you willing to supplement your income with income from tourism?"

Answers	N	%
Yes	87	41.63
I do not know	92	44.02
No	30	14.35
Total	209	100.00

Source: Authors' calculations

The results indicate that the majority of respondents (40.67%) are not prepared to exclusively engage in rural tourism and derive the majority of their income from it. However, a large proportion of respondents (32.54%) are uncertain about whether they are ready to take this step. A small number of respondents (26.79%) are willing to take this step and to exclusively engage in rural tourism (*Table 17*).

Table 17. Responses to the statement "Are you willing to exclusively engage in rural tourism, i.e., to earn most of your income from rural tourism?"

Answers	N	%
Yes	56	26.79
I do not know	68	32.54
No	85	40.67
Total	209	100.00

Source: Authors' calculations

Only 18.66% of respondents believe that their rural household has the facilities to accommodate tourists. The majority (44.50%) only partially possess the necessary

conditions to provide accommodation for visitors in their rural households, while 36.84% do not have such possibilities (*Table 18*). This result indicates that only one-fifth of Azanja residents surveyed could offer accommodation services to visitors relatively quickly and without significant investment.

Table 18. Responses to the question "Do you have the facilities to accommodate tourists in your rural household?"

Answers	N	%
Yes	39	18.66
Partially	93	44.50
No	77	36.84
Total	209	100.00

Source: Authors' calculations

The majority of respondents, almost 50% (46.89%), partially have the facilities and capabilities to serve tourists food and drinks produced on their own rural household. However, one-third of respondents do not have these conditions and capabilities. Only one-fifth of respondents (20.10%) have the facilities and capabilities to serve tourists food and drinks produced on their own rural household (*Table 19*).

Table 19. Responses to the question "Do you have the facilities and capabilities to serve food and drinks to tourists that you produce on your own rural household?"

Answers	N	%
Yes	42	20.10
Partially	98	46.89
No	69	33.01
Total	209	100.00

Source: Authors' calculations

The research results indicate that the majority of respondents (38.76%) believe that Azanja is particularly known for its *rakija* (a type of fruit brandy). Following that, 14.35% of respondents believe that Azanja is known for its dairy products, 11.96% of respondents chose honey, while 11.48% chose wine (*Table 20*).

Table 20. Responses to the question "For which products is Azanja particularly known?"

Answers	N	%
Rakija (a type of fruit brandy)	81	38.76
Dairy products	30	14.35
Honey	25	11.96
Wine	24	11.48
Bakery products	20	9.57
Cured meat products	18	8.61
Traditional craft products	5	2.39
Processed fruit	4	1.91
Teas and medicinal herbs	2	0.96
Total	209	100.00

Source: Authors' calculations

Only 10.53% of respondents believe that investments of up to 10,000 EUR would be sufficient to provide the conditions for engaging in rural tourism. However, the majority of respondents (45.45%) estimate that they need larger investments (from 10,001 to 30,000 EUR). A significant portion of respondents (34.93%) estimated that even larger investments (from 30,001 to 50,000 EUR) are necessary. Finally, 9.09% of respondents project the necessary investments to be over 50,000 EUR (*Table 21*).

A deeper analysis of the obtained responses leads to two conclusions. First, it is evident that the economic potential of most households in and around Azanja is insufficient for engaging in rural tourism. Second, most rural households require significant investments (between 30,000 and 50,000 EUR) to provide the conditions for offering rural tourism services.

Table 21. Estimated investments that Azanja residents consider necessary to engage in rural tourism

Answers	N	%
Up to 10.000 EUR	22	10.53
From 10.001 to 30.000 EUR	95	45.45
From 30.001 to 50.000 EUR	73	34.93
Over 50.000 EUR	19	9.09
Total	209	100.00

Source: Authors' calculations

The majority of respondents (62.20%) believe that financial aid from the state is the most suitable source of funding for rural tourism. A significant portion of respondents (31.10%) think that rural tourism should be mainly financed from dedicated European Union funds. Other options were considerably less represented in the responses. The fewest respondents (0.96%) believe that rural tourism should be financed through bank loans (*Table 22*). This can be explained by the fact that bank loans are expensive and the assumption that most Azanja residents are already indebted and have low creditworthiness.

Table 22. Responses to the question "Which sources of financing do you consider most suitable for rural tourism?"

Answers	N	%
Financial aid from the state	130	62.20
European Union funds	65	31.10
Bank loans	2	0.96
Foreign direct investments	8	3.83
Reliance on own resources	4	1.91
Total	209	100.00

Source: Authors' calculations

The level of human capital development in Azanja

Research results show that 10.05% of respondents stated that they are completely familiar with the regulations related to rural tourism, while 36.36% are familiar with these regulations to a large extent. Also, about 19% of respondents claim to be mostly familiar with the regulations. A significant portion of respondents (27.75%) are familiar with the regulations to a lesser extent, and only 6.70% admitted to not being familiar with regulations related to tural tourism (*Table 23*).

Table 23. Responses to the question "How familiar are you with the regulations governing rural tourism?"

Answers	N	%
Completely	21	10.05
To a large extent	76	36.36
Mostly	40	19.14
To a lesser extent	58	27.75
I am not familiar	14	6.70
Total	209	100.00

Source: Authors' calculations

About 15% of respondents believe that they completely possess the necessary knowledge and skills required for engaging in rural tourism, while as many as 30% stated that they possess this knowledge to a large extent. Similarly, 22.02% of respondents chose the option mostly as the answer to this question. On the other hand, around 24% of respondents stated that they have the necessary knowledge and skills to a lesser extent, while 8.61% stated that they do not have necessary knowledge and skills (*Table 24*). Considering the age and educational structure of Azanja's residents, it is almost certain that the majority of respondents did not objectively assess their knowledge and skills. An objective assessment would require testing in several different areas, and only then could it be more precisely determined to what extent the residents of Azanja possess the necessary knowledge and skills for engaging in rural tourism.

Table 24. Responses to the question "Do you possess the necessary knowledge and skills to attract and host tourists?"

Answers	N	%
Completely	32	15.31
To a large extent	63	30.14
Mostly	46	22.02
To a lesser extent	50	23.92
I do not have at all	18	8.61
Total	209	100.00

Source: Authors' calculations

The majority of respondents included in the research (58.37%) are not willing to attend special educational programs on rural tourism, or to expand and improve their knowledge in this area. A smaller portion of respondents (41.63%) stated that they are

willing to improve themselves in this way (*Table 25*). This fact is concerning, as without the necessary knowledge, skills, and experience, good results in rural tourism cannot be expected. In other words, this aspect of so-called human capital is of particular importance, as it represents a condition for utilizing all other forms of territorial capital.

Table 25. Responses to the question "Are you willing to attend special educational programs on rural tourism?"

Answers	N	%
Yes	87	41.63
No	122	58.37
Total	209	100.00

Source: Authors' calculations

The majority of respondents (40.67%) believe that the residents of Azanja are very entrepreneurial, but a significant portion (33.49%) rated them as mostly entrepreneurial. The option that residents of Azanja are highly entrepreneurial was chosen by 15.31% of respondents, while the option somewhat entrepreneurial was chosen by 10.53% of respondents. It should be emphasized that none of the respondents selected the answer that residents of Azanja are not entrepreneurial (*Table 26*).

Table 26. Responses to the question "To what extent are the residents of Azanja entrepreneurially oriented?"

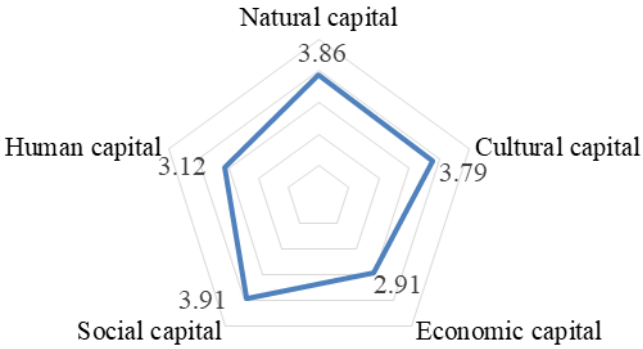
Answers	N	%
Highly entrepreneurial	32	15.31
Very entrepreneurial	85	40.67
Mostly entrepreneurial	70	33.49
Somewhat entrepreneurial	22	10.53
Not entrepreneurial at all	0	0.00
Total	209	100.00

Source: Authors' calculations

Discussion of research findings

Through the realization of field research, all the necessary data were collected for the assessment of the level of territorial capital in Azanja. The average value for natural capital is 3.86. Cultural capital was also assessed from several perspectives, and the average value is 3.79. The research results showed that the level of economic capital is relatively low (2.91). Social capital is significantly higher (3.91), but human capital is also recorded at a lower level (3.12). Figure 1 shows the average values for each dimension of territorial capital.

Figure 1. Avegage values for each dimension of territorial capital in Azanja



Source: adapted from Dejanović, 2024

No dimension of territorial capital exceeded average value 4. All scores range from 2.91 to 3.91. Based on these results, it can be concluded that Azanja does not have a single distinct advantage for the development of rural tourism, but to the greatest extent it can rely on its social capital (hospitality, harmonious relations in the community, peaceful and slow way of life, solidarity, etc.). Likewise, the natural capital can be rated as moderately high (beautiful landscapes, relief, rich flora and fauna, good geographical location). Cultural capital is also at a similar level. The residents of Azanja preserve their traditions and customs, but over time they "lost" some essential elements (old crafts). Likewise, the low level of economic and human capital represents an aggravating circumstance for the development of rural tourism in Azanja. A small number of rural households have the conditions to accommodate tourists, that is, the conditions to serve food and drinks that they have produced on their household. Estimated investments are quite high, and financing conditions are currently insufficient and unfavorable. However, even if investments in rural tourism were to be secured, there are not enough people in Azanja, with the appropriate knowledge and skills, to engage in this activity. The research results showed that the majority of Azanja residents are not ready to learn and improve their knowledge and skills in this area. Therefore, human and economic capital are „weak" points in the structure of territorial capital in Azanja (Dejanović, 2024). The improvement of these dimensions of territorial capital is a *conditio sine qua non* for the development of rural tourism in Azanja.

Conclusion

The results of the field research conducted in 2024, involving 209 residents of Azanja, revealed no single outstanding advantage for the development of rural tourism. The average values for all dimensions of territorial capital in Azanja range from 2.91 to 3.91. However, Azanja can most reliably depend on its social capital (hospitality, harmonious relationships within the community, peaceful and slow-paced lifestyle,

solidarity, reciprocity, and community spirit, etc.). Similarly, natural capital can be assessed as moderately high (beautiful landscapes, diverse terrain, rich flora and fauna, favorable geographical location). Cultural capital is also at a similar level. Namely, the residents of Azanja preserve their traditions and customs, but over time have lost some essential elements (e.g., old crafts). Nevertheless, it must be reiterated that the low level of economic and human capital presents the weak points and challenging circumstances for the development of rural tourism in Azanja.

This paper has several implications. From a theoretical standpoint, this paper contributes to the expanding body of knowledge on rural tourism, a topic of increasing academic interest. By examining the interplay of territorial capital dimensions in the context of rural tourism development, this paper enhances the understanding of the multifaceted factors influencing the attractiveness and sustainability of rural destinations. From a practical standpoint, the findings of this research offer valuable insights for policymakers, tourism practitioners, and local communities involved in rural tourism development. By identifying the strengths and weaknesses of Azanja's territorial capital, this research provides a basis for formulating targeted strategies to enhance the region's appeal to tourists and foster sustainable rural tourism development. The emphasis on social capital highlights the importance of community engagement and collaboration in creating a welcoming and authentic rural tourism experience. Furthermore, this research has social implications by shedding light on the potential of rural tourism to revitalize rural areas and improve the livelihoods of local communities. By recognizing the diverse components of territorial capital, this research underscores the need for a holistic approach to rural development that considers not only economic factors but also the social, cultural, and natural assets of a region.

This research, while insightful, is not without limitations. The focus of this paper is only on one place, Azanja, which consequently limits the generalizability of the findings to other rural places. Additionally, the reliance on self-reported data through questionnaires may introduce biases in the assessment of territorial capital dimensions.

The proposition for future studies is to conduct longitudinal research and to examine the changes in territorial capital and their impact on rural tourism development over an extended period. This would provide insights into the long-term sustainability of rural tourism initiatives. Furthermore, it would be beneficial to apply qualitative research methods, such as interviews and focus groups, to gain a deeper understanding of the perceptions and experiences not only of residents, but also of tourists that are interested in rural tourism.

Conflict of interests

The authors declare no conflict of interest.

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THE ROLE OF COMMUNICATION MANAGEMENT IN THE DEVELOPMENT OF RURAL AREAS

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ABSTRACT

The role of communication management in the development of rural areas is becoming increasingly significant for achieving sustainable social and economic growth in these communities. Effective communication and information management are key factors in connecting local actors, fostering collaboration among organizations, and promoting rural areas as attractive destinations for tourism and investment. Through the analysis of best practice examples, this paper explores the strategies and tools of communication management that contribute to enhancing the quality of life in rural areas. Special emphasis is placed on digital media and social networks as channels for promoting local products and traditions, facilitating easier connections with broader audiences and markets. The aim of the paper is to highlight the importance of a planned and tailored approach to communication that can contribute to the long-term development and sustainability of rural communities.

Introduction

The development of rural areas represents a key aspect of sustainable development for a country, as these communities encompass a significant portion of its territory and natural resources. Although rural areas often face challenges such as a lack of infrastructure, limited economic opportunities, and population migration, communication management can play a crucial role in reversing these trends. Through strategic planning and the

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application of communication tools, it is possible to improve the awareness of the local population, connect them with potential investors and tourists, and enhance collaboration between various sectors.

In the context of rural development, communication management refers to the process of planning and implementing communication strategies aimed at improving the economic and social status of rural communities. These strategies include the use of digital media, social networks, and other channels for promoting local products and cultural resources, which contributes to creating authentic brands for rural destinations and attracting the attention of a wider audience (Mendes & Laureano, 2021).

In modern conditions, where digital platforms have become the dominant means of communication, rural areas have the opportunity to become more accessible and recognizable through innovative communication approaches (Stefanović, et al., 2024). However, to achieve this goal, it is necessary to develop tailored strategies that correspond to the specifics of the local environment. Understanding local traditions, customs, and languages enables the creation of messages that are relevant and appealing to the target audience. It is advisable to use local products and services, which can attract tourists seeking authentic experiences. Promoting local food, crafts, and events can increase interest in rural destinations. Effective strategies may involve utilizing local media, social networks, and other platforms popular in the community (Jovanovic, et al., 2024). Organizing workshops or informational sessions for local producers and tourism workers can help develop the skills necessary for effective communication and product promotion (Cvijanović, et al., 2023; Cicmil et al., 2023). Regularly monitoring the effectiveness of communication strategies and adjusting approaches based on feedback from the community ensures long-term sustainability and relevance.

Effective communication plays a crucial role in the promotion and sale of agricultural products, as well as in the development of rural tourism. In the context of agribusiness, well-designed communication strategies allow producers to successfully present their products and contribute to their competitiveness in the market. Precise audience targeting and authentic stories about production build consumer trust and strengthen brands. On the other hand, communication is equally significant for the development of rural tourism, as it allows for the transmission of the attractiveness of rural areas and the promotion of authentic experiences related to rural life and work. This promotion can attract visitors, support the local economy, and contribute to the sustainable development of rural communities.

Through the analysis of specific examples of good practices, this paper will highlight the most important communication strategies that have enabled the successful transformation of rural areas, as well as the key challenges faced by rural communities in the process of their implementation.

Literature Review

In contemporary society, communication plays a crucial role in the development of all aspects of life, particularly in rural areas. In this context, communication management becomes essential for achieving sustainable development in rural communities. Effective communication enables better connections between local populations and resources, programs, and initiatives that can enhance quality of life. Additionally, communication management contributes to empowering communities by informing and actively involving citizens in decision-making processes.

The role of communication in promoting agricultural products and developing local tourism is becoming increasingly significant with the rise of digitalization and the widespread availability of the internet. The literature review shows that communication strategies, especially digital marketing and social media, play a key role in promoting agricultural products and connecting rural communities with tourists, thereby increasing interest in local products and fostering economic development. With adequate support and a strategic approach, rural tourism can significantly improve the standard of living and economic opportunities in rural areas of Serbia (Dimitrijević, Ristić, Bošković, 2022).

Today, digital marketing is the only strategy that uses traditional means of advertising to attract clients and entice them into the virtual realm. In addition to the classic firm growth techniques of using Internet resources and traditional means of promotion, digital marketing leverages the latest technological advancements that allow you to engage with clients in an effective manner (Stevanović, et al., 2022). When using digital marketing tools, it is important to consider several factors, such as high interactivity, which shows up as immediate and direct feedback to the audience; the ability to measure any user action; and the capacity to customize advertising messages and products for specific target audience segments (Zhang, et al, 2021; Ristić et al., 2023; Dašić, et al., 2023a). Digital marketing has a significant positive impact on the business performance of companies in the agricultural sector of Serbia. The application of digital tools can contribute to increased sales, enhanced brand recognition, and better communication with consumers. Although many companies in this sector have yet to fully exploit the opportunities presented by digital marketing, research shows that companies that have implemented digital strategies report better competitiveness and higher profitability (Mihailović et al., 2024).

According to research by Mendes and Laureana (2021), digital communication strategies, such as social media, allow farmers to reach a wider audience and raise awareness about local products. They emphasize that by utilizing digital platforms, agricultural producers can communicate directly with consumers, sharing stories about the origins of their products, cultivation methods, and the cultural significance these products hold. Such direct communication strengthens consumer trust and encourages the purchase of local products, thereby contributing to the sustainable development of rural communities.

Information technologies have advanced significantly over the last few decades, particularly those that can be applied to every facet of human endeavor (Dašić, et al., 2023b). The use of social media platforms such as Facebook, Instagram, and Twitter allows farmers and tourism organizations to effectively disseminate information and visually showcase their products, further motivating consumers (Onitsuka, 2019; Mihailović, Popović, 2021; World Bank Document, 2021). Digital tools facilitate quicker market connections and enable targeted campaigns that enhance the recognition of local products while also creating a sense of authenticity and attachment to local communities.

Through digital communication, rural communities have the opportunity to present not only their products but also the tourism potential of their regions, including traditional agriculture, ethno-homesteads, and local festivals. When local products are promoted as part of the tourism offering, visitors have the chance to experience authentic activities, often involving tastings and workshops (Luković & Nićiforović, 2022). This approach attracts tourists who wish to experience the uniqueness of the region and contributes to economic development through sustainable and responsible consumption.

Effective media engagement can empower local communities, enhance marketing strategies for agricultural products, and increase participation in rural tourism initiatives. Some authors recommend utilizing local media to bridge communication gaps and encourage sustainable development practices (Yu, Appiah, Zulu, Adu-Poku, 2024; Cardey et al., 2024). Additionally, residents of rural areas, by using interactive mapping tools, can contribute to the collection and construction of knowledge about the cultural heritage of their surroundings, highlighting the significance of citizens' roles in communication strategies that promote the preservation and appreciation of cultural resources (Del Espino Hidalgo Rodríguez Díaz, 2023). The focus is on initiatives that enable the transformation of rural villages into sustainable settlements through community empowerment, with particular emphasis on energy transition and technological development. An example of such an approach can be seen in the ALMIA project in Spain, where the local community and experts collaboratively developed networks for energy transition. This project serves as a model for rural revitalization that underscores the importance of communication and collective action in achieving long-term rural development (del Arco et al., 2021).

Some studies explore accessibility issues in rural areas, particularly focusing on how improved transportation solutions can enhance residents' access to essential services and economic opportunities. A multi-layered policy approach is proposed, which includes demand-responsive transport and inclusive management strategies to bridge accessibility gaps in rural regions. Additionally, it emphasizes that communication management in rural settings plays a crucial role in coordinating stakeholders, promoting sustainable mobility solutions, and raising awareness about accessibility policies. Finally, the research indicates that enhancing communication channels between policymakers and local communities improves transportation services, addressing the issue of marginalization in rural areas and fostering sustainable rural development (Vitale Brovarone & Cotella, 2020).

The development of digital communications has significantly transformed the way people in rural areas establish social connections and engage in community life. In contemporary times, social media and digital platforms have become key tools for strengthening social capital, enabling easier information exchange, connectivity, and collaboration among individuals. Social capital, defined as a network of relationships, trust, and mutual support among community members, represents one of the fundamental elements for the advancement of rural communities and the achievement of their economic, social, and cultural goals (Zolak, 2024).

In rural areas, where residents often face challenges like geographic isolation and limited access to resources, digital communication technologies enable the overcoming of these obstacles (Dašić, Živković, Vujić, 2020). Social networks like Facebook, Instagram, and local digital platforms allow communities to quickly and effectively spread information, organize initiatives, share resources, and strengthen a sense of belonging. Digital platforms also provide space for engaging different social groups, including both young and older generations, promoting inclusivity and expanding the range of participants in community activities.

Increased community engagement through digital channels contributes to empowering local populations and improving interpersonal relationships, thereby strengthening the overall social capital of the community (Luca, Zbuchea, 2021). Nyasulu and Chawinga (2018) conclude that information and communication technologies (ICT) significantly enhance the provision of healthcare services in rural communities in Malawi, despite challenges like limited infrastructure and internet access. ICT enables faster communication between patients and healthcare workers, easier monitoring of health data, and the spread of information on preventive measures, which contributes to improved health outcomes. The authors recommend greater investments in ICT infrastructure and staff training as key steps for the further development and sustainability of healthcare systems in rural areas.

Finally, some authors (Patil, 2019; Kamarudin et al., 2019) explore the significance of English language proficiency, emphasizing how communication skills impact academic and professional success. Key findings suggest that students from rural areas often face difficulties in acquiring the English language due to a lack of resources and access to quality education. Various measures are proposed to enhance communication skills, including English language courses, the use of digital tools, and interactive learning methods, to empower individuals from rural backgrounds and facilitate their access to the global job market.

Theoretical Framework

This study employs a qualitative research approach to explore the role of communication management in the development of rural areas, with a particular emphasis on the sales and promotion of agricultural products and the development of rural tourism. The qualitative methodology allows for an in-depth analysis of the experiences and

perceptions of local communities, as well as management practices in communication. Focusing on the sales and promotion of agricultural products and rural tourism development creates an opportunity to identify key communication strategies that can enhance the economic and social stability of rural communities.

Effective Communication in the Promotion and Sale of Agricultural Products

Effective communication forms the foundation of successful promotion and sales of agricultural products in today's business environment. The development of technologies and the emergence of new communication channels, particularly through the internet and social media, have enabled agricultural producers to reach a broader audience and connect with consumers in a faster and more direct manner (Lučić, 2022). Through carefully crafted communication strategies, farmers can build brand recognition, increase consumer awareness of their product quality, and gain a competitive edge in the market.

Establishing effective communication in the promotion of agricultural products allows producers not only to increase sales but also to develop long-term relationships with customers, fostering trust and consumer loyalty. By utilizing digital platforms such as social media, blogs, and online marketplaces, farmers can precisely target their desired audience, providing information about the origin of their products, production methods, as well as health and environmental benefits. This information becomes increasingly important in an era where consumers are more conscious about what they consume and where their food comes from. In addition to digital channels, traditional forms of promotion, such as fairs, events, and tastings, continue to play a crucial role in bringing products closer to end consumers.

Authors Mendes and Laureano used a survey methodology involving managers and business owners in the agricultural sector to gain insight into their use and perception of digital marketing. They highlight that digital marketing can play a critical role in enhancing branding, expanding market reach, and increasing revenue in the agriculture sector. The study shows that the most commonly used tools include social media (particularly Facebook and Instagram), search engine optimization (SEO), and e-commerce platforms. These tools enable businesses to interact directly with consumers and provide better opportunities for market analysis and understanding consumer behavior. The benefits of digital marketing application include increased sales, greater product visibility, and improved access to consumer needs information. However, the study points to challenges faced by agribusiness companies in implementing digital strategies. The main obstacles include a lack of digital skills among employees, limited marketing budgets, and, in some cases, resistance to changes in traditional business practices (Mendes, Laureano, 2021).

De Silva's (2020) research identifies several key strategies effective in increasing the visibility and sales of agricultural products, including:

1. Direct Communication with Consumers – Utilizing platforms like Facebook and Instagram to showcase products, inform about seasonal offerings, and maintain direct contact with customers.

2. Use of Visual Content – Posting photos and videos that display the production process, quality, and freshness of products, enhancing transparency and consumer trust.
3. Personalized Interaction – Responding to comments and messages from consumers to build a community connection and foster customer loyalty.
4. Producer Storytelling Campaigns – Emphasizing stories about the farm, tradition, and values of small-scale farmers, which contributes to authenticity and emotional connection between consumers and products.

Social media offers low-cost, high-potential promotion avenues for agricultural products, especially for small-scale producers with limited resources. Through these platforms, farmers can reach targeted consumers directly, bypassing traditional distribution channels.

Alshammari and Kora (2019) conclude that effective communication strategies are key to successful agricultural product marketing. Their literature analysis highlights the importance of targeted communication approaches, such as the use of digital channels (particularly social media), tailoring messages to meet consumer needs, and transparency in presenting product information. These strategies contribute to higher consumer trust and long-term loyalty, which are especially valuable in the competitive agribusiness sector.

The authors recommend several guidelines to enhance communication strategies in agricultural marketing: Customized Digital Presence: Creating specific content for social media, including visual displays and videos, that directly address the needs of target groups; Farmer Communication Training: Providing training for small and medium-sized farmers to use digital tools more effectively for direct communication with customers; Transparency and Authenticity: Highlighting information about the origin, cultivation methods, and quality of products to increase consumer trust; Market Segmentation: Using segmented campaigns directed at specific demographic and geographic segments to increase the likelihood of successful promotional activities.

Fountas and Koundouras (2020) conclude in their research that adopting information and communication technologies (ICT) among farmers in Greece positively impacts productivity, efficiency, and the sustainability of agricultural practices. The study shows that ICT enables better resource management, quicker data-driven decision-making, and improved control over work processes. However, the authors note certain obstacles, including limited digital literacy, high implementation costs, and restricted internet access in rural areas.

In the work by Kinnunen and Pärssinen (2022), it is emphasized that the most commonly used social media platforms in Finland's agricultural sector are Facebook, Instagram, and YouTube, each utilized in unique ways to promote agricultural products and connect with consumers:

1. Facebook – Farmers use Facebook to share stories about farm work, seasonal activities, and content that showcases the authentic rural lifestyle. The platform allows for direct interaction with consumers through comments and messages, fostering a sense of community and loyalty. Facebook groups also serve as gathering spots for local product enthusiasts, where farmers can introduce new products and receive feedback.
2. Instagram – This visually oriented network is used to display high-quality photos and short videos of products, enhancing brand promotion. Farmers often share behind-the-scenes content, like production process photos or daily work snapshots, which engages consumers and builds transparency.
3. YouTube – Employed for educational videos and family farm stories, often in vlog format. Longer videos allow farmers to explain production processes from cultivation to packaging, adding brand value and increasing consumer trust. YouTube channels may also include product usage guides, recipes, or stories about sustainable practices.

In conclusion, the authors assert that the combination of these networks contributes to creating a strong digital presence, enabling farmers to actively manage their brand image, increase sales, and establish long-term relationships with customers.

The introduction of social media and influencers as promotional tools has significantly transformed the way agricultural products are marketed and reach consumers in Croatia. Agriculture is a crucial segment of the economy, and the influence of social media influencers is becoming increasingly significant. Through authentic content and direct communication with followers, influencers can create recognition and trust in domestic products. Given the specific needs and interests of consumers in Croatia, involving influencers in promoting agricultural products offers targeted advertising opportunities that not only enhance product visibility but also encourage local consumption and raise awareness of the quality of domestic production. Researching the impact of influencers in this context can contribute to understanding best practices and strategies that producers can implement to effectively penetrate the market, relying on the credibility and consistency of digital marketing on social media (Mandušić, Katalinić, Blašković, 2023).

Effective Communication in Rural Tourism Development

The development of rural tourism is becoming increasingly important as a means of improving the economic position of rural communities, preserving cultural heritage (Dašić, 2022), and promoting natural resources. In this process, effective communication plays a crucial role by connecting potential tourists with rural destinations and raising awareness of the unique experiences that rural areas offer. Through clear and targeted communication strategies, rural communities can attract a larger number of visitors, promote local products and services, and build a recognizable image.

Today, welcoming guests in rural areas has become the norm and even a sign of smart management. It is not uncommon for businesses that were once exclusively agricultural to realize that tourism generates a higher net income than agriculture. Accommodation on farms is often not inexpensive; basic national and even international hotel chains typically cover only the lower segment of the market.

In the modern age, digital platforms such as social media, websites, and travel blogs have become powerful tools for promoting rural tourism. Through these channels, information about natural beauty, cultural events, traditional customs, and accommodation capacities in rural areas (Mihic et al., 2023; Pavlović et al., 2023) can quickly and effectively reach a wide audience. Additionally, direct communication with visitors allows rural destinations to better understand their needs and expectations, contributing to the enhancement of tourism offerings and strengthening the local economy.

The work of González and Vázquez (2019) explores the role of communication strategies in promoting tourism in rural areas. The authors analyze how various communication approaches, including digital media and personalized promotional campaigns, can enhance the attractiveness of rural destinations for tourists. Key findings indicate that effective communication can significantly improve the visibility of rural tourist destinations and encourage sustainable tourism growth by connecting with the specific interests and needs of target tourist groups. Other tourism scholars, such as Doležal and Šauer (2020), assert that effective communication is crucial for the development of rural tourism, as demonstrated by the example of the Czech Republic. They conclude that clear and strategically driven communication among local tourist organizations, residents, and visitors contributes to increased visitation and economic opportunities in rural areas. Through case studies, the authors illustrate that transparent communication is vital for building trust and a positive image of the destination. The paper emphasizes the need for further investments in communication strategies to better inform potential tourists and enhance collaboration among all stakeholders in the rural tourism sector.

Engaging local communities in the planning and implementation of tourism projects is a key aspect of sustainable tourism, which can significantly contribute to the economic, social, and environmental stability of these communities. Involving local residents not only allows for a better understanding of their needs and expectations but also strengthens their sense of belonging and responsibility toward tourism resources. Active participation of local communities can help create more authentic and sustainable tourism offerings that reflect the cultural values and traditions of the area. Additionally, collaboration with local stakeholders can help reduce conflicts of interest and increase support for tourism projects, resulting in more positive experiences for both tourists and hosts. In light of these benefits, it is essential to develop strategies that empower local communities and include them in all phases of tourism planning. This is supported by the research of Demirović Bajrami et al. (2020), which suggests the importance of engaging local communities in the planning and implementation of tourism projects. They recommend developing programs to increase awareness and education on sustainable tourism, as well as strategies to enhance social cohesion within

the community. One of the main factors influencing support for sustainable tourism is social cohesion within the community. Residents who are closer to one another and have stronger social ties are more likely to support sustainable initiatives. Economic feasibility and expectations of financial benefits from tourism are also significant factors. Residents who believe tourism will bring economic benefits are more inclined to support it. Rural tourism can be a major factor in economic revitalization, but its success depends on the community's ability to effectively communicate its resources and attractions (Morrison, 2018). Educational level and awareness of sustainable development directly influence attitudes toward tourism. Residents with higher education and greater environmental knowledge showed stronger support. Active participation of local residents in planning and decision-making processes increases their support for sustainable tourism. When they feel included, they are more likely to view tourism as a positive factor for their community. In Ireland, local communities have implemented communication strategies that utilize digital platforms to promote their tourism offerings. These initiatives have enabled direct interaction with tourists, as well as transparent sharing of information about local events and attractions. For example, by using social media, local producers and hospitality providers have created unique campaigns that attracted visitors, contributing to the growth of rural tourism. This strategy increased tourist traffic in some areas by more than 20% in a single season. In Italy, the "Sustainable Tourism" initiative is focused on promoting rural areas through communication strategies that highlight local stories, traditions, and culture. Using social media and video content, local communities launched a campaign centered on authenticity and visitor experiences. This strategy resulted in a 25% increase in visits to certain rural areas, as well as a heightened interest in local products (Fountas & Koundouras, 2020).

Some authors (Ritchie & Crouch, 2017) believe that destination marketing organizations play a central role in creating and promoting the image of rural areas. They are responsible for developing marketing strategies and communicating with tourists, which includes using various channels such as social media, the internet, and traditional media. These agencies must work closely with local communities and entrepreneurs to create authentic tourism products. Involving local residents in tourism promotion can enhance visitor experiences and empower the community.

Collaborative tourism planning is an increasingly important approach in the development and management of tourism destinations, emphasizing cooperation among all relevant stakeholders, including local communities, governments, the private sector, and non-governmental organizations. This approach allows for the creation of synergy between different interests and needs, ensuring sustainable tourism development that considers ecological, social, and economic aspects. Given the complexity and dynamism of the tourism sector, collaborative planning not only aids in identifying and addressing challenges but also in developing shared visions and strategies that can contribute to the long-term sustainability of destinations. The inclusion of diverse perspectives enriches the decision-making process, strengthens mutual trust among stakeholders, and fosters

innovation. In this sense, the significance of collaborative planning lies in its ability to transform the tourism sector into a more inclusive and responsive system that leverages local resources and potentials while meeting visitor needs (Bramwell & Lane, 2016).

Conclusion

Effective communication strategies are of great importance for promoting agricultural products and developing rural tourism. By using digital tools and social networks, agricultural producers and tourism organizations can increase the visibility of their products and offers, encourage sustainable development, and improve the economic status of rural communities.

The use of social media and information technology can significantly enhance sales and consumer engagement, creating long-term value for local communities and farmers. Digitalization holds the potential to improve rural development but also to deepen existing inequalities in access to information and communication technologies (ICT). The adoption and utilization of ICT in rural areas are often limited, which slows down economic and social development in these regions. Factors such as infrastructure, education level, and economic conditions contribute to the disparity between urban and rural communities. Several studies call for policies to reduce these inequalities through improved ICT access, education, and support for adopting digital technologies in rural areas, which would enable more equitable development in the digital age (Salemink, Strijker, Bosworth, 2017).

One of the main factors supporting sustainable rural tourism development is social cohesion within the community. Residents who are closer to one another and have stronger social bonds are more inclined to support certain initiatives. Additionally, collaborative planning and effective communication play a crucial role in the sustainable tourism development of rural communities.

Conflict of interests

The authors declare no conflict of interest.

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ЗАПИСНИК

са XVII. (седамнаесте) редовне седнице Скупштине
НАУЧНОГ ДРУШТВА АГРАРНИХ ЕКОНОМИСТА БАЛКАНА
(НДАЕБ)
одржане 27.03.2024. године електронским путем.

Констатовано је да је кворум за ову седницу испуњен, с обзиром да је 56 чланова измирило чланарину за 2023. годину (према достављеној евиденцији). Тиме су формално – правно (према Статуту) обезбеђени услови за правоснажно одлучивање, с обзиром да се електронској седници одазвало 31 чланова, од 56 чланова колико их испуњава услове за одлучивање.

Седници су се одазвали: Биљана Грујић Вучковски, Дејан Дашић, Јонел Субић, Лана Настић, Маријана Јоксимовић, Душан Јоксимовић, Милош Пјанић, Радомир Јовановић, Соња Милутиновић, Тања Вујовић, Тања Станишић, Владимир Радивојевић, Данијела Пантовић, Маја Младеновић, Горица Цвијановић, Милан Марковић, Дејан Секулић, Драго Цвијановић, Горан Максимовић, Жељко Вашко, Александар Остојић, Љиљана Арсић, Жељко Војиновић,Зоран Симоновић, Ивана Вучинић, Анђелка Трипковић, Милош Миловановић, Марко Јелочник, Љиљана Рајновић, Сања Добричанин, Бранко Михаиловић.

Д Н Е В Н И Р Е Д

1. Усвајање записника са XVI (шеснаесте) ванредне седнице Скупштине Научног друштва аграрних економиста Балкана (НДАЕБ) одржане 14.11.2023. године. (Прилог бр. 2)
2. Извештај о раду НДАЕБ-а за 2023. годину (Прилог бр. 2)
3. Информација о финансијском пословању за 2023. годину (Прилози бр. 3.1; 3.2; 3.3.)
4. План активности НДАЕБ-а за 2024.годину (Прилог бр. 4)
5. Разно

Чланови Скупштине НДАЕБ-а једногласно су гласали ЗА, по свим тачкама предложеног дневног реда.

С поштовањем,

Београд, 31. март, 2024.године

Председник НДАЕБ-а
Проф. др Горан Максимовић, с.р.

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Example:

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

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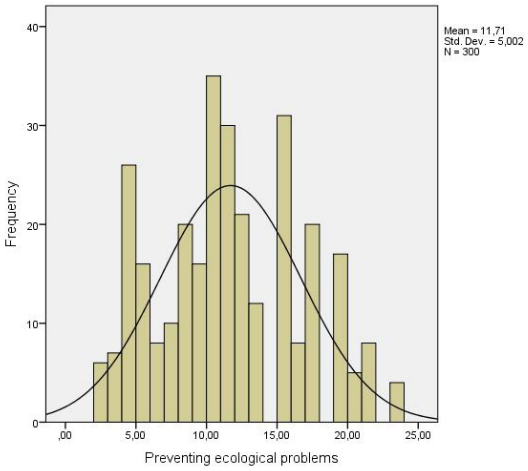
Figure 1. Agriculture, value added (% of GDP)



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