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CONTENT

THE FOOD IMPORT – INTERNATIONAL TOURISM NEXUS IN CROATIA: AN APPLICATION OF THE ARLD AND NARDL APPROACH AND CAUSALITY

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ABSTRACT

The purpose of this study is to examine the relationship between food import dependency and the international tourist arrivals in Croatia during the period spanning 1969-2018. In this paper, we provide empirical evidence on the above hypothesis by detecting the causality between foods imports represented as various food products and international tourism arrivals, that suit as a proxy for tourism consumption. The study method was able to capture symmetries in the relationship between some food import products and tourism, known as autoregressive-distributed lags, but not for all imported food items designed for this study. Since an asymmetric analysis, in such cases, requires the use of nonlinear models, we use nonlinear models and find evidence of asymmetric cointegration. For almost two decades before the global COVID-19 crisis, we conclude, Croatia's food imports grew rapidly, and these imports appear to be mainly driven by exports of services linked to pervasive tourism expansion.

Introduction

The all-important tourism sector in Croatia generates large revenue inflows while increasingly driving the imports of food products up to unsustainable levels (Orsini, 2017). Croatia is ironically in the European club of food insecurity, although it possesses a huge amount of fertile land. The food-import dependency index in Croatia exceeds the food export dependency index (Sahin, 2019; Blagojević et al., 2020). With it, instead of healing tourism's effect on the economy, come some unrecognisable social costs in its rural areas: under-employment, resources vesting, idle capacity. The mass over-tourism so emblematic before the pre-COVID-19 era, for better or worse had deepened food dependency. If

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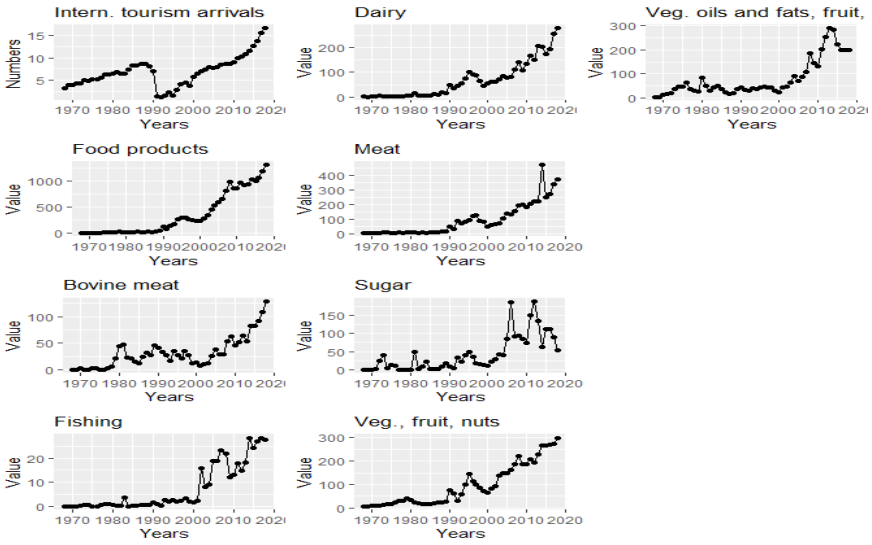
tourism does not change its negative impact on the food trade misbalance, in Croatia, it will continue to diminish its domestic agrarian output, downgrading rural regions' landscape and demoralising the new generation of the country's inhabitants, nudging and coercing them to leave the country. The present paper addresses a literature gap by examining the impact of international tourism on food product imports growth in this country.

Despite the fact that food imports have skyrocketed over the past few decades (see *Fig.1*), we do not know, without a formal analysis, if that was mainly driven by international tourism.

The data regarding food imports in Croatia during the studied period (1969-2018), in the long term, shows that food supply from imports increased very quickly after 1990. We observe similar trends in almost all types of food imports (meat, dairy, vegetables, and even fishing). According to the up-to-date statistics, the food trade deficit has increased since the last year of our analysis: it jumped up to 23% in 2019, concerning the year before on a short-term basis. Furthermore, the food imports covering exports decreased, in the same year, from 67 to 64%.

After a sharp time contraction of international tourism arrivals – followed by a one-time food import decrease – indicated by a structural break in years around 1990, international tourist arrivals, along with food imports, were trending steadily upward. We argue, in this paper, that tourism pivotally affected the food import boom because the food import growth here paralleled, very closely, that movement by international tourist arrivals. Those overlapping occurrences, which so long have gone hand in hand, motivated us to reconsider research on a more formal basis. Is it likely that increased imports stem from increased food consumption by the international tourists who fill the restaurants in Croatia? Does the lack of a punitive tariff on those kinds of imported goods mainly from the EU countries sustain the aforementioned trends?

Figure 1. Tourist arrivals and food imports in Croatia 1969-2018



Notes: arrivals in millions; otherwise in million USA $; source: own calculation

In this context of prolonged food dependency, assumed to be caused by tourism, we will try to find some evidence of a symmetric, as well as an asymmetric (where positive and negative shocks to the food import due to tourism are unequally likely) causality impact of tourism on food import.

After searching recent similar literature adhering to this topic, we found subsequent papers based on the idea of linkage between tourism demand and food product imports. The increased demands for food consumption surged during active tourism periods to provide energy for temporary newcomers from abroad; that food provides with it essential nutrients needed for bodily functions, and thus eating is simultaneously regarded as an 'obligatory' tourist activity (Richards, 2003) and enjoyment. Pirani and Arafat (2016), after assessing the food trade-in balance over the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) are investigating several avenues to secure food imports, mainly through foreign agricultural land ownership. The rapidly-expanding tourism sector has raised the issue of the relevance of food security and sustainability in that region. Bhutan, one of the landlocked lands, relies heavily on imported goods (food and beverages) from neighbouring countries such as India and Thailand, trying to develop the tourism industry, which in turn leads to significant economic leakages, primarily in agriculture (Pratt et al., 2018). Tourist food imports also mean that Jamaica's food manufacturing and processing sectors miss out on opportunities to develop, diversify, and, potentially, revitalise (Belisle, 1984). Another example is documented by Njoya and Nikitas (2020), who explain how to minimise imports of manufactured food in Senegal, reflecting on the effect of food and beverage processing, caused by tourism hotels and restaurants operating; and argue, by government backing agritourist development initiatives, such as farm-based accommodation, agricultural festivals, and farm-tours.

Mazilu et al. (2014) underline that tourism per se decreases dependence on local resources, as an increasing number of technologies, food, and health services are imported in today's globalised economy. Food imports for tourist consumption not only represent a waste of the Caribbean's precious foreign cash reserve, but also a loss of potential employment and income in agriculture, the poorest and slowest-growing sector of the economy (Belisle, 1994). Fisher (2004) examines the effect of immigration and international tourism in food product imports, which, may have an impact on the (trans-)formation of tastes in Germany.

Other papers, written by the same author, investigate the association between German wine imports from Spain and the amount of German tourists that visit the nation (Fisher and Gil-Alana, 2009). Therefore, we have paid serious attention to the 'tourism arrivals' nexus which affects demand for imported food. To that end, we have used a different approach to investigate the relationship among tourism growth and food import, namely the ARDL and NARDL cointegration tests developed by Pesaran and Shin (1999) and Pesaran et al. (2001), as well as the Granger approaches of causality analysis, based on annual data for the period spanning 1967-2018.

Materials and methods

Theoretical considerations

We defined demand for imported food products in an assumed country, in a broader sense, as a function of the income of the residents and foreign visitors. We may also assume that foreign tourists, who spend their income, are the sole, isolated food consumer in a hypothetical country. The residents do not consume that food; they prefer to eat exclusively food from domestic food growers, manufacturers, and processors. Other variables, which usually theoretically imply an impact on food import demand (such as the product's own price, the prices of close substitutes, and consumer preferences, Young and Burton, 1996), are abstracted and are out of the scope of our interest. Therefore, we will neglect those forces' impact on consumption and omit their effect on food import.

The consumer preferences hypothesis used previously had an important repercussion in simplifying our theoretical narrative: with it, we eliminate domestic breach of food demand, from the story. We also assume that tourist income, in the long run, approximately follows the magnitude of tourist arrivals; so, for purely practical reasons, we will replace the variable of foreign tourist income spending with the variable of tourist arrivals from abroad.

To set up a simple log-linear relation between the only two variables which we will deal with in this paper, we construct the following formula:

FOODIMPi= alfa + beta*ARRIVi +residual (1)

According to eq. (1), food import depends on the number of tourist arrivals. Because we need to distinguish among various imported food products, we use subscripts i. In theory, beta is expected to be positive, indicating that increased international tourist arrivals lead to a rise in imported food products; alfa is constant and e is the error term that includes all other factors affecting the food imports.

ARDL cointegration and bounds tests

Eq. (1) is generally specifying a long-run model. Since Granger causality is based on time series data short-run dynamics, and in order to not lose information from the data, we will transform eq. (1) into an error-correction form based on the short-run ARDL equation to detect the symmetric causality between two variables (FOODIMP and ARRIV). However, prior to this, we propose a few steps of pre-testing.

To analyse the long-term relationship between a set of variables, Pesaran et al. (2001) suggest the use of an autoregressive distributed lag procedure or bounds test that does not require stationary pre-testing, and which can be used regardless of whether the variables are I(0), I(1), or mutually cointegrated, given that none of the series are I(2). Despite these relaxing circumstances, we have made a verification to ascertain whether second-order integration in some time series exists; this is determined by conducting an ADF and the

DF-GLS test unit root test to eliminate further exercises with data that encompass some of the variables. Consequently, if those tests show that the FOODIMP and ARRIV time series variable is either I(0) or I(1), an analysis with that imported group of food products will continue with the bounds test. The bounds test is particularly appropriate for small samples, such as that used in this paper, in which the order of integration of the variables of interest is not known or may not necessarily be the same. The bounds test is based on the following unrestricted error correction model (UECM):

$$\Delta FOODIMP_t = const + \sum_{i=1}^{k} \beta \Delta FOODIMP_{t-1} + \sum_{i=1}^{k} \gamma \Delta ARRIV_{t-1} + \omega Y_{t-1} + \theta ARRIV_{t-1} + \varepsilon_t \quad (2)$$

where both variables are expressed in natural logarithms. An appropriate lag selection is based on the Schwarz Bayesian Criterion (hereinafter "SBC"). The automated model selection process involves choosing the maximum lag for each regressor, and is set up to be 6 (because the data is annual). The ARDL procedure allows for the possibility that the variables may have different optimal lags (after the searching process has ended), whereas this is impossible with conventional cointegration procedures. The null hypothesis, i.e. there is no long-term relationship between imported food product growth and tourist arrivals variable growth, is not rejected, after testing the *F*-statistic, when:

$H0$: $\omega=\theta=0$, against the alternative $H0$: $\omega\neq\theta\neq0$.

Pesaran et al. (2001) offer a bounds test for two sets of crucial variables instead of the traditional critical values. All variables in the first set are assumed to be zero, while all variables in the second set are assumed to be one (1). The null hypothesis of a non-existent cointegration connection cannot be rejected if the tested F-statistic (or Wald statistic) value falls below the lower bound critical value; but, if it exceeds the appropriate upper bound critical value, the null hypothesis is rejected. The inference is inconclusive if the tested F-statistic value falls between the lower and upper critical value ranges.

The set of the bound critical values for limited data was recently developed by Narayan (2005) (30 to 80 observations), and is the benchmark for *F*-statistic assessing. Furthermore, because of the potential existence of a trend in the series (if the former case is unable to find cointegration between two series), estimations are completed to satisfy the unrestricted intercept and no trend case (as an auxiliary test). Estimations are completed using an ordinary least squares procedure with a White's test for cross-sectional heteroscedasticity-consistent standard errors, and a covariance matrix, appropriate serial correlation diagnostics (the Breusch–Godfrey LM test), and the Jarque–Bera statistic for the normality test.

Symmetric causality analysis

The bounds approach is useful for determining how tourism input affects a specific group of imported food products, either by performing independent estimations of eq. (1) using ΔFOODIMPt1 as dependent variables or by determining the likelihood of a cointegration link.

If there is a cointegration relationship between the variables, the next step is to assess the short-run and long-run dynamics of the series. Hence, the ARDL eq. (2) can be re-parameterised after replacing FOODIMPt−1 and ARRIVt−1 with the lagged residuals, and becomes:

$$\Delta FOODIMP_t = const + \alpha ECT_{t-1} \sum_{i=1}^{n} \rho \Delta FOODIMP_{t-1} + \sum_{i=1}^{p} \sigma \Delta ARRIV_{t-1} + \mu_t \quad (3)$$

e.g., the error correction model *via* the two-step procedure of Engle and Granger.

In this error-correction model (please see eq. (3)), Granger predicts the possibility of two potential sources of symmetric causality.

The first is based on a first-differenced variable where ARRIV causes FOODIMP, in case significance of $\sum \sigma_i \neq 0$ is demonstrated. This type of Granger causality is short-run causality – the Wald test – which is applied for all the lag independent ARRIV variables using the joint F test. Furthermore, if the coefficient of ECTt-1 is statistically significant (by t-value), then it indicates long-run causality, specifically the second source of causality. ECTt-1 should be between 0 and 1 with a negative sign, which implies convergence of the system back to the long-run equilibrium position.

Additionally, μt represents the error terms and should be white noise and serially uncorrelated.

We will also assess reverse causality which goes from food import to tourist arrivals (a rather weird and counterintuitive direction of events). In the case of this bizarre statistical causality, we will adopt the theory that the tastes of tourists contribute to the phenomenon itself. More precisely, the Granger representation theorem states that if there is cointegration, then there is short-run Granger causality in at least one direction, i.e., the error correction term enters at least one of the equations of the error correction model. For pure statistical curiosity, a vice-versa type of causality, run out, test exercise will be done to check the validity of cointegration evidence (or implicitly the affirmation of the Granger representation theorem). Causation can, of course, be mutual.

NARDL cointegration and bounds tests

The main assumption so far in our narrative, based on eq. (2), is that if an increase in the ARRIV causes the FOODIMP to jump up, a decrease in the ARRIV must cause the FOODIMP to fall, by the same proportion. However, those two occurrences, in which we are interested, are only microscopic elementary particles framed in the broader

complex economic system, which is prone to chaotic behaviour. Albu (2006) shows that slight changes to the usual linear form of economic models make the behavior of systems simulated using the new nonlinear models more complicated, and hence more realistic. This means a lot of nonlinearity, which can distort the linear behaviour of our variables. Hence, nonlinearity changes in the ARRIV could have asymmetric effects on FOODIMP. For instance, when the ARRIV increases, more foreign mega-stores quickly open, and the number of shelves containing imported food multiplies soon after. Expected increases in tourists' future income spending because of a swift rise in ARRIV may have, in the country, a disproportionally larger impact on food imports.

When or if the imported food product paired with tourism arrivals time series in mutual relation shows the ARDL model inadequacy, we will pursue the case by applying an asymmetric NARDL model put forth by Shin et al. (2014), which solves the problem of long-run and short-run asymmetries. It is a standard approach, as it provides a dynamic error correction specification combined with the asymmetric long-run cointegration regression by separating a given time series, namely ARRIVt, into its oppositely signed partial sums positive and negative one, which will address possible asymmetries.

That conceptualised partial sum generates two new time series variables, as is outlined by eq. (4) below:

$$POS_t = \sum_{j=1}^{t} \Delta\, ARRIV_j^{+} \qquad (4)$$

$$NEG_t = \sum_{j=1}^{t} \Delta\, ARRIV_j^{-}$$

In eq. (4), the positive (POS) variable, which is the partial sum of the positive dynamics, only translates itself into an increase in the ARRIV. The negative (NEG) variable, which is the partial sum of the negative dynamics, reflects a decrease in the ARRIV. Now, we propose, replacing ARRIV, given like in specification (3) with POS and NEG variables (as in Shin et al., 2014):

$$\Delta FOODIMP_i =$$

$$\alpha + \sum_{i=1}^{n1} \beta\, \Delta\, FOODIMP_{t-1} + \sum_{i=1}^{n2} \delta_i^{+}\, \Delta POS_{t-1} + \sum_{i=1}^{n2} \delta_i^{-}\, \Delta NEG_{t-1} + \cdots$$

$$\ldots + \gamma_0 ARRIV_{t-1} + \rho_1^{+} POS_{t-1} + \rho_1^{-} NEG_{t-1} \qquad (5)$$

A newly-formed model given by specification (5), because of its uniqueness, is referred to as nonlinear autoregressive distributed lag (NARDL model). That unrestricted specification provides a bounds based test statistic and, with it, we are checking for the existence of a stable long-run association among variables of interest. So, if the ARDL bounds test fails to deliver relevant statistical evidence regarding cointegration, we will transit towards NARDL modelling.

Asymmetric causality analysis

The unrestricted specification of the NARDL error correction model in eq. (5) allows for the possibility of short-run asymmetry, which reflects two restrictions; the validity of these restrictions was tested by employing the standard Wald tests (Shin et al., 2014). The first refers to events which take place during an increase of tourist arrivals, which causes a rise in food imports: the Wald test will show $\sum \delta_i^+ \neq 0$ if the tourism arrivals are going in the opposite declining direction, meaning the force of this will have an impact on the food import path, and $\sum \delta_i^- \neq 0$ should be detected.

For long-term causality evidence in our bivariate case, we use normalised long-run estimates and a long-run specification to generate the error term. We then replace the linear combination of lagged level variables with *ECMt-1*. Regarding the significance of the same term, we will be able to establish the direction of the long-run causality. The long-run asymmetric model in this case will take the following form:

$FOODIMP_i = a + bPOS_i + cNEG_i$, where $\hat{b} = \frac{\widehat{\rho_i^+}}{-\rho_i}$ and $\hat{c} = \frac{\widehat{\rho_i^-}}{-\rho_i}$.

Data

In our study, the import is proxied by the value of various food products, which flow from abroad into Croatia: the bovine meat (*bov*), the fish (*fish*), the dairy (*dai*), the meat (*mea*), the sugar (*sug*), the vegetables, fruit, nuts (*vegfn*), the vegetable oils and fats (*vegof*), and total food products in the general sense: the food (*food*). These variables are sourced from CHELEM - International Trade (GTAP sectoral classification), with the assistance of DB-NOMICS data provider (2020), retrieved from http://www.db.nomics.world.

The international tourism arrivals (*arriv*) variable is employed as a crude measure of orientation towards tourism spending on food, and has been used as a substitute (alternative term) for tourism consumption in this study, directed to the above-mentioned food items. This data is collected from the Statistical Yearbook of the Republic of Croatia, and the period considered is that spanning 1969-2018 (SGJ). The data used is the principal annual time series in the analysis for the Croatia food dependency related to tourism. Furthermore, a dummy variable is included to account for the exact timing of the dissolution of the former Yugoslav federation of 1991. We felt that this institutional structural change in the former Yugoslav federation's past was an important event, which affected trade that proceeded following those years. We assign a value of 1 for the period before 1991 and zero for the period thereafter. All the variables used in this paper come in their natural log form.

Results and discussions

We start with an examination of the integration properties of the variables by applying the Augmented Dickey and Fuller (1979) (ADF), as well as the DF-GLS test invented by Elliott, Rothenberg, and Stock (1992). In the presence of I(2) or higher variables, the computed statistics provided by Pesaran et al. (2001) and Narayan (2005) are not valid (Ang, 2007).

Using the conventional specifications for each variable in each of the tests, the results presented in Table 1 report that there is no I(2) or higher indicated feature in the same variables. All the included variables in the examination are found to be I(1) at a level and I(0) at first differences.

Table 1. Unit Root Test ADF & DF-GLS

	Augmented Dickey–Fuller Test		**DF-GLS**
Levels	*arri*	-0.171 (2)	0.341 (1)
First diff.		-3.709(1)***	-3.547(1)**
Levels	*food*	1.936(1)	1.881 (1)
First diff.		-3.010(3)	-5.047(1)***
Levels	*bov*	0.654 (1)	0.925 (1)
First diff.		-5.526(0)***	-5.301(1)***
Levels	*fish*	1.513 (4)	0.826 (2)
First diff.		-4.224 (2)***	-7.112(2)***
Levels	*dai*	2.175(3)	1.797(2)
First diff.		-7.729(0)***	-6.139(1)***
Levels	*mea*	1.438(3)	1.275(2)
First diff.		-6.137(2)***	-7.797(1)***
Levels	*sug*	-2.212(1)	-1.131 (1)
First diff.		-5.342(2)***	-6.479(1)***
Levels	*vegfn*	1.155 (3)	0.875(1)
First diff.		-4.877(2)***	5.927(1)***
Levels	*veofof*	-0.992 (1)	-0.525(1)
First diff.		-6.316 (0)***	-5.448(1)***

Source: author's research

Notes: All the regressions include a linear trend in the levels, and include an intercept in the first differences; secondly, the numbers in parentheses are the optimal lag orders and are selected based on Schwarz Bayesian; thirdly, *, ** and *** denote the 10%, 5% and 1% levels of significance, respectively.

We attempt to set up the best of the models (in *Tables 2-6* below) and fix an optimal lag, which is crucial. With an initial lag of 6, the automated model selection, according

to minimal SBC (Pesaran and Shin, 1999), calculates the optimal lag length. They recorded evidenced cointegration between variables in various bivariate cases included dummy variable because. Hence, the variable's empirical F value surpasses critical values related to the bounds test (given in *Table 3*).

Table 2-6 also shows the estimated symmetric and asymmetric models that have passed several diagnostic tests, which indicate no evidence of serial correlation and heteroscedasticity, nor deviation from normal distribution.

Before the causality evaluation, which will require the running of eight bivariate equations for various food import variables (driven by tourist arrivals), we first check whether or not the variables of prime interest, i.e. each of the food variables and *arriv*, have any cointegration relationship.

In the first step of applying the bounds test, we specify the optimal lag length of the UECM version, i.e. eq. (1), and check the long-run level equilibrium relationship. The results are given in *Table 2* for both cases (III and V).

Table 2. Result of the cointegration test using ARDL approach and Granger causality

	International tourist arrivals causing import (arrivals → import)							
Dependent variable	Case	p and q orders	F-Test	ECMt-1	Wald test	LM-test	HET	JB-test
fish	III	4,4	5.879**	-0.879***	0.772	0.405	0.637	0.603
	V	4,4	5.065	-0.543***	0.567	0.502	0.229	0.711
dai	III	3,4	1.027	-0.840**	1.358	0.308	0.034	0.675
	V	3,4	5.937*	-0.849***	1.238	0.257	0.138	0.628
mea	III	4,4	4.470*	-0.947***	2.695*	0.004	0.313	0.438
	V	4,4	4.508	-0.831***	2.543*	0.117	0.623	0.025
sug	III	4,4	4.760**	-0.847***	4.486***	0.238	0.113	0.047
	V	4,4	6.191**	-0.934***	3.898**	0.597	0.017	0.000
vegfn	III	2,1	5.335**	-0.341***	4.082***	0.261	0.884	0.587
	V	2,1	5.715**	-0.315***	3.789**	0.186	0.772	0.485

Source: author's research

Notes:

- The critical values are derived from Tables CI (V) and CI (III) (see *Table 3* below). LM is the Lagrange multiplier test for serial correlation with a $\chi 2$ distribution, with only one degree of freedom; J-B is the Jarque–Bera test for normality, HET is the White test for heteroscedasticity with a $\chi 2$ distribution, with only one degree of freedom; asterisks *, ** and *** denote statistical significance, respectively, at the 1%, 5% and 10% levels. Italic and bold labels for the variables indicate bounds testing repeats, according to case III.

- Long-run Granger causality is conducted using the t-statistics of α coefficient, which stands before the ETCt-1 term, the latter of which measures how fast the deviations from the long-run equilibrium die out following changes in each variable, according to eq. (2).

- Short-run Granger causality is conducted using Wald statistics, testing $H0$: $\sigma = 0$ that stands as a coefficient before the *arriv* variable for all p lags, according to eq. (2). The figure in italics captures the arriv input as a dependent variable, F-stat. (objective is to inspect reverse causality).

Table 3. Critical Values for the (N)ARDL Modelling Approach Related to the Bounds Test

	Case V		**Case III**	
	I(0)	I(1)	I(0)	I(1)
10% critical value	5.78	6.54	4.38	5.35
5% critical value	6.985	7.86	5.247	6.303
1% critical value	9.895	10.965	7.337	8.643

Source: Pesaran et al. (2001); case V and case III are related to 'unrestricted intercept, unrestricted trend', 'unrestricted intercept, no trend', and ARDL regression, respectively.

The ARDL bounds test results show that there is no equilibrium relationship between the selected variables of food import (meant in the general sense) and tourist arrivals in the following cases: *food, bov, and vegof*. Conversely, in other variables the null of no cointegration is rejected (*fis, dai, meat, sug, veg*). Those last cases with cointegration evidence are indicated in *Table 2* by a significant F-test.

Even in the relaxed case of unrestricted intercept and no trend equation frame (case 5) produced by the F-test, we do not reach a decisive conclusion about linear cointegration in some mentioned food import variables. Therefore, we drop those variables in this stage of symmetric Granger causality testing. We hope to provide, later on, deeper insights into the possible asymmetric cointegration by using NARDL modelling.

Let us now consider the first two linear models, which refer to imported food products (reported in *Table 2*). From the Wald test of the additive short-run symmetry condition, we observe no apparent significant short-run effects of change in *arriv* to the import of *fish*, and neither to the import of *dai*. However, the analysis reveals short-run unidirectional Granger causality running from *arriv* to other kinds of food import (*mea*, *sug*, and *vegfn*).

The coefficient estimates for the lagged error correction terms (ECTt-1) range between a low of 31.5% for the *veg* variable and a high of 94.7% for the meat variable, indicating the percentage of adjustment towards a long-run equilibrium that occurs within an annual interval. Meanwhile, the t-statistics of the coefficients of the lagged error correction terms (ECTt-1) indicate the statistical significance of the long-run causal effects. There is long-run unidirectional Granger symmetric causality running from tourist arrivals to various components of food imports. And this, according to *Table 2*, is specifically from international tourist arrivals, which affect the imports of the following food products: *fis*, *dai*, *sug*, and *vegfn*.

As was designed in the theoretical consideration, we search for reversed Granger causality direction – from food imports to tourist arrivals; again we should target one or more food import cases in the corresponding cointegration testing – in our study. Despite the trial, we are able to deliver a plausible F test result only in two cases (see *Table 4*). In these two regressions, when *meat* or *vegof*, respectively are independent variables, slight evidence of a cointegration link between the two variables (F statistics at 10% significantly) is revealed.

To summarise this reverse short-term causality, we can identify one bidirectional, long-run causality, which refers to the meat import (read in *Tables 2* and *4*). Meat import is a consequence, as well as a long-run cause, of tourist arrivals. We also find here evidence that the *vegfn* import cause arrivals along the long-run trajectory path.

Table 4. Result of the cointegration test using ARDL approach and Granger causality (reverse cases)

Import causing international tourist arrivals (import → arrivals)							
	Case	P and q orders	F-Test	ECMt-1	Wald test	LM-test	HET
mea	III	(3,4)	4.984*	-0.351**	1.248	0.099	0.510
	V	(3,4)	4.571	-0.429**	1.345	0.068	0.592
vegfn	III	(3,4)	5.016*	-0.315***	0.856	0.561	0.734
	V	(3,4)	5.065	-0.448***	0.786	0.817	0.655

Source: author's research

Notes: Ibidem

We continue our analysis by selecting the best specification of the NARDL model for each food import product, which drops off from previous analysis within the ARDL model, and thus it is necessary to pick up cointegration F-statistics before proceeding through to an asymmetric causality checking versus arrivals impact.

We compare now obtained F-statistics with the critical values for the NARDL bounds test statistics, which are in the same range as for the ARDL, according to the critical value proposed by Pesaran et al. (2001). For *bovine* meat and *vegof*, the F value is higher than the upper bound of the critical value at the 5% level of significance, but for total food products, it is significant at only 10%. How does the causality result in here stemming from the nonlinear model complement earlier research? We review only three types of food (*food*, *bov*, and *vegof*). From *Table 5*, we recognise that, in the short-term, increases in the *arriv* cause *food*, just the same as *bovine* meat and *vegof*.

In all those dependent variables, the $\sum \sigma_i^+ \neq 0$ is supported by a significant Wald test at 5% significance. Regarding the opposite movement of the independent variable set in the NARDL equation, decreases in the *arriv* variable cause in the following short run variables: *food, bov*, and *vegof*, respectively. The $\sum \sigma_i^- \neq 0$ that stands before those coefficients has significant statistics according to the Wald test. Introducing a nonlinear adjustment of the *arriv* into the NARD model has resulted in more cases in

which tourism affects food imports, asymmetrically, and in the short run. This evidence can be supplemented by new cognition, which also arises from long-run causality. ECMt-1 carries a significantly negative coefficient in all three food import cases. Thus, in all cases, the null hypothesis regarding the long-run existence of an asymmetric relationship is rejected at the 1% level of significance.

Table 5. Result of the cointegration test using NARDL approach and Granger causality

Dependent variable	Case	p and q orders	F-Test	ECMt-1	Wald test (POS)	Wald test (NEG)	LM-test	HET	JB-test
food	III	2,3	2.367	0.341**	3.787**	4.273**	0.594	0.515	0.000
	V	1,1	3.851*	0.438**	2.312	1.765	0.774	0.779	0.001
bov	III	1,1	7.783**	0.431**	3.312**	4.179**	0.695	0.126	0.063
	V	1,1	7.723**	0.574**	1.987	2.100	0.502	0.247	0.022
veofof	III	1,1	6.797**	0.512**	3.127**	3.673**	0.354	0.648	0.512
	V		7.867**	0.643**	1.756	1.987	0.526	0.647	0.527

Source: author's research

Notes: Ibidem

Once again, our pieces of evidence suggest a bidirectional relationship between aggregate food import and tourist arrivals when considering the NARDL model.

Table 6. Result of the cointegration test using NARDL approach and Granger causality (reverse cases)

Dependent variable	Case	p and q orders	F-Test	ECMt-1	Wald test (POS)	Wald test (NEG)	LM-test	HET	JB-test
food	III	1,1	3.862*	0.476*	3.827**	4.073**	0.755	0.882	0.054
	V	1,1	4.362**	0.534**	2.234	1.987	0.775	0.966	0.098

Source: author's research

Notes: Ibidem

According to the nonlinear model (*Table 6*), we show that if imported food brings about more tourists, viewing separately, regardless – in the short or long run – to the country, that gives rise to a side-effect which touches tourism.

Conclusions

Our understanding of the interrelationships between food import demand and tourism consumption proxied by international tourist arrivals in Croatia, by employing rigorous statistical testing – the unit root, cointegration analysis, bounds testing (Pesaran et al., 2001), and the Granger causality test, as a result of this research, has improved.

In this paper, we first investigate the link between food imports and international tourist arrivals, assuming the relation between these two variables to be linear or the effects of one variable on the other to be symmetric. Results regarding the autoregressive distributed lag (ARDL) model show that there is a distinct unidirectional causal relationship between *arriv* and *mea*, *sug*, and *vegfn* in the short run, while in the long

run there exists this relationship for the same previous variables along with *fis* and *dai* too. The reverse causality from *meat* and *vegof*, respectively to *arriv* exists but only in the long run, and there is no reverse causality in the short run.

To justify the fact that the relationship between two occurrences in our focus need not be straightforwardly linear, we take an additional step and separate the declines from increases in food import variables; we then engage in finding asymmetric causality, after carrying out an asymmetric cointegration analysis. The NARDL-based results indicate that, in the short term, increases in the *arriv* cause aggregate food, as well as *bovine* meat and *vegof*. On the other hand, the fall of the *arriv* has a short-run impact on *food*, *bov* and *vegof*, decreasing their import. We also find bidirectional short-term asymmetric causality, where the increase in food imports aggregated causes the *arriv* to jump up. In all those cases, we find also the long-run causality impact.

Our contribution is not quite comparable to that of Fisher (2004) and Fisher et al. (2006). For German aggregate food imports coming after these papers, the focus is on alternate, and perhaps simpler, explanations of food imports dynamics. Authors dealing with this issue from other perspectives conclude that increased food product imports from particular countries (imports of wine, cheese, and processed/preserved vegetables from France and Italy) have been attributed to migration to Germany and Germans' international travel activities to particular places. Normally, in a tourism-based economy such as Croatia, overwhelming food imports is no excuse for the country's present-day state of food dependency, which we reveal in our contribution. Manny factors besides tourism are cumulative causative ingredients of this dependency, namely: the profit-lacking initiative to adopt sufficient primary food production in rural districts; the relative price problems, or unfavourable terms of trade of agriculture products; exchange rate issue; lacking the economies of scale operating on small land parcels; and low comparative advantage in food processing for some goods versus those from abroad. All of the aforementioned are complexities that cause food import, from behind, along with the tourism to growth. The importing of food is, as a matter of fact, an effective short-term policy for improving food insecurity because of a huge inflow of foreign tourists to Croatia. It is not difficult to see how this trend curve – an echo of what is happening in tourism consumption – would be flattened by the build-out of the new reality. It may be that tourism will decrease, taking on a more sustainable number of arrivals generally, because of the detachment from mass tourism in the future. Alternatively, by improving some of the aforementioned factors that cause a hinderance, a more diversified and productive food production supply in the country may be possible. We hope that our study contributions will sharpen the diagnosis of how tourism has affected food imports in Croatia.

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Conflict of interests

The authors declare no conflict of interest.

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AVAILABLE AGRICULTURAL AREAS AND OWNERSHIP STRUCTURE OF HOLDINGS IN THE REPUBLIC OF SERBIA

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ABSTRACT

The subject of research in this paper is the analysis and presentation of data on agricultural holdings, the structure of available and utilized area. The main goal is to determine and explain more comprehensively and in detail, by using appropriate methods, and based on available data, the condition of utilized agricultural area and its characteristics by utilization categories and ownership structure of holdings. The importance of this research arises from the fact that the results on utilized agricultural area can be used to adopt appropriate measures and undertake certain activities in land and overall agricultural and rural policy related to sustainable utilization, arrangement and protection of agricultural land and more balanced integrated development of rural areas, as well as to find better solutions in the field of utilization, ownership sector and conditions of agricultural area management.

Introduction

Starting from the fact that the data on the structure of the agricultural holdings play a key role in implementation and monitoring the agricultural policy of the European Union (EU), The Statistical Office of the Republic of Serbia (hereinafter: the Office) planned, organized and conducted the "Agricultural farms structure survey (hereinafter: the Survey) in 2018" The survey was conducted on a sample that included 121,070 agricultural holdings. It was funded from the budget of the Republic of Serbia and from the pre-accession funds of the European Union, within the IPA 2016 project (Instrument for Pre-accession Assistance, 2016). The survey is a nationally significant, organizationally and programmatically very comprehensive activity of the Office in the field of agriculture. The obtained data will serve for the creation of the national agrarian policy, and for providing the basis for the functioning of the system of agricultural statistics. Applied instruments, coverage, features and standardization of concepts and definitions are in line with the recommendations of the World Programme for the census of Agriculture (UN-FAO), the European Parliament Regulations on conducting

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the Farm Structure Survey and Survey on Agricultural Production Method (*Regulation [EC] No 1166/2008 of the European Parliament and of the Council of 19. November 2008, on farm structure surveys and survey on agricultural production methods; Regulation [EC] No 1200/2009, Regulation [EU] No 715/2014*), Eurostat methodology and valid domestic regulations. Besides the agricultural census, the Survey is a key research that collects internationally comparable data on the funds and structure of agricultural holdings.

An important segment of the analysis of the collected data is the analysis of available agricultural land by categories of utilization and the ownership structure of holdings in the Republic of Serbia, in 2018. The results of such an analysis are intended for the wider scientific and professional public, with the desire to expand agro-economic and statistical analysis of the utilization, arrangement and protection of agricultural land in Serbia - especially by municipalities and areas (Đorđević, at al 2011). The presented results can be significant indicators by which the state and local government will be able to define the problems of agricultural activity more adequately and accordingly plan and make appropriate decisions and take appropriate measures for development, both at the local and state level (Petrović, Miladinović, Novakov, 2007) .

Materials, methods, goals and significance of the research

The subject of research in this paper is the analysis and presentation of data on agricultural holdings, the structure of available and utilized area. Main goal of this research is to determine and explain more comprehensively and in detail, and based on available databases, professional literature and legislation, using appropriate methods, the condition of *utilized agricultural area* (hereinafter: UAA) and its quantitative and qualitative characteristics – in total and by types of *agricultural holdings* (hereinafter: AHs) – *family agricultural holdings* (FAHs) and *agricultural holdings of legal entities and entrepreneurs* (AHLEEs), by statistical regions and lower statistical units of data grouping (districts and municipalities). The justification of such a defined goals stems from the knowledge that the current tendencies and the current situation in the management of agricultural area in general, and especially arable land and areas under orchards and vineyards (Todić, 2019), as production-significant utilization categories of agricultural area, are considered sporadically, without critical consideration of responsibility of their owners and/or users.

Implementation of such a defined basic research goal indicates necessity of more detailed and continuous study of the causes that led to the reduction of available agricultural land and especially its better and more important production categories of utilization (Tomić, Njegovan, 2013).

The importance of this analysis stems from the possibility to point out to the scientific and professional public, competent state institutions, owners and/or users of agricultural area, the need to utilize, arrange and protect agricultural area in Serbia in accordance with the principle of sustainability (Trivić, 2019).

The significance of this research stems from the fact that the results of the analysis of *utilized agricultural area* can be used to adopt appropriate measures and undertake certain activities in land and overall agricultural and rural policy (Bogdanov, 2007) related to sustainable use, arrangement and protection of agricultural area and more even integrated development of rural areas (European Commission, 2012), as well as to find better solutions in the field of utilization, ownership sector and conditions of agricultural land management.

Results

The starting point and backbone of all the observed parameters is precisely the structure of *agricultural holdings* AHs in Serbia. The results show that there were a total of 564,542 AHs in Serbia in 2018, of which 562,895 were *family agricultural holdings* (FAHs), only 1,375 agricultural holdings of legal entities (AHLEs) and 272 agricultural holdings of entrepreneurs (AHEs). It can be concluded that the total number of agricultural holdings is dominated by FAHs (99.71%).

Table 1. Basic indicators on the number and size of AH in the Republic of Serbia, 2018

Holdings	All AHs		AHs without land		UAA		
	number	%	number	∑=100	ha	%	ha/AH
FAH	562 895	99.71	5 180	97.92	2 916 125	83.90	5.18
AHLE	1 375	0.24	70	1.32	557 866	16.05	405.72
AHE	272	0.05	40	0.76	1 903	0.05	7.00
All AHs	564 542	100.00	5 290	100.00	3 475 894	100.00	6.16

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

AHLEEs are minor in number (only 0.24% and 0.05%), but this group has a significant share in UAA and a large average area of property, so it can be concluded that they are significant production and economic entities in Serbian agriculture. However, at the same time, their participation in the NUAA is relatively large.

Table 2. Agricultural holdings with the status of legal entity, by regions

	AHs						
	number of holdings	FAHs		AHLEEs			
				AHLEs		AHEs	
		number	%	number	%	number	%
REPUBLIC OF SERBIA	564 542	562 895	100.00	1 375	100.00	272	100.00
SERBIA – NORTH	157 104	156 138	27.74	855	62.18	111	40.81
Belgrade Region	30 033	29 949	5.32	75	5.45	9	3.31
Vojvodina Region	127 071	126 189	22.42	780	56.73	102	37.50
SERBIA – SOUTH	407 438	406 757	72.26	520	37.82	161	59.19
Šumadija and West Serbia Region	242 636	242 224	43.03	300	21.82	112	41.18
South and East Serbia Region	164 802	164 533	29.23	220	16.00	49	18.01
Kosovo Region	…	…	…	…	…	…	…

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

Regionally, the largest number of FAHs is in the region of Šumadija and Western Serbia (42.97%). This region has the largest number of agricultural holdings of entrepreneurs AHEs (41.2%), while the largest number of AHLEs is in the Region of Vojvodina (56.0%).

Table 3. Available land per utilization categories in the Republic of Serbia, 2018.

	AL					
	total	agricultural land			Woodland area	other
		all	UAA	NUAA		
Area [ha]	5 178 692	3 765 847	3 475 894	289 953	972 283	440 562
Structure [%]	100.00	72.72	67.12	5.60	18.77	8.51

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

The structure of available land per utilization categories in Serbia is strongly dominated by UAA (67.12%) – which makes a total of 72.2% of available agricultural land together with NUAA (5.60%). It is followed by woodland (18.77%) and other land (8.51%) (Table 3). If we take into account the significant differences in the categories of available land by region, it is desirable to look at this structure of the UAA and NUAA and by districts.

Table 4. Available land per districts in the Republic of Serbia, 2018.

	UAA		NUAA		Woodland area		Other land		AL total
	ha	%	ha	%	ha	%	ha	%	ha
REPUBLIC OF SERBIA	3 475 894	67.12	289 953	5.60	972 283	18.77	440 562	8.51	5 178 692
SERBIA – NORTH	1 719 899	76.56	76 982	3.43	158 199	7.04	291 414	12.97	2 246 494
Belgrade Region	145 533	55.26	12 340	4.69	30 648	11.64	74 820	28.41	263 340
Vojvodina Region	1 574 366	79.39	64 643	3.6	127 551	6.43	216 594	10.92	1 983 154
SERBIA – SOUTH	1 755 995	59.89	212 971	7.26	814 084	27.76	149 148	5.09	2 932 198
Šumadija and Western Serbia Region	1 035 998	60.93	76 055	4.47	519 487	30.55	68 708	4.04	1 700 248
Southern and Eastern Serbia Region	719 997	58.4	136 916	11.11	294 597	23.91	80 440	6.53	1 231 950
Kosovo and Metohija Region	…	…	…	…	…	…	…	…	…

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

Differences in the representation of the UAA in certain regions range from only 58.44% in the Region of Southern and Eastern Serbia to 79.39% in the Region of Vojvodina. Significant differences in the representation of NUAA are evident, ranging between 11.11% in the Region of Southern and Eastern Serbia to 3.26% in the Region of Vojvodina. The differences are even greater at the district level. NUAA ranges from 1.17% (Srem District) to 22.78% (Pirot District). Thus, the share of UAA by

regions is between only 58.44% in the Region of Southern and Eastern Serbia (where landowners left their properties in large numbers) to as many as 79.39% in the Region of Vojvodina, which is the richest region in Serbia in terms of AL and benefits for agricultural production (Lovre, Zekić, 2008).

There are also significant regional differences in the representation of woodland by districts (Pantić, Živanović Miljković, 2010). Areas covered by woodland comprise 18.77% of the total AL in the Republic of Serbia. At the level of the defined areas, the share of areas covered by woodland in the total AL ranges from 0.07% (North Banat District) to 39.58% (Zlatibor District). However, in relation to the above-mentioned average indicators for Serbia, regional differences in the structure of AL by utilisation categories point to the following statements:

First, the dominant share of the UAA in the total AL is characteristic for all four statistical regions, with the representation of the UAA in Vojvodina Region being significantly above (79.39%), and in all three regions in central Serbia the representation is relatively uniformed and significantly below the national average and ranges from 55.26% in the Belgrade region, 60.93% in the Region of Šumadija and Western Serbia and 58.44% in the Region of Southern and Eastern Serbia;

Second, the difference between the total AL and UAA indicates a significant representation of one or two of the three individual utilisation categories, namely:

- *other land* comprises approximately one third of available land in Belgrade region (28.41%);
- *other land* is significantly represented in the structure of the AL of the Region of Vojvodina (10.92%);
- woodland area comprises 30.55% of AL of Šumadija and Pomoravlje;
- cumulatively shown categories of *woodland* (23.91%) and *NUAA* (23.91%), comprise about one third of the available land in the Region of Southern and Eastern Serbia (Table 4.)

A significant aspect of the analysis of AL by utilisation categories is also the analysis of the relationship between UAA and NUAA by the legal status of holdings (Lovre, 2013). The majority of AL belongs to FAHs (73.58%), and 26.42% to AHLEEs. However, the share of FAHs in utilized area is 83.90%, and AHLEEs only 16.10%. The share of FAHs in NUAA is 35.80%, and AHLEEs even 64.20%. FAHs also has a dominant share in the category of woodland area (72.57%), and AHLEEs owns only 27.43% of woodland.

Table 5. AL by utilization categories and legal status of holdings in the RS, 2018

		AL				
		total	**UAA**	**NUAA**	**Woodland area**	**Other**
		All agricultural holdings AHs				
Area	ha	5 178 692	3 475 894	289 953	972 283	440 562
	%	100.00	67.12	5.60	18.77	8.51
Holdings	number	564 542	559 252	109 115	360 662	492 912
	%	100.00	99.06	19.33	63.89	87.31
Average	ha/AH	9.17	6.22	2.66	2.70	0.89
	%	100.00	67.75	28.97	29.39	9.74
		AL				
		total	UAA	NUAA	Woodland area	Other
		Family agricultural holdings FAHs				
Area	ha	3 810 550	2 916 125	103 815	705 567	85 042
	%	100.00	76.53	2.72	18.52	2.23
Holdings	number	562 895	557 715	108 727	360 320	492 083
	%	100.00	99.08	19.32	64.01	87.42
Average	ha/FAH	6.77	5.23	0.95	1.96	0.17
	%	100.00	77.23	14.11	28.93	2.55
		Share FAHs (all AHs=100)				
Area	%	73.58	83.90	35.80	72.57	19.30
all FAHs	%	99.71	99.73	99.64	99.91	99.83
		Agricultural holdings of legal entities and entrepreneurs AHLEEs				
Area	ha	1 368 142	559 769	186 138	266 716	355 520
	%	100.00	40.91	13.61	19.49	25.99
Holdings	number	1 647	1 537	388	342	829
	%	100.00	93.32	25.24	88.14	242.40
Average	ha/AHLEE	830.69	364.20	479.74	779.87	428.85
	%	100.00	43.84	57.75	93.88	51.63
		Share AHLEEs (all AHs=100)				
Area	(%)	26.42	16.10	64.20	27.43	80.70
all AHLEEs	(%)	0.29	0.27	0.36	0.09	0.17

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

Utilized agricultural area of the total available FAHs land is 76.53%, and unutilized is 2.72%. However, the utilized area of AHLEEs is only 40.91%, and the unutilized area is 13.61% of the available land of this group of holdings.

Table 6. Available land by utilization categories and legal status of holdings

	All AHs	FAHs	AHLEEs
AL	5 178 692 ha	3 810 550 ha (73.58%)	1 368 142 ha (26.42%)
UAA	3 475 894 ha	2 916 125 ha (83.90%)	559 769 ha (16.10%)
ha/ AH	6.22 ha/AH	5.23 ha/FAH	364.2 ha/AHLEE
NUAA	289 953 ha	103 815 ha (35.8%)	186 138 ha (64.2%)
ha/ AH	2.66 ha/AH	0.95 ha/FAH	479.7 ha/AHLEE
Woodland	972 283 ha	705 567 ha (72.5%)	266 716 ha (27.43%)
ha/ AH	2.7 ha/AH	1.96 ha/FAH	779.87 ha/AHLEE

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

If we take into account the size of AHLEEs property and their large share in the total AL, the following can be concluded:

1. The average size of AH property in Serbia is only 6.22 ha/AH UAA. The regional analysis of this indicator points out that only holdings in the Region of Vojvodina are with an above-average area of property (12.71 ha/AH or 2.04 times higher) - which is the result of the concentration of the largest number by area of significantly larger AHLEEs. In contrast, holdings properties in all three other regions are lower than the national average: 4.89 ha/AH in the Belgrade region, 4.28 ha/AH in the Šumadija and Western Serbia Region and 4.40 ha/AH in the Southern and Eastern Serbia Region.
2. Legal entities and entrepreneurs comprise only 0.29% of the total number of AHs, but they have 26.42% of the total AHs at their disposal; their share in UAA is 16.10%, and in NUAA 64.20%.
3. AHLEEs are relatively few (1 647), but have a significant average size of property of 364.2 ha of utilised and even 479.74 ha of NUAA and 779.87 ha of woodland.

AHLEEs have at their disposal even 186,138 ha or 64.20% of the total NUAA in Serbia, which indicates the need for a detailed analysis of the management of agricultural land owned and utilised by this group of entities (Ševarlić, 2015).

Discussions

The results show that there are significant differences between the three *ownership subgroups* of all holdings, and they are reflected in the large disproportion of their representation in the total number of holdings and the total area of the UAA. From this point of view, all AHs can be classified into three relatively homogeneous groups of holdings by size of the property - *small* ("less than 5 ha"), *medium* ("5-20 ha") and *large* ("more than 20 ha"). The analysis of the ownership structure according to the share of the defined three collective groups of AHs indicates certain characteristics, as follows:

- *AHs with smaller property* - is a group in which the dominant part is concentrated, even 71.74% of the total number of AH in Serbia, and they utilise only 23.24% of the total UAA;

- *AHs with medium size of property* and comprise 24.29% of the total number of AHs, and utilise 35.14% of the total UAA;
- *AHs with larger property* comprise 3.96% of the total number of holdings, and utilise 41.62% of the total UAA.

Regional analysis of the ownership structure of FAHs indicates significant differences in the ownership structure in four statistical regions in Serbia, which are reflected in the following statements:

Table 7. Ownership structure of FAHs in the Republic of Serbia by regions

Indicators		**Total**	**Without land**	**< 5 ha**	**5,01-20 ha**	**>20 ha**
		REPUBLIC OF SERBIA				
All FAHs	number	562 895	5 180	399 271	136 838	21 606
	%	100.00	0.92	70.93	24.31	3.84
UAA	ha	2 916 125	0	806 971	1 218 203	890 951
	%	100.00	0	27.67	41.77	30.55
		Belgrade Region				
FAHs	number	29 949	265	23 069	6 035	580
	%	100.00	0.88	77.03	20.15	1.94
UAA	ha	118 872	0	45 131	51 237	22 504
	%	100.00	0.00	37.97	43.10	18.93
		Share of the Belgrade Region (RS=100)				
All FAHs	%	5.32	5.12	5.78	4.41	2.68
UAA	%	4.08	0.00	5.59	4.21	2.53
		Vojvodina Region				
FAHs	number	126 189	3 128	70 140	37 813	15 106
	%	100.00	2.48	55.58	29.97	11.97
UAA	ha	1 168 428	0	122 094	382 918	663 416
	%	100.00	0.00	10.45	32.77	56.78
		Share of the Vojvodina Region (RS=100)				
All FAHs	%	22.42	60.39	17.57	27.63	69.92
UAA	%	40.07	0.00	15.13	31.43	74.46
		Šumadija and West Serbia Region				
FAHs	number	242 224	740	179 730	58 533	3 221
	%	100.00	0.31	74.20	24.16	1.33
UAA	ha	985 301	0	386 710	495 038	103 553
	%	100.00	0.00	39.25	50.24	10.51
		Share of the Šumadija and Western Serbia Region (RS = 100)				
All FAHs	%	43.03	14.29	45.01	42.78	14.91
UAA	%	33.79	0.00	47.92	40.64	11.62
		South and East Serbia Region				
FAHs	number	164 533	1 047	126 331	34 456	2 699
	%	100.00	0.64	76.78	20.94	1.64

Indicators		Total	Without land	< 5 ha	5,01-20 ha	>20 ha
UAA	ha	643 525	0	253 035	289 012	101 478
	%	100.00	0.00	39.32	44.91	15.77
		Share of the Southern and Eastern Serbia Region (RS=100)				
All FAHs	%	29.23	20.21	31.64	25.18	12.49
UAA	%	22.07	0.00	31.36	23.72	11.39
		Kosovo and Metohija Region				

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

FAHs larger than 20 ha are dominant in the Region of Vojvodina (69.91% of the total number of holdings of this size in the Republic of Serbia) and utilize 74.46% of land in the group of larger properties. Representation of FAHs larger than 20 ha in the Belgrade region is 2.68%, in the region of Šumadija and Western Serbia 14.91%, and in the region of Southern and Eastern Serbia 12.49% of the holdings of this group.

The largest part of FAHs with a holding of up to 5 ha and FAHs with a holding of medium size (5–20 ha) is in the Region of Šumadija and Western Serbia (over 45%). In the Region of Southern and Eastern Serbia, FAHs with a property of up to 5 ha (31.64%) are dominant, and holdings with a property of over 20 ha have almost negligible share in the total number of FAHs.

The general conclusions of the regional analysis of the ownership structure between collective groups of FAHs in Serbia are:

1. ***small holdings*** ("up to 5 ha") are dominant in the total number of FAHs in all four statistical regions (between 55.58% in the Region of Vojvodina and 77.03% in the Belgrade region), and are in second place in terms of representation in total UAA in all regions (37.97% in the Belgrade region and 39.32% in the Region of Southern and Eastern Serbia), while in the region of Šumadija and Western Serbia this group of FAHs utilize 39.25% of the total UAA of the region, and in the Region of Vojvodina have the lowest share in the UAA (10.45%);

2. ***large holdings*** ("over 20 ha") are the least represented in the total number of FAHs in all four regions (between 1.33% in the Region of Šumadija and Western Serbia to 11.97% in the Region of Vojvodina); they are least represented in the UAA in three regions (between 10.51% in the region of Šumadija and Western Serbia and 18.93% in the Belgrade region), while in the region of Vojvodina they are the dominant group in the UAA - they utilize 56.78% of the UAA region.

3. ***medium holdings*** ("5–20 ha") are between small and large holdings in terms of representation in the number of FAHs in all four regions (between 20.15% in the Belgrade region and 29.97% in the Vojvodina region); representation in the UAA is 32.77% in the Region of Vojvodina and 44.91% in the Region of Southern and Eastern Serbia, and in the Region of Šumadija and Western Serbia they are the most represented, with 50.24% of the UAA.

The distribution of AHLEEs and their UAA by regions in Serbia points to the following observation:

Table 8. Ownership structure of AHLEEs in the Republic of Serbia by regions

Indicators		Total	Without land	< 5 ha	5,01-20 ha	>20 ha
		REPUBLIC OF SERBIA				
All AHLEEs	number	1 647	109	464	300	774
	%	100.00	6.62	28.17	18.21	46.99
UAA	ha	559 769	0	834	3230	555 705
	%	100.00	0	0.15	0.58	99.27
		Belgrade Region				
AHLEEs	number	83	6	27	18	32
	%	100.00	7.23	32.53	21.69	38.55
UAA	ha	26 661	0	55	198	26 408
	%	100.00	0.00	0.21	0.74	99.05
		Share of the Belgrade Region (RS=100)				
All AHLEEs	%	5.04	5.50	5.82	6.00	4.13
UAA	%	4.76	0.00	6.59	6.13	4.75
		Vojvodina Region				
AHLEEs	number	883	45	151	153	534
	%	100.00	5.10	17.10	17.33	60.48
UAA	ha	405 938	0	271	1686	403 981
	%	100.00	0.00	0.07	0.42	99.52
		Share of the Vojvodina Region (RS=100)				
All AHLEEs	%	53.61	41.28	32.54	51.00	68.99
UAA	%	72.52	0.00	32.49	52.20	72.70
		Šumadija and West Serbia Region				
AHLEEs	number	412	37	199	85	91
	%	100.00	9.02	48.23	20.69	22.05
UAA	ha	50 697	0	355	863	49 479
	%	100.00	0.00	0.70	1.70	97.60
		Share of the Šumadija and Western Serbia Region (RS = 100)				
All AHLEEs	%	25.02	33.94	42.89	28.33	11,76
UAA	%	9.06	0.00	42.57	26.72	8.90
		South and East Serbia Region				
AHLEEs	number	269	21	86	44	118
	%	100.00	7.95	31.82	16.22	44.01
UAA	ha	76 472	0	153	482	75 837
	%	100.00	0.00	0.20	0.63	99.17
		Share of the Southern and Eastern Serbia Region (RS=100)				
All AHLEEs	%	16.34	20.01	18.48	14.56	15.24
UAA	%	13.61	0.00	18.36	14.92	13.60
		Kosovo and Metohija Region				

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

Without land is 109 AHLEEs of the total listed AHLEEs (1,647) or 6.62%, which is a significant percentage in relation to the total number of AHs (in the Region of Southern and Eastern Serbia 20.01%, and in the Region of Šumadija and Western Serbia 33.94% of the total number of AHLEEs without land). In all regions, AHLEEs with a property of more than 20 ha utilize the largest part of the land available to this group of holdings. The analysis of the ownership structure of the AHLEEs in four statistical regions in Serbia, according to the representation of three collective groups of holdings with a certain size of property, indicates the following regional differences:

Small holdings dominate in the total number of holdings, and are minor in the total UAA holdings of legal entities and entrepreneurs in three regions - Belgrade (32.53% of AHLEEs of this region and 0.21% of UAA of AHLEEs), in the Region of Šumadija and Western Serbia (48.23% of AHLEEs of this region and 0.70% of UAA of AHLEEs of the region) and Southern and Eastern Serbia (31.82% of AHLEEs and 0.20% of UAA of AHLEEs), while in the Region of Vojvodina the representation is in the number of holdings (17.10% of AHLEEs), and the least represented are in UAA (0.07% of UAA of AHLEEs of this region);

Large holdings dominate in the total of UAA and are differently represented in the total number of AHLEEs in all four statistical regions - in the Belgrade region this group makes 38.55% of AHLEEs region and 99.05% of UAA of AHLEE of this region, in Vojvodina this group is 60.48% of AHLEEs and 99.52% of UAA of AHLEEs region, in Šumadija and Western Serbia they comprise 22.05% of AHLEEs and 97.60% of UAA of AHLEEs, and in Southern and Eastern Serbia 44.01% of AHLEEs and 99.17% of UAA of AHLEEs of this region;

Medium holdings are relatively more represented in the total number, and minor in the total of UAA of AHLEEs in all four statistical regions - in the Belgrade region this group of holdings comprises 21.69% of AHLEEs and utilizes 0.74% of UAA of AHLEEs of this region; in the Region of Vojvodina 17.33% are AHLEEs and utilize 0.42% of UAA of AHLEEs of this region; in the region of Šumadija and Western Serbia 20.69% of AHLEEs is this group of holdings and they utilize 1.70% of UAA of AHLEEs of this region, in the Region of Southern and Eastern Serbia this group comprises 16.22% of AHLEEs and utilizes 0.63% of UAA of AHLEEs of this region.

FAHs are dominant in the total number of holdings (99.71%) and, at a slightly lower level, in the total number of UAA (83.84%).

FAHs with smaller property are dominant in the total number of FAHs in all four statistical regions - 70.95% of the total number of FAHs, and their share in the UAA is only 27.67%. This result suggests **a large fragmentation of FAHs properties**.

FAHs with a medium size of property comprise 24.31% of the total number of FAHs, and the share in UAA is 41.77%. The largest part of FAHs with medium-sized property is in the Region of Šumadija and Western Serbia (over 45%).

FAHs **with larger property** comprise only 3.84% of FAHs, and their share in UAA is 30.57%. So the number of large FAHs is small, but they utilize one third of the FAHs land.

Large holdings are the least represented in the total number of FAHs in all four regions; in the Region of Vojvodina and the dominant group in the UAA, utilize 56.78% of the UAA region.

Table 9. Regional analysis of the ownership structure of FAHs collective groups in Serbia

Region	Small holdings up to 5 ha		Medium holdings 5 – 20 ha		Large holdings over 20 ha	
	Share in the number of FAH	Share in UAA	Share in the number of FAH	Share in UAA	Share in the number of FAH	Share in UAA
Belgrade Region	77.03%	37.97%	20.15%	43.10%	1.94%	18.93%
Vojvodina Region	**55.58%**	**10.45%**	29.97%	32.77%	**11.97%**	**56.78%**
Sumadija and West Serbia Region	74.20%	39.26%	24.16%	50.24%	1.33%	10.51%
South and East Serbia Region	76.78%	39.32%	20.,94%	44.91%	1.64%	15.77%
Kosovo Region						

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

AHLEEs represent, by number, a small group (only 1,647 households or 0.29% of the total number of AHs), but have a significantly higher share in UAA (16.10%)

AHLEEs **with smaller property** comprise 28.71% of the total number of holdings in this group, and their share in UAA is only 0.15% (excluding land 6.67%). These holdings dominate in the number of AHLEEs, and are minor in the total UAA of AHLEEs holdings in three regions; AHLEEs **with a medium size of holdings** comprise 18.21%, and their share in the UAA is only 0.58%. AHLEEs **with larger holdings** comprise 47%, and their share in the UAA is even 99%. However, in the category of holdings larger than 100 ha it is 29.57% of the total number of AHLEEs and they utilize 96.76% of the land of this group of holdings. **Large holdings** dominate in the total of UAA and are differently represented in the total number of AHLEEs in regions.

Table 10. Regional analysis of the ownership structure of **AHLEEs** in Serbia, 2018

Region	Small holdings up to 5 ha		Medium holdings 5 – 20 ha		Large holdings over 20 ha	
	Share in the number of AHLEEs	Share in UAA	Share in the number of AHLEEs	Share in UAA	Share in the number of AHLEEs	Share in UAA
Belgrade Region	32.53%	0.21%	21.69%	0.74%	38.55%	99.05%
Vojvodina Region	17.10%	0.07%	17.33%	0.42%	60.48%	99.50%
Sumadija and West Serbia Region	48.23%	0.70%	20.69%	1.70%	22.05%	97.60%
South and East Serbia Region	31.82%	0.20%	16.22%	0.63%	44.00%	99.17%
Kosovo Region						

Source: author's calculation based on data of the Statistical Office of the Republic of Serbia

The analysis of the ownership structure of all AHs according to the legal status of holdings in Serbia indicates that:

FAHs is dominant in the total number of holdings (99.71%) and, at a slightly lower level, in the total UAA (83.84%). In the group of *holdings with smaller property*, FAHs occupy 70.95% of the total number of FAHs, and their share in UAA is only 27.67%. This result suggests a large fragmentation of FAHs properties. In the group of *holdings with medium size of property*, there are 24.31% of the total number of FAHs, and their share in the UAA of FAHs is 41.77%. In the group of *holdings with larger property*, only 3.84% are FAHs, and their share in the UAA of this group of holdings is 30.57%. So the number of large FAHs is small, but they utlize one third of the FAHs land;

AHLEEs by number represent a small group of holdings (only 1,647 households or 0.29% of the total number of AHs), but have a significantly higher share in the total UAA (16.10%) and are the dominant category by number of holdings and UAA in two groups of holdings with larger properties (over 20 ha and over 100 ha). In the group of *holdings with smaller properties*, AHLEEs comprise 0.12% of the total number of holdings in this group, and their share in UAA is only 0.11%. In the group of holdings with medium-sized property, AHLEEs comprise 0.22%, and their share in UAA in this group is only 0.26%. In the group of *holdings with larger property*, AHLEEs comprise 3.58%, and their share in UAA is as high as 38.41%. However, in the category of properties larger than 100 ha there is 29.57% of the total number of AHLEEs and they utilize 96.76% of the land of this group of holdings.

AHLEEs are relatively small (1,647), but have a significant average size of property, an average of 364 ha of utilized property and even 479 ha of NUAA; 779 ha of woodland. AHLEEs have at their disposal even 186,138 ha or 64.20% of the total NUAA in Serbia, which indicates the need for a detailed analysis of agricultural land management in this group of entities.

Conclusions

The aim of this paper represents a realistic view of economic strength and type of agricultural production on holdings in Serbia, in order to obtain a quality, analytical and comparable basis for analysis of structural characteristics and economic parameters of AHs and conceptualization of agricultural policy measures, but also for comparative analysis with AHs in EU countries and neighboring countries [Simonović, 2004], as well as a base for scientists in further scientific research on the structural characteristics and economic performance of agricultural holdings in Serbia. Systematization of data and analysis of the obtained results led to a number of important conclusions about this segment of agriculture in the Republic of Serbia. Some of the basic conclusions can be singled out in a brief review of the overall results obtained.

According to the obtained results in the Republic of Serbia in 2018, there are 564,542 agricultural holdings, 562,895 family agricultural holdings, 1,375 agricultural holdings of legal entities and 272 agricultural holdings of entrepreneurs. It can be concluded that

the total number of holdings is dominated by family holdings (99.71%). The largest part of the total number of FAHs is in the region of Šumadija and Western Serbia (about 43%), and the smallest is in the region of Vojvodina (5.32%). *AHLEE*s are minor in number (only 0.29%), but this group has a significant share in the UAA and a large average area of property, so it can be concluded that they are important production and economic entities in Serbian agriculture.

It can be concluded that Serbian agriculture is characterized by a dominant number of FAHs in relation to the AHLEEs. The average size of property is small (6.22 *ha/AH*; 5.23 *ha/FAH* and 364.2 *ha/AHLEE* - Table 6). The FAHs category is dominated by FAHs with a property of less than 5 ha, and in the AHLEEs category the most represented are entities with a property of more than 20 ha. This ownership group uses the largest part of the land in all observed regions. There is an obvious contrast between the smallest and the largest ownership group of holdings and their representation in the total number of agricultural holdings AHs and in the total area UAA.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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PERCEPTION OF CLIMATE CHANGE - A SURVEY AMONG AGRICULTURAL ADVISORS

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ABSTRACT

This paper is based on the results of an empirical study conducted on a sample of 103 employees of the Croatian Agricultural and Forestry Advisory Service in mid-2018. The main goal of the study was to determine the opinions and attitudes of agricultural advisors on climate change. Attitudes were measured using 16 statements which summarize three composite indicators (awareness of anthropogenic causes and consequences, mitigation responsibility, and indifference and defeatism towards climate change). Results of the research show that the respondents are relatively aware of the anthropogenic impact on climate change, as well as wider consequences of climate change on society and the environment (MKIs = 3.83). On average, respondents expressed strongest agreement with statements about political and civic responsibility in climate change mitigation (MKIo = 4.06). Most agricultural advisors perceive climate change as dangerous for the stability of domestic farming, and as many as 92.4% of respondents believe that farmers do not have the necessary knowledge to successfully deal with the risks of climate change in their own production.

Introduction

In the last few decades, climate change has been a frequent subject of political, scientific and public debate, both in the world and in Croatia. Research shows that opinions and attitudes of experts, scientists and the public about the causes of climate change, as well as the consequences through which they manifest themselves, are not

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mutually aligned, but are instead shaped by socio-cultural characteristics, vulnerability of individual communities and geographical affiliation (Howel et al., 2015). Climate change is primarily a natural phenomenon; however, it is also increasingly influenced by social activities and the way of life of modern societies.

This has stirred a global political debate and stimulated the adoption of numerous strategic documents and guidelines aimed at reducing society's negative impact on the environment and fostering adaptation to climate change. At the global level in recent times, the international organization United Nations (UN) promoted the maintenance of the average increase in global temperature at 1.5 - 2^{o}C with the Paris Agreement (2016), through joint action of all signatory states. Today, this agreement is complemented and directly linked to the "Goals of the 2030 Agenda for Sustainable Development," which balances the environmental, societal and economic dimensions. Among the 17 goals of sustainable development, goal number 13 ("Climate action") is directly aimed at taking urgent action to combat climate change and its consequences.

Of all the economic sectors, the agricultural sector is particularly vulnerable to climate change, as all direct climate characteristics (temperature, precipitation and weather conditions) significantly influence production. It is inevitable that climatic conditions are changing and that farming must adapt to emerging natural trends or new risks in the production process. Climate-smart agriculture is increasingly promoted as one of the solutions to the problems of food safety and environmental degradation, as well as a way of adaptation to climate change (Thierfelder and Wall, 2009; Derpsch et al., 2008).

In the last few decades, even Croatian agriculture has been increasingly exposed to extreme weather phenomena such as floods, hail, water shortages due to droughts, fires, etc., which significantly lower yields and affect the volume of production and crop quality. According to the data of the Government of Croatia, in 2018 losses of almost HRK 195 million (≈$33 million) due to direct damage were recorded in agriculture, that is, on land and in livestock. Furthermore, it is predicted that by 2050, the yield of agricultural crops in Croatia will decrease by 3 to 8% due to climate change (The Ministry of Environment and Energy of the Republic of Croatia, 2017, p. 29). Because of the high value that agriculture creates in the overall economy of Croatia, the high number of employees in that sector and in jobs related to that sector, because of the need to ensure food security, etc., climate change is an important aspect of thinking about agricultural sustainability. Therefore, it is necessary that all who hold a stake in agriculture contribute to overcoming the negative impacts of climate change on farming (and vice versa) by exchanging information and integrating knowledge.

Agricultural advisory services are an important link in the process of communicating about the risks of climate change and the exchange of knowledge and learning between agricultural practice (producers) and scientists. Research from around the world shows that farmers who work with advisory services and related organizations are more successful in addressing the risks of climate change in their production (Mendelsohn and Dinar, 2003; Maddison, 2007; Preethi et al., 2013; Bryan et al., 2013; Di Falco

and Veronesi, 2013; Shakra Juana et al., 2013; Di Falco, 2014). That is only true under the assumption that agricultural advisory services, that is, agricultural advisors, are aware of climate change and are well informed about the possible harmful effects of climate change on the sustainability of global and local agriculture. These are important predictors of activities that lead to the adaptation of farming to climate change.

There are no empirical insights into the opinions and attitudes of agricultural advisors or farmers on climate change in the domestic literature, although there are scientific and professional papers that analyze the possible negative and positive effects of climate change on domestic farming in general (Šimunić et al., 2007; Šimunić et al., 2014; Vučetić, 2014; South, 2016). It is worth mentioning recent research on general attitudes of citizens towards climate change, which shows that the population of Croatia is relatively well acquainted with some aspects of climate change (Landau et al., 2008; European Commission, 2014), and that most perceive them as a serious social problem, but on average a somewhat milder problem compared to citizens of the European Union (Ančić et al., 2016).

There are several recent studies in the foreign literature that consider the causes and consequences of climate change from the point of view of agricultural advisors. These studies indicate that attitudes of agricultural advisors on climate change are not unambiguous, but are instead shaped by acquired practical experience and knowledge, field of work or socio-demographic characteristics, and are under the influence of the local social environment in which they operate. In a survey in the Midwestern United States conducted on a representative sample of agricultural advisors in both public and private sectors, three-quarters of respondents expressed the opinion that climate change is happening, but have a divided opinion of the role of humans on the phenomenon (Mase, 2014). The author found that gender and affiliation of advisors to a private or public sector significantly determine their belief about the causes of climate change. Female respondents and advisors working in public advisory services were more likely to believe in anthropogenic causes of climate change. Although most advisors in this study agreed that farmers need to adapt to climate change, their views on how to adapt have varied significantly. Advisors who are fully or partially convinced that climate change is induced by human action are significantly more supportive of farming practices that have the potential to reduce vulnerability and improve adaptability to climate change.

Similarly, a survey of four US states that was part of the "Useful to Usable" project (U2U, 2016) found that 53% of advisors believe that climate change is caused by human activity. Most of them (77%) agree that the both-sided (farmer and advisor) use of a weather forecasting tool for making production decisions can result in better outcomes for agricultural economy and the environment.

Furthermore, the qualitative research of Church et al. (2017) on a sample of 36 agricultural advisors showed that they do not express much concern about climate change, although they largely accept that the occurrence of extreme weather conditions poses a risk to US agriculture. Finally, we mention an interesting study by Nilles et al.

(2019) in which the authors linked the perceptions of agricultural advisors on climate change with five-year data on crop damage using structural equation modeling. The authors found that higher crop loss rates were associated with lower advisors' belief in the anthropogenic impacts on climate change.

In this article, we discuss how agricultural advisors in Croatia perceive climate change. The objectives of the study were to determine the extent to which agricultural advisors are aware of the anthropogenic impacts and wider consequences of climate change, to establish the level of their self-assessed knowledge of risks, and to find out about some of their experiences with the consequences of climate change and actions taken to mitigate it in domestic agriculture.

Materials and methods

The research was conducted using an online survey distributed among employees of the Croatian Agricultural and Forestry Advisory Service in May and June 2018. The online survey was filled out only by advisors working in the agriculture sector and rural development; the sample did not include forestry advisors. The survey was completely completed by 103 respondents (or 51.3% of advisors not working in forestry), coming from all 21 Croatian counties.

The questions in the survey pertained to four thematic units: socio-demographic data, general views on climate change, knowledge about risks to global agriculture, and some aspects of the impact of climate change on domestic agriculture. Attitudes were measured using 16 statements summarizing three composite indicators: awareness of anthropogenic causes and consequences (8 items); mitigation responsibility (3 items); and indifference and defeatism towards climate change (5 items), to which respondents expressed their degree of (dis)agreement on a 5 point Likert-type scale (from 1 – "I completely disagree" to 5 – "I completely agree"). Most of these statements were taken from a study by Whitmarsh (2005) and adapted for this research.

Measurement scale reliability was assessed using Cronbach's reliability coefficient (α). All scales were found to show acceptable reliability ($\alpha \geq 0.7$). Answers about climate change awareness and observed adverse impacts on domestic agriculture were obtained through a combination of open-ended and closed-ended questions.

Statistical analysis of the data included descriptive statistics (frequencies, proportions, means and standard deviations) and inferential analyses (Pearson's chi-squared tests of independence). Chi-squared tests (χ^2) were used to assess the statistical significance of differences in attitudes with respect to gender and age. Respondents were divided into two subgroups according to age: younger (up to 45 years) and older (46 years or more). Type I error rate was set to 5% ($\alpha = 0.05$). Two-sided tests were used.

The survey data were analyzed using IBM SPSS Statistics for Windows, version 21.0 (IBM Corp., Armonk, N.Y., USA).

Results and discussion

Sample Structure

Of 103 agricultural advisors who participated in the study, 58 were women and 45 were men (Table 1). The mean age of the participants was 46.5 years, ranging from 25 to 62. Respondents with 6 to 15 years of work experience in the advisory service (35.9%) were the most common in the sample. When examined by field of work, advisors from plant production and plant protection dominated the sample (61.2%).

Table 1. Sample description

Features		f	%
Gender	Men	45	43.7
	Women	58	56.3
Age (year)	25-35	19	18.4
	36-45	26	25.3
	46>	58	56.3
Level of education	College of higher education	98	95.1
	PhD	5	4.9
Work experience in the Advisory Service (year)	1-5	31	30.1
	6-15	37	35.9
	16>	35	34.0
Field of work	Plant production and plant protection	63	61.2
	Livestock production	26	25.2
	Rural Development, Economics, Fisheries	10	9.7
	Combination	4	3.9

Perception of Climate Change

Knowledge and conviction of each individual, social group and community that climate change is happening, as well as knowledge and understanding of anthropogenic causes of climate change and possible harmful effects on society and the environment are requirements for effective action in reducing climate change risk. Numerous empirical studies have shown that the formation of subjective attitudes about the causes and consequences of climate change is influenced by a number of factors such as: experience of a problem related to climate change as opposed to anticipated problems, confidence in the credibility of scientific information, level of knowledge, conflict between economic and environmental priorities, ecological worldview and values, cultural characteristics, public opinion in the local environment, etc. (Fielding et al., 2014). Depending on these factors, different notions about the problem of climate change establish themselves: conviction, skepticism or denial.

Awareness of the existence of climate change and familiarity of agricultural advisors with it are key to achieving the full reach of agriculture resistant to climate change, but also its contribution to change mitigation. We conceptualized the problem of climate change in 16 statements to gain insight into the general attitudes of agricultural

advisors about the phenomenon. Distributions of degrees of agreement with individual statements and mean values (M) are presented in the Table 2.

Among the eight statements that make up the composite indicator "awareness of anthropogenic causes and consequences of climate change" (Table 2), respondents agreed the most with statement number 4, i.e., that climate change can be disastrous for human survival ($M_4 = 4.30$). There was also a very high degree of agreement with the statements expressing the views that climate change seriously endangers the world's farming ($M_8 = 4.22$) and biodiversity ($M_6 = 4.00$). Although there was on average a slightly lower degree of agreement about the causes of climate change, most respondents still see it as a consequence of the modern society's way of life (61.1%) and the large contribution of industry (58.3%) and agriculture (52.4%) to global warming. Similar findings about beliefs of agricultural advisors on the anthropogenic causes of climate change have been obtained in some foreign studies (Mase, 2014; U2U, 2016). It is also interesting that 40.8% of surveyed advisors are "indecisive" ("neither agree nor disagree") in detecting agriculture as the cause of climate change, while 6.8% of them believe that agriculture does not contribute to the creation of climate change.

The belief of the majority of respondents in the anthropogenic impact on climate change is supported by the high degree of their agreement with the three statements describing the indicator "responsibility in climate change mitigation." Among the individual statements, respondents agree the most with the statement that governments and policies need to make more concrete actions about climate change ($M_{11} = 4.25$). Also, 84.4% of respondents believe that each of us has a moral responsibility to alleviate this global problem ($M_9 = 4.21$), and about two thirds (62.1%) agree that changes in human activities and consumption are key to mitigate them ($M_{10} = 3.72$).

Table 2. The general attitude on climate change

Indicators with individual statements	Level of agreement* (%)			M_i	SD
	1,2	3	4,5		
Awareness of anthropogenic causes and consequences					
1. Climate change is a result of modern society lifestyle.	10.7	28.2	61.1	3.66	0.996
2. Industry contributes most to global warming and climate change.	9.7	32.0	58.3	3.63	0.918
3. Agriculture has a large share in the creation of climate change.	6.8	40.8	52.4	3.53	0.777
4. Climate change can be catastrophic for the survival of mankind.	3.8	6.8	89.4	4.30	0.838
5. The natural equilibrium (eco-system stability) has never been more vulnerable than today.	8.7	27.2	64.1	3.75	0.936
6. Climate change seriously endangers biodiversity.	3.8	15.5	80.7	4.00	0.816
7. Floods and droughts are exclusively consequences of climate change.	14.5	28.2	57.3	3.52	0.927
8. Climate change seriously threatens farming in the world.	3.9	9.7	86.4	4.22	0.917

Indicators with individual statements	Level of agreement* (%)			M_i	SD
	1,2	3	4,5		
Responsibility in mitigation of climate change					
9. As individuals we are all morally responsible for climate change mitigation.	3.9	11.7	84.4	4.21	0.836
10. Changes in human activities / consumption are key for climate change mitigation.	5.9	32.0	62.1	3.72	0.833
11. Governments / politics have to deal more concretely with climate change issues.	2.9	6.8	90.3	4.25	0.825
Indifference and defeatism towards climate change					
12. There are more important problems (issues) than climate change.	45.7	37.9	16.4	2.63	0.950
13. Nature (the natural environment) can fight climate change by itself.	67.0	26.2	6.8	2.38	0.933
14. The scientists exaggerate with their forecasts of the climate change consequences for the Earth.	68.0	20.4	11.6	2.15	1.115
15. Media often exacerbates the consequences of climate change.	34.0	38.8	27.2	2.91	0.951
16. It's too late to fight climate change.	58.2	29.1	12.7	2.40	0.953

* 1 = I totally disagree; 2 = I disagree; 3 = I do not agree nor disagree; 4 = I agree; 5 = I completely agree

Some previous research has shown that respondents have diverse attitudes toward some aspects of climate change, even within the same sample (Whitmarsh, 2005; Poortinga et al., 2011). We checked for the presence of possible inconsistencies in the attitudes of our respondents with negatively scored statements that collectively make up the indicator "indifference and defeatism towards climate change." Based on the mean values and percentages denoting disagreement on most of these statements, it can be concluded that respondents have a relatively consistent general view about the causes and consequences of climate change, on average. Respondents expressed the least disagreement (34.0%) with the statement about the media's exaggerations of the consequences of climate change (M_{15} = 2.91). Although some advisors (27.2%) agree with this statement, we consider it an expression of their distrust in the credibility of information provided by some public media.

Contingency analysis (χ^2) found that there was no statistically significant difference in the level of agreement with most individual statements with respect to gender and age of the respondents. The only significant gender differences were found in two statements: "Nature (natural environment) can fight climate change on its own" (χ^2 = 10.120, P = 0.006) and "Media often exaggerate the consequences of climate change" (χ^2 = 7.817, P = 0.033). Disagreements ("I completely disagree" and "I disagree") with these statements are significantly more often expressed by female advisors (77.6%) compared to their male colleagues (53.3%), indicating their greater conviction in the need for social intervention in mitigating the effects of climate change on the natural environment. Also, it was shown that younger respondents expressed a higher degree

of agreement statistically significantly more often compared to older advisors on three statements: "Industry contributes the most to global warming and climate change" ($\chi^2 = 8.507$, P = 0.014), "Natural balance (ecosystem stability) has never been more endangered than it is today" ($\chi^2 = 8.194$, P = 0.010), and "Climate change is seriously threatening biodiversity" ($\chi^2 = 8.858$, P = 0.012). These data indicate that younger advisors are more concerned about human disturbance of natural rhythms and have a stronger sense of ethical concern for maintaining biodiversity.

Based on mean values of the three composite attitude indicators (Table 3), it can be concluded that the surveyed advisors agree the most on average with statements about political and civic responsibility in climate change mitigation ($M_{KIo} = 4.06$).

Table 3. Average values of climate change attitudes composite indicators

Indicator	M_{KI}	SD	Cronbach alfa (α)
Awareness of anthropogenic causes and consequences (M_{KIs})	3.828	1.674	0.753
The responsibility in the mitigation of climate change (M_{KIo})	4.061	1.080	0.701
Indifference and defeatism (M_{KId})	2.434	1.665	0.710

Furthermore, respondents on average display a satisfactory level of awareness of the causes and possible wider consequences of climate change on society and the environment ($M_{KIs} = 3.83$). This is also indicated by the low degree of agreement on the composite indicator "indifference and defeatism" ($M_{KId} = 2.43$), although it should be noted that a small number of advisors nevertheless has an ambivalent attitude towards climate change.

Self-Assessed Knowledge and Trust in Information Sources

Giving the public access to credible information about the causes and risks of climate change increases the likelihood of making informed responses and proactive action with the goal to adapt to and mitigate negative effects on the environment and climate. When it comes to agriculture, the scientific, professional and political public agrees that climate change can have very detrimental effects on future farming, thus threatening global / local food security. Consequently, it is very important that agricultural advisors are well informed about the possible risks of climate change in farming, as insufficient information often leads to an unrealistic assessment of the degree of danger. In this study, we examined only advisors' subjective assessments of their general knowledge about these risks, and determined which sources they consider the most credible.

From the answers we can see that 72.8% of respondents think that they are well informed about the possible consequences of climate change in agriculture, 20.4% assess their knowledge as moderate, while 6.5% state that they either are not or do not know if they are sufficiently aware of these risks. Participants who consider themselves well informed most often see the risks of climate change on global agriculture in: reduced yields and product quality, disruptions in production cycles, emergence of new pests and diseases,

loss of arable land, loss of soil fertility, impaired domestic animal health, higher prices of agricultural products, reduction in general crop and livestock production globally, food shortages, pollution of drinking water, etc. However, in order to obtain an accurate insight into the real level of agricultural advisors' knowledge about these risks, an objective knowledge test should be applied in addition to a subjective assessment.

When asked whose information they trust the most, more than three quarters of the surveyed advisors (81.6%) decided to answer "scientists." The rest believe the most in the information they receive from agrometeorological experts, from their more experienced colleagues they work with (6.8%), or from farmers (5.8%). The remaining respondents answered "I don't know" or that they believe "their own observations" the most. Interestingly, none of the respondents chose the answer "government organizations," although in answers concerning their attitudes (Table 2, statement 11) they emphasize the necessity of greater engagement and action from political elites in the fight against climate change.

Some Experiences with the Consequences of Climate Change in Domestic Agriculture

It is well known that Croatia, due to its climatic and geographical characteristics, is one of the countries with greater vulnerability to climate change, especially its primary sector (agriculture, forestry and fisheries). The experiences of local agricultural advisors (and farmers) are extremely important for determining appropriate agro-technical measures for adapting farming to climate change, as their consequences are not spatially uniform. Through several questions, we tried to determine whether agricultural advisors see climate change as problematic for domestic agriculture, what harmful consequences of climate change do farmers or users of their services face, and whether they carry out professional training on these issues.

Table 4 shows the proportions of the answers to the question "Do you think that climate change seriously endangers domestic farming?" It is evident from the table that there is a relatively high proportion (61.2%) of agricultural advisors who see climate change as a threat to the stability of domestic production at the level of the entire sample. The analysis revealed a statistically significant difference in the respondents' responses by gender (P = 0.014). Differences in the proportion of younger and older advisors who consider climate change a serious threat to domestic farming were not significant.

Table 4. Do you think climate change seriously endangers domestic farming?

Answers	Men	Women	Younger (25 - 45)	Elder (46>)	All respondents
	%	%	%	%	%
Yes, it seriously endangers	71.1	53.5	68.9	55.2	61.2
Neither yes nor no, (moderately)	17.8	43.1	22.4	37.9	32.0
It does not endanger	11.1	3.4	6.7	6.9	6.8
Sig.	χ^2=8.555; P=0.014		χ^2=2.222; P=0.330		100.0

Extreme weather events which, among other things, cause direct damage to agriculture have been evident in Croatia in recent years. The next question in the survey pertained to the advisors' knowledge about the frequency and harmful consequences of some phenomena of climate change encountered by farmers in their area. As can be seen from Table 5, drought was among the most frequently mentioned weather disasters, which according to the respondents (63.1%) often (or every year) occurred in their area, causing damage to crops. The most commonly cited consequences of bad weather were reduced yields in production, followed by the emergence of new plant diseases and soil erosion.

Table 5. The frequency of consequences occurrence of climate change by the user

Consequences	Often, every year	Rarely, once in five years	Never
Drought	63.1	35.9	1.0
Flood	21.4	68.0	10.6
Soil erosion (agricultural land)	35.0	49.5	15.5
The appearance of new plant diseases / pests	43.7	46.6	9.7
Yeld reduction	61.2	37.8	1.0

In adapting agriculture to climate change, agricultural advisory services are key links between farmers and sources of new information and knowledge about adaptive production options and their reporting at the local farm level (Simpson and Burpee, 2014). The task of the advisor is, based on relevant agroclimatic data and research, to help farmers to develop knowledge and practical skills in order to transform existing and introduce new production practices more successfully; practices that are more resistant to climate change and less harmful to the environment.

The results of our research show that the vast majority of surveyed advisors (84.5%) hold professional lectures or workshops on topics related to the adaptation of agriculture to climate change annually (Table 6). These professional lectures are mainly part of the educational packages intended for the beneficiaries of Measure 10 (Agriculture, Environment and Climate Change) and Measure 11 (Organic Farming) of the Rural Development Program. Lectures and workshops cover a wide range of topics, such as: "Adaptation of agricultural crops to climate change," "The impact of agriculture on climate change and climate change mitigation," "Soil erosion caused by climate change," "Pest spread caused by climate change," "Sustainable management of soil, water, fertilizers and pesticides," "Agriculture and plant protection from fire under the influence of extreme weather events," etc. Also, some respondents state that they present comparative data on precipitation and temperatures at the local level to farmers as part of their lectures on farming. That way the farmers can take appropriate action on the farm in advance in case of forecasted weather disasters.

Table 6. The organization of professional lectures/workshops on climate change

Number of lectures / workshops	f	%
1-10 per year	47	55.3
11-20 per year	18	21.2
20 > per year	20	23.5
Total	85	100.0

Despite the fact that farmers in Croatia are facing rising risks of climate change (as illustrated in Table 5), according to agricultural advisors they relatively rarely seek advice on how to better deal with these problems. Namely, when asked how often farmers ask them for advice on adapting their production to climate change, more than two thirds of respondents (68.9%) stated that they do so very rarely or only occasionally, while only 31.1% answered that farmers often or very often they seek this advice. Farmers seeking advice are adapting to climate change depending on production, by introducing irrigation of their crops, hail protection nets, application of agrotechnical measures to prevent soil erosion, early sowing, foliar fertilization, green fertilization, new more resistant crops, new methods of disease and pest control, reduced tillage, etc. Also, some advisors state that they advise farmers to insure crops against the possible negative effects of climate change.

Planning adaptation in agriculture aligned with climate change largely depends on the education of farmers and their ability to articulate appropriate solutions in their production. The survey showed that agricultural advisors are very critical of Croatian farmers' education on climate change; as many as 92.4% of respondents believe that farmers do not have appropriate knowledge, which can significantly slow down the process of adapting domestic agriculture to climate change.

Conclusions

Knowledge and awareness of the relationship between causes and consequences of climate change is a prerequisite for undertaking systematic and coordinated societal activities on a global and local level, for mitigating their negative effects on people and the economy, as well as for reducing pollution and environmental degradation. Because climate change is considered an important risk in farming, many authors emphasize the role of agricultural and related services in propagating climate information and training farmers to successfully implement innovative agricultural technologies and practices resistant to climate variation. This assumes that agricultural advisors are well informed about the nature and extent of the risks associated with climate change in local agriculture.

The basic findings of this research indicate that most agricultural advisors in Croatia are aware of the anthropogenic impact on climate change and its wider consequences for human communities and ecosystems. This is confirmed by the relatively high degree of their agreement with statements primarily about political (M11 = 4.25), but also about civic responsibility (M9 = 4.21) in climate change mitigation. Most advisors consider

themselves well informed about the possible risks and harmful consequences that climate change brings to agriculture, and consider the information coming from scientists to be the most credible. The results of the research showed that about two thirds of the surveyed advisors perceive climate change as dangerous for the stability of domestic farming, and as many as 92.4% of them believe that Croatian farmers do not have the necessary knowledge to successfully deal with climate change risks in their own production.

Ultimately, climate change is certainly a great challenge not only for Croatian agriculture but also for the wider economy and society. Consequently, it is necessary to conduct systematic, comprehensive, and interdisciplinary research in order to obtain information on climate change based on science, but also research that examines the views of the public. This will lead to a better understanding and harmonization of approaches in planning desirable social interventions. It is necessary to develop human capital - knowledge, skills and abilities of farmers which would allow them to cope with the consequences of climate change, but it is also necessary to act on mitigating the harmful effects of agriculture on the climate and the environment.

Conflict of interests

The authors declare no conflict of interest.

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MULTI-CRITERIA DECISION MAKING TRENDS IN ECOTOURISM AND SUSTAINABLE TOURISM

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ABSTRACT

The goal of this paper is to provide a comprehensive overview of application of multi-criteria decision making (MCDM) methods in papers from the field of ecotourism and sustainable tourism. A search has been done of the relevant terms in titles, abstracts and keywords found in papers from 26 prominent journals from the field of tourism belonging in Web of Science (WoS) Clarivate Analytics. It has been established which MCDM methods were used and who are the most common authors of such papers. A keyword frequency analysis was also performed. It is established there are 39 papers in the field of ecotourism and sustainable tourism where MCDM methods were applied whereby all were published after the year 2000, as well as that their number is constantly increasing.

Introduction

Due to an exponential increase in the global focus on sustainable development, a new area of tourism appeared based on its principles. According to Maksin et al. (2009), sustainable tourism first appeared in the early 20th century, and its main characteristic is that it "makes a lasting contribution to the environmental improvement, social well-being, economic prosperity and the conservation of natural and man-made resources, cultural values and local community identity" (p. 16). UNEP & WTO (2005) define sustainable tourism as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities" (p. 12).

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Ecotourism has its own conceptual definition as well. Maksin et al. (2009) define it as an "ecologically responsible journey and a visit to the areas with relatively conserved nature, for enjoying, studying and appreciating the values of nature, landscapes and cultural heritage, promoting and being involved in protecting and enhancing those values, as well as the environment and the local community" (p. 24). Voza & Fedajev (2020) stand out that for developing countries "ecotourism can be an opportunity for accelerating economic development by exploiting natural resources, without changing their original state" (p. 89). The environmentally sustainable tourism can be distinguished as a strategic determinant not only for the economic, but social development as well (Vuković et al., 2019). On the other hand, Diamantis (1999) argues that "the definition of ecotourism is not really necessary if the discussion focuses on the concepts rather than the issues implied by ecotourism", whereby "the three common concepts within ecotourism are natural-based, educational, and sustainable (which includes economic and social criteria)" (p. 93). As far as the hotel industry is concerned, Kostić et al, (2019) revealed that "the application of green business practices, which is in accordance with the principles of environmental protection, positively affects the satisfaction of the guests" (p. 54).

The number of papers on sustainable tourism increased dramatically in the recent past according to Ruhanen et al. (2015). They conducted a 25-year bibliographic analysis in the four best ranked tourism journals and came to the conclusion that despite the increase in the number of published papers, the subjects and topics remained constant. Also, most papers were case studies, empirical studies and critical reviews. The increase in the number of papers on sustainable tourism was also indicated by Zolfani et al. (2015).

In the sphere of sustainable tourism and ecotourism, there are numerous factors i.e. criteria which are to be taken into consideration upon decision-making. Therefore, the methods of multi-criteria decision making have found application in these fields as well. Multi-criteria decision making (MCDM) has been present in science since the middle of the 20th century but the number of papers published on the application of MCDM to various fields has been increasing since the 90s (Köksalan et al. 2011). An increasing number of academic publications in this field made various authors to deal with its systematization. However, not a single paper referred to the use of MCDM in the field of ecotourism and sustainable tourism.

Thus, based on the aforementioned, the overall goal of this paper was the overview of multi-criteria decision making methods implementation in scientific papers which refer to ecotourism and sustainable tourism, and have been published in the most prominent academic journals in the field of tourism. The main research questions were:

- What is the historical trend of knowledge development in the analyzed scientific fields like?
- In which journals were papers mostly published?
- Which methods of MCDM were mostly implemented?
- Which authors were the ones to deal with these topics most often?

- What are the most frequently used keywords?
- What are the most significant sub-fields of research (key topics)?

Materials and methods

In order to find the answers to the main research questions, authors conducted a bibliometric analysis – "the quantitative study of physical published units, or of bibliographic units, or of surrogates of either" (Broadus, 1987).

The importance of bibliometric analyses in the field of tourism is seen based on the review of bibliometric papers to this day in this domain (Koseouglu et al., 2016). The application of bibliometric analyses is present in the field of sustainable tourism (Ruhanen et al., 2015; Garrigos-Simon et al., 2018; Sánchez-Cañizares et al., 2018; Della Corte et al., 2019; Niñerola et al., 2019; Segui-Amortegui et al., 2019; Serrano et al, 2019; Jiménez-García et al., 2020; Lima Santos et al., 2020; Moyle et al., 2020; Milalic et al., 2021; León-Gómez et al., 2021; etc.), as well as in the field of ecotourism (Nordin & Jamal, 2020; Liu & Li, 2020; Khanra et al., 2021; etc.).

Firstly, a search has been done for the already defined relevant terms in titles, abstracts and keywords of 26 tourism/hospitality related journals with an impact factor from the Web of Science (WoS) Clarivate Analytics. Advanced search options were used on the websites of the journals' publishers: journals.sagepub.com (6 journals); www.sciencedirect.com (8 journals); www.emerald.com (3 journals); www.tandfonline.com (8 journals); onlinelibrary.wiley.com (1 journal).

The search was not limited to a certain data publishing period, but to the entire history of publishing the papers of the analyzed journals. The search has been done during July 2020, based on words which point to ecology i.e. sustainability, and determinants which refer to MCDM, as well as abbreviations or full forms of the most prominent methods, according to Zavadskas et al. (2014), Mardani et al. (2015), etc.: WPM, WSM, AHP, COPRAS, TOPSIS, VIKOR, ELECTRE, MOORA, MULTIMOORA, DEMATEL, SWARA, ANP, PROMETHEE, WASPAS, SAW, ARAS, DEA, MAUT, MCDM, MADM, MCDA, MODM.

Subsequently, content analysis of the results was conducted by reading the full papers. This way it was confirmed whether the certain paper fulfilled the requirements to be included in the dataset for further analysis. Thus, the following has been unequivocally established: Is the method in question truly implemented in the paper or is it there for some other reason? Does a certain abbreviation truly represent some of the methods or does it refer to some other term? Does the paper essentially focus on ecotourism and sustainable tourism or do the listed terms come up for other reasons?

Data about the publications who found themselves in final selection were coded in a simple flat-file database in Excel. The attributes for which values which were entered for each paper were the following: (1) the journal's title; (2) the paper's title; (3) the author's names; (4) the authors' affiliations (institutions and countries); (5) the year of

publication; (6) keywords; (7) MCDM method used; (8) area of tourism to which the paper refers (ecotourism or sustainable tourism); (9) key topic to which the method is implemented.

The keywords from the papers selected were processed through the Rapid Miner tool, and based on them a word cloud was made where the most frequently used words and phrases were visually highlighted.

In accordance with the aforementioned, figure 1 briefly depicts the structure of the research, whick consists of five phases.

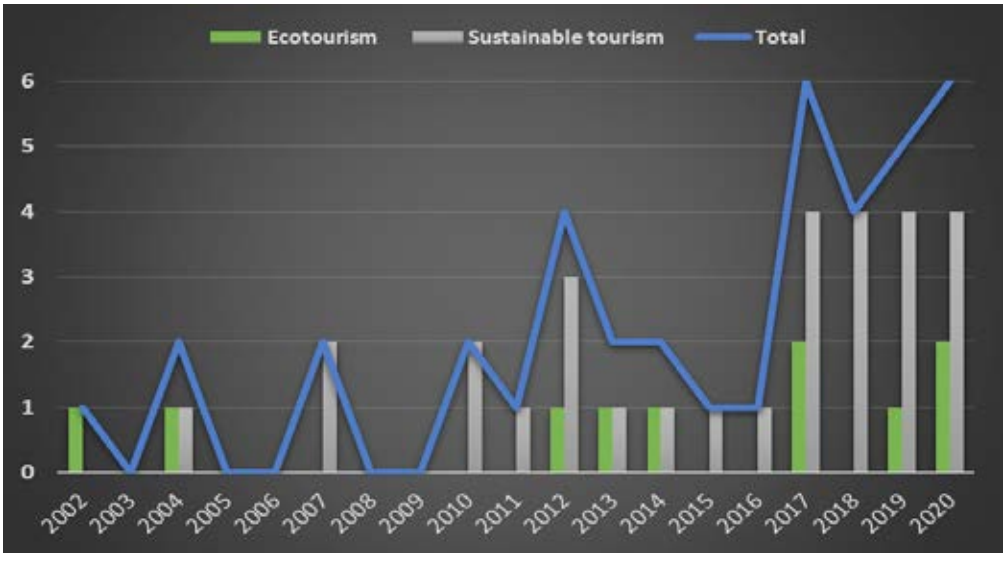
Figure 1. Structure of the research

Results and Discussion

Based on the defined methodology, there were 39 papers in the final selection which were the subject of further analysis.

The following figure shows a yearly dynamics of paper publishing to this day. Each of the papers was published in the 21st century, the oldest one dating from 2002.

Figure 2. Yearly dynamics of paper publishing



Source: Authors' research

In the previous decade which makes up half of the time periods since such papers have been published, there were 32 papers published which is 82% of the total. In the decade before that there were 7 papers published (17.9%), out of which 2 were from the field of ecotourism, and 5 from the field of sustainable tourism.

It is expected that the number of papers with the subject theme will continue to increase in the upcoming period, which goes hand in hand with the increase of the number of papers published which deal with MCDM (Zavadskas et al. (2014); Mardani et al. (2015)) and sustainable tourism (Ruhanen et al. (2015); Zolfani et al. (2015)) separately.

For a simpler overview of the results obtained, as well as their discussion, the rest of this section will be shown and explained in four separate chapters which refer to journals, methods, authors and key words and topics.

Part 1: Prominent journals

The results of the research show that ecotourism and sustainable tourism are the matter of MCDM in about 39 papers which were published in 10 out of 26 analyzed journals (38.46%). The following table shows journals which had papers published according to the subject matter, as well as the number of such papers in journals and the fields they cover.

Table 1. Number of papers per journal

Journal	Ecotourism	Sustainable tourism	Total papers	
			No.	%
Tourism Management	4	5	9	23.08
Journal of Sustainable Tourism	2	6	8	20.51
Tourism Economics	1	4	5	12.82
Asia-Pacific Journal of Tourism Research	2	2	4	10.26
Current Issues in Tourism	1	2	3	7.69
International Journal of Tourism Research	0	3	3	7.69
Tourism Management Perspectives	0	2	2	5.13
International Journal of Contemporary Hospitality Management	0	2	2	5.13
International Journal of Hospitality Management	0	2	2	5.13
Journal of Hospitality and Tourism Technology	0	1	1	2.56
TOTAL	10	29	39	100.00

Source: Authors' research

The greatest number of published papers was in the Tourism Management journal (8 papers, 23.08%) which can be related to the impact factor, which is the largest among all analyzed journals. The significant presence of papers published in the Journal of Sustainable Tourism (20.51%) is logical given the name and subject matter of this journal. Ruhanen et al. (2015) also reported these two journals had the largest number of published papers on sustainable tourism in the period 1987–2012.

The papers which refer to ecotourism (10 papers) can be found in five journals, while papers which refer to sustainable tourism (29 papers) can be found in ten journals. Once again, the most prominent journals are Tourism Management and Journal of Sustainable Tourism. The most probable reason for the disproportion in the number of papers on ecotourism vs. sustainable tourism is that sustainable tourism represents a broader concept.

Part 2: Prominent methods

The following table shows a review of established MCDM methods in the analyzed journals. All of the six methods were found only in the Tourism Management journal, while four of them were implemented in the Journal of Sustainable Tourism. Once again, such results are probably a consequence of the high impact factor as well as the journals' topic.

Table 2. Frequency of MCDM methods in journals

	AHP	ANP	DEMATEL	DEA	VIKOR	ELECTRE	Total methods in journal
Tourism Management	2	1	1	3	1	1	6
Journal of Sustainable Tourism	2	3	1	1	0	0	4
Tourism Economics	1	0	0	4	0	0	2
Asia-Pacific Journal of Tourism Research	2	0	0	1	0	0	2
Current Issues in Tourism	0	1	2	0	2	0	3
International Journal of Tourism Research	1	0	0	1	0	0	2
Tourism Management Perspectives	0	0	0	1	0	0	1
International Journal of Contemporary Hospitality Management	1	1	1	0	0	0	3
International Journal of Hospitality Management	0	0	0	2	0	0	1
Journal of Hospitality and Tourism Technology	0	0	1	0	0	0	1
Total journals per method	6	4	5	7	2	1	
Total papers per method	9	6	6	13	3	1	

Source: Authors' research

The method which is most commonly used in papers is DEA (13 papers in 7 journals). This result is in accordance with Emrouznejad's & Yang's allegations (2018) that DEA is one of the MCDM methods which has experienced exponential growth when it comes to "the number of publications related to its theory and applications". Ashrafi et al. (2013) point out that the "existing literature related to evaluating the efficiency of the hotel industry, generally, uses different types of radial Data Envelopment Analysis (DEA) to compare the relative efficiency of different hotels in a location" (p. 31).

AHP is the next most significant method when it comes to the application in ecotourism and sustainable tourism. Its use is convenient when there are various criteria which can be put into certain categories (Hermann et al., 2007; Agarski et al., 2012), as well as when it is needed to determine the weights of criteria (Papić, 2016) upon which every comparison between two elements of the hierarchy is performed based on the Saaty's Rating scale or so-called "nine-point" scale (Saaty, 2008).

The following table (*Table 3.*) shows a review of established MCDM methods in the papers per analyzed topics. The broader conceptual determination of sustainable tourism over ecotourism has prevailed once again in terms of quantitative indicators.

Table 3. Frequency of MCDM methods per topic

	AHP	ANP	DEMATEL	DEA	VIKOR	ELECTRE	Total methods
Ecotourism	2	2	1	3	0	0	4
Sustainable tourism	7	4	5	10	3	1	6

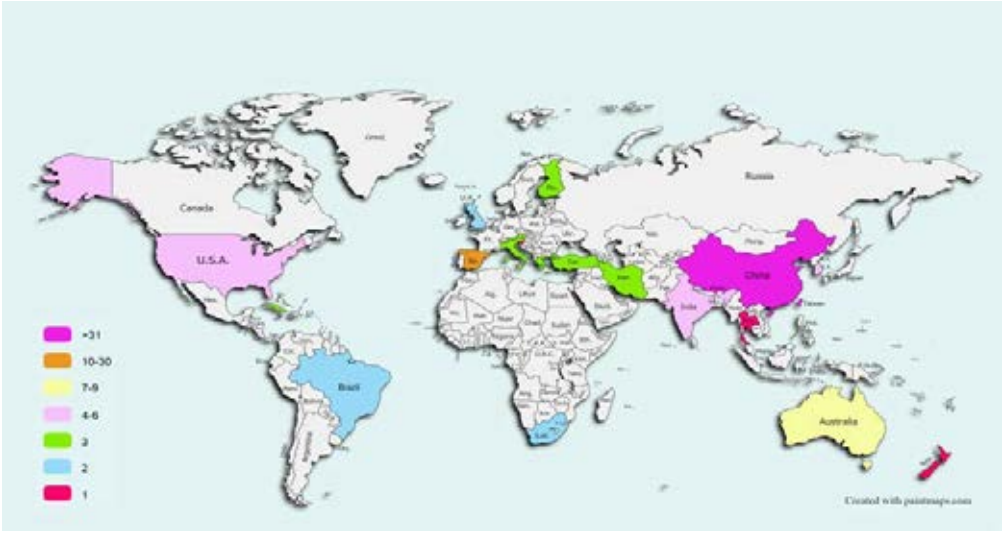
Source: Authors' research

A significant result of this research is the finding that methods such as WPM, WSM, COPRAS, TOPSIS, MOORA, MULTIMOORA, SWARA, PROMETHEE, WASPAS, SAW, ARAS and MAUT haven't been used in papers in the field of ecotourism and sustainable tourism.

Part 3: Prominent authors

The number of the authors who contributed to the 39 papers analysed is 116, and that from 20 different countries (*Figure 3.*).

Figure 3. Authors by countries



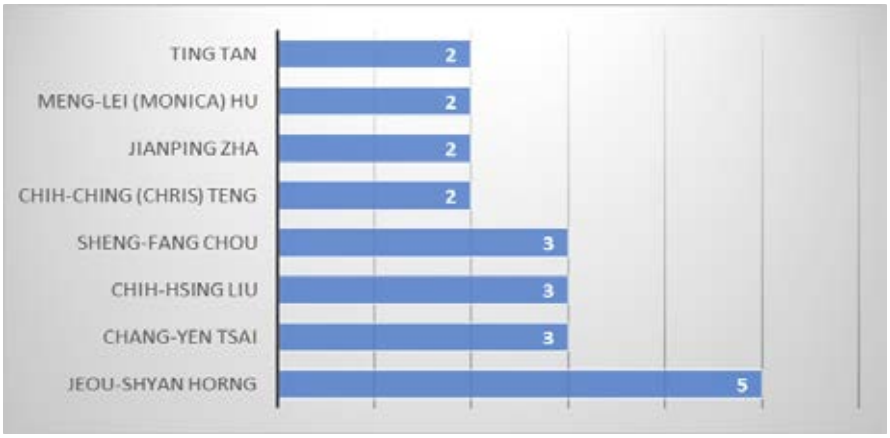
Most of the authors were from China (n=39 including 18 from Taiwan). The academic interest of Chinese authors in the analyzed research field can potentially be related to the state of the tourism sector in China, which is recording progress. For example, according to the World Bank data, China ranks first in the world for expenditures for travel items. Also, these expenditures were constantly increasing from 1995 to 2018 (World Bank, International tourism, expenditures for travel items (current US$) – China). Moreover, the importance of tourism in China according to the World Bank can be seen by the fact that the number of arrivals has been constantly increasing since

2014, according to which China ranks third in the world (World Bank, International tourism, number of arrivals – China).

The number of Spanish authors is significant as well (n=22), upon which 15 contributed to the Navarro Jurado et al. (2012) paper. An average number of authors who contributed to papers while excluding the aforementioned one is 3.07.

The following figure (*Figure 4.*) shows an overview of authors who have two or more papers with the subject theme. Upon analyzing the authors of subject works, the individuals were taken into consideration irrelevant of being main authors or co-authors i.e. independent of their position.

Figure 4. Most frequent authors (≥ 2 published papers)



Source: Authors' research

The most prominent author is Jeou-Shyan Horng with five papers published (12.82% of all papers), four of which she was the main author. Professor Horng has a long and successful research career in the field which can be seen in how many times her papers were cited (n = 1941) and her *h*-index of 23 (Scopus preview – Horng, Jeou Shyan – Author details – Scopus, 2021).

What could also be noticed in the previous picture confirms the allegations regarding the engagement of Chinese authors in this research field according to its quantity and quality. According to World Bank data, China ranks first in the world according to the number of Scientific and technical journal articles which was constantly increasing from 2000 to 2018 (the whole period for which data exists) (World Bank, Scientific and technical journal articles – China).

Part 4: Key words and key topics

The following figure (*Figure 5.*) shows the most frequent keywords in analysed papers. It can be concluded that the most frequent keyword is Data envelopment analysis which is a full form for the MCDM method DEA. When it comes to the methods, among all the keywords

the prominent one is Analytic Hierarchy Process – full form for AHP. Such results were expected considering the number of papers where the aforementioned methods were used (13 and 9, respectively). The other prominent keywords were sustainability and multicriteria analyses, which were also expected considering the subject theme of the papers.

Figure 5. Word cloud of the keywords

Still, having analysed the 201 keywords which could be found in the 39 papers, the fields of application of MCDM methods could not be fully established. Therefore, the authors had to re-read the papers and single out key topics which were used for MCDM methods in the domain of ecotourism (*Table 4*.) and sustainable tourism (*Table 5*.). The authors of the papers with the year of publication, key topics and applied MCDM methods are listed for each paper in both of the tables.

In 8 out of 39 papers there has not been a single MCDM method used which were the subject of the search, but solving certain issues in accordance with the multi criteria approach has been taken into consideration in analysis (multi criteria analysis – MCA), evaluation (multi criteria evaluation – MCE), i.e. decision making (multi criteria decision making – MCDM). The MCDM abbreviation was also used for papers where certain hybrid methods were applied (Hajizadeh et al., 2020).

Table 4. The review of papers on ecotourism

Author(s)	Topic	MCDM method
Herath (2002)	The author emphasized the importance of using certain analytical tools in the ecotourism planning process.	MCDM
Zografos & Oglethorpe (2004)	The authors emphasized the three-dimensional MCA (adding sociocultural objectives) and its application in the field of ecotourism, as well as the importance for the analysis of the preferences of different stakeholders. Also, the authors demonstrated the possibilities of MCA for the integration of quantitative and qualitative research approaches.	MCA
Horng et al. (2012)	The authors singled out 35 energy saving and carbon reduction indicators based on literature/documents reviews and expert interviews and determined their relative weights. Their implementation was conducted through a questionnaire survey which highlighted key elements for improvement.	ANP
Horng et al. (2013)	The authors developed an innovative physical dining environment design (IPDE) assessment model for use in restaurants taking into account the relationship between creativity, eco-friendliness, aesthetics and performance.	ANP, DEMATEL
Dhami et al. (2014)	The authors used visitors' preferences and physical characteristics of the environment to map forest ecotourism areas.	AHP
Li et al. (2017)	The authors created a framework for evaluating electronic word-of-mouth (eWOM) and concluded that ecological-biological attractions failed to make tourists feel very satisfied in various aspects.	AHP
Peng et al. (2017)	The authors analyzed the determinants of eco-efficiency and concluded that eco-efficiency is continuously increasing, that „eco-efficiency is more relevant to scale efficiency than to pure technical efficiency" and that the development of eco-efficiency has four phases.	DEA
Ruan et al. (2019)	In order to measure ecological security and observe "quality" from the perspective of "efficiency", the authors created a new model of evaluation: Driver-Pressure-State-Impact-Response - Data Envelopment Analysis (DPSIR – DEA).	DEA
Zha et al. (2020)	The authors created a model for measuring changes in eco-efficiency and eco-productivity and broke down the 6 elements of tourism growth.	DEA
Hajizadeh et al. (2020)	The authors evaluated the possibilities for the development of ecotourism using Weighted Linear Combinaiton (WLC) and Fuzzy Ordered Weighted Average (Fuzzy-OWA) methods, concluding that "OWA has a high potential for modeling complex decision problems because of a new concept in this method called order weights".	MCDM

Source: Authors' research

Based on the data shown it could be concluded that the given MCDM methods were used predominantly for means of planning and development of ecotourism, mainly in places where authors live and work. Table 4 also shows that Horng et al. (2013) have combined two methods – ANP i DEMATEL, which was not visible from data listed in Table 3.

Table 5. The review of papers on sustainable tourism

Author(s)	Topic	MCDM method
Kajanus et al. (2004)	The authors used the A'WOT method (a combination of AHP and SWOT) indicating the importance of local culture to the development of rural tourism.	AHP
Schianetz et al. (2007)	The authors provide an overview of tools for sustainability assessments for tourism destinations, considering their characteristics (strengths, weaknesses, specifics of application to certain areas, examples of use).	MCA
Tsaur & Wang (2007)	The authors proposed a procedure for evaluation of sustainable tourism development that can be applied to a specific tourist destination (3 elements at the objective level, 10 at the attribute level and 28 at the criterion level).	AHP
Lee et al. (2010)	The authors developed a model for assessing the attractiveness of the destination in terms of sustainable forest recreation tourism (23 determinants).	AHP
Moriarty (2010)	Author compared economic sustainability measures between divisions of New Zealand's hospitality industry and national tourism exemplars.	DEA
Park & Yoon (2011)	The authors developed community-based rural tourism development indicators (33 indicators, 4 dimensions).	AHP
Jurado et al. (2012)	The authors created an approach to assess the growth constraints of coastal tourist destinations. The two main advantages are: 1) "focuses on an open coastal area with an economy based on mass tourism", 2) "flexible formula – adaptable to other coastal areas".	MCDM
Assaf et al.. (2012)	The authors dealed with the impact of the triple bottom line (TBL) reporting (social, environmental and economic) on hotel performance, concluding that extensive reporting on all three dimensions leads to better performance (environmental reporting in particular).	DEA
Chan (2012)	Focus of this paper was on the hotel energy benchmarking framework based on prevailing conditions in China.	DEA
Hu et al. (2013)	The authors created a model for energy conservation and carbon reduction (ECCR) for restaurants (30 ECCR criteria, 5 dimensions – the most important „buildings").	ANP
Hyman (2014)	The author determined the impact of climate change on beach and non-beach tourism using "43 pre-determined literature-linked indicators" which include "bio-geophysical, social, technological, economic, technological and institutional factors".	MCDM
Malik & Bhat (2015)	The authors divided the territory of Kashmir into three parts based on tourism potential (based on natural and socio-economic characteristics) and emphasized the importance of tourism carrying capacity (TCC) for regulating the impact of tourism on the environment.	MCE
Michailidou et al. (2016)	The authors created a "methodological framework to plan, manage and implement climate change mitigation and adaptation measures in the tourism context" ("18 mitigation and 16 adaptation measures under 4 criteria i.e. environmental benefit, applicability, cost and social acceptance").	ELECTRE
Fernández-Tabales et al. (2017)	The authors created indicator systems of sustainability in tourism destinations based on the roles of the "public administration, tourism businesses and the local community" (43 indicators divided into 5 sub-systems).	AHP

Author(s)	Topic	MCDM method
Pérez et al. (2017)	The authors were focused on measuring the degree of sustainability of tourist destinations, taking into account the perception of stakeholders (3 dimensions – social, economic, patrimonial; 17 indicators).	MCDM
Önder et al. (2017)	The authors synthesized various frameworks for sustainable tourism indicators for subnational regions and cities, concluding that it is more feasible to analyse existing sustainable tourism indicators than to introduce new measures lacking in direct practical applicability for the organizations.	DEA
Park & Kim (2017)	The authors used 153 sustainable practices and their relative importances/weights for the development of guidelines for a green convention (7 categories and 37 subcategories).	AHP
Horng, Hsu & Tsai (2018)	The authors created an assessment model of corporate social responsibility (CSR) practice in the field of tourism (5 dimensions i 15 criteria).	ANP, DEMATEL
Chiu (2018)	The author analyzed the bed and breakfast (B&B) industry in the context of managerial efficiency.	DEA
van Heerden & Saayman (2018)	The authors analyzed the sustainability of national arts festivals in order to "identify the presence of tendencies to overspend and budget mismanagement exhibited by visitors at the Innibos National Arts Festival", creating a framework for the development of "price discounts or package combos" which needs to be adjusted according to gender.	DEA
Horng et al. (2018)	For the hospitality industry, the authors are developing a sustainable service innovation (SSI) framework.	DEMATEL, ANP
Peng & Tzeng (2019)	The authors explored the feasibility of performance-improving strategies.	DEMATEL, VIKOR, ANP
Kularatne et al. (2019)	The authors examined the impact of environmentally sustainable practices on hotel efficiency.	DEA
Andria et al. (2019)	The authors ranked tourist destinations and evaluated their performance in terms of sustainability (two-step FAHP-FMCDM method).	DEA, AHP
Ozturkoglu et al. (2019)	The authors identified dimensions for sustainability-oriented hospitality service innovation (SOHSI) for the food and beverage (F&B) industry. The specificity is that not one, but three dimensions were used (social, environmental and economic; so-called „triple bottom line – TBL").	DEMATEL
Lin (2020)	The authors evaluated the system of urban and rural tourism based on four aspects: cultural preservation, environment sustentation, economic development, and social consciousness.	DEMATEL, VIKOR
Kim & Chung (2020)	The authors analyzed the visitor return rate of millennials on the example of national museums.	DEA
Zha et al. (2020)	The authors developed an approach to identify the seven elements of tourism growth ("technological efficiency, technology gap effect, technological progress, labor input effect, capital input effect, tourism resource endowment effect, and environmental overload effect").	DEA
Kumar et al. (2020)	The authors established criteria for evaluating the green performance of airports using the Best Worst Method (BWM) and VIKOR. It has been established that "green policies and regulations are the most important performance criteria for green airports".	VIKOR

Source: Authors' research

DEMATEL was also combined with other methods in the field of sustainable tourism (primarily VIKOR and ANP) in 4 out of 5 papers where two or three methods were used (Horng, Hsu & Tsai, 2018; Horng et al., 2018; Andria et al., 2019; Lin, 2020; Peng & Tzeng, 2019). One could notice that all of the aforementioned papers are of a more recent date, thus, the phenomenon presented could be observed as a future trend.

Conclusions

Based on the analysis conducted in this paper, important facts were ascertained, ones which refer to the application of MCDM in the field of tourism, taking the component of ecology and sustainability as a whole into consideration. Analyzing the most prominent journals in the field of tourism, it has been established that in 10 journals (out of 26), there are papers which refer to the application of MCDM in ecotourism and sustainable tourism. The total number of analyzed papers is 39, whereas the journal with the most papers published is Tourism Management. All papers were published in 21st century (from the year 2002). Methods used in papers were: DEA (13), AHP (9), ANP (6), DEMATEL (6), VIKOR (3) and ELECTRE (1).

Based on the other specific findings of this research, stated in the results and discussion section, it can be said that the paper represents a strong database but also a knowledge base, and it provides beneficial guidelines for further research in specific academic area.

What this paper lacks is that it focuses solely on journals with an impact factor (IF) in Web of Science (WoS) Clarivate Analytics and not on other means of dissemination scientific results (conference proceedings, monographs, books, dissertations, etc.). This limitation is a good starting point for broadening the quantity of publications where papers of that subject theme can be found. The second direction for further research is broadening the area of the application of the MCDM methods so that it includes tourism in its entirety, not just its specific subfields. Finally, further research could include lesser known MCDM methods.

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Conflict of interests

The authors declare no conflict of interest.

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LENDING AGAINST WAREHOUSE RECEIPTS - EVIDENCE FROM SERBIA

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ABSTRACT

The paper examines factors influencing development of the public warehouse system. Public warehouse system primary role is to provide stakeholders in agribusiness financing against stored commodity as collateral. Case study is conducted in Serbia. Interviews with banks, analyses of the public warehouse results, computational analyses and intensive literature research were conducted. Most important factors for lending against warehouse receipts from bankers' perspectives are guarantee system performances followed by efficient enforcement procedure, efficient public warehouse surveillance, favourable central bank's rating of warehouse receipts and subsidies. According to the results, Serbian public warehouse legal framework is properly established resulting in fast development of the public warehouse system in first years. After 2014 system deteriorated primarily due to the absence of inspection and Indemnity fund low guarantee performance. Lessons learned from Serbia point out that besides proper legal framework, implementation and favourable business environment are paramount for successful public warehouse system.

Introduction

The paper aims to present the principles on which public warehouse systems are based, lending against warehouse receipts mechanics and prerequisites for well-established public warehouses.

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The main limitation of agricultural production is the chronic shortage of financing. Agricultural producers are often lacking adequate collateral to secure loans. (Muhović et al., 2019; Popović et al., 2018).

Lending against warehouse receipts is based on the securely stored commodity as short term loan collateral often referred as "inventory credit". Warehouse receipt is important financial instrument for farmers, traders, processors and other agribusiness stakeholders. Warehouse receipts are documents issued by the public warehouses proving ownership of stored commodity of a particular quantity and quality in a public warehouse. Warehouse receipts are commonly used as collateral for financial institutions loans (IFC/WB, 2013; Jovičić et al., 2014; Grbić & Jovanović, 2020). The pledge on stored commodities is important path for overcoming collateral constraints in agricultural sector (Höllinger, Lamon, 2009).

Most common definition of public warehouses is the following that states that public warehouse is "a platform that enables farmers, traders, processors, and exporters to obtain finance secured by agricultural commodities deposited in a warehouse" (FRMA, 2020).

Trade and financing based on the stored commodity go back to Ancient Mesopotamia. Modern public warehouse system emerged in the United States with the introduction of legal framework in 1913, with the first warehousing law, made it possible for warehouse receipt finance to be generalised and expanded. The USA's public warehouse system is followed by Latin America and later China, Eastern Europe, the former Soviet Union and India (Coulter, Onumah, 2002; UNCTAD, 2009).

Warehouse receipt financing is allowing farmers to postpone selling of commodity after the harvest, when the price is usually the lowest. Farmers have the opportunity to store their products in public warehouses and to meet their short-term financial needs with loans that have a commodity record as collateral. Later, during the period of the year when the price is higher, agricultural producers can sell their products and settle their obligations on the basis of short-term loans taken. Landing against warehouse receipts has positive macroeconomic effect by levelling supply and demand throughout longer period and decreasing commodity price volatility.

Secondly, the warehouse receipts contribute to improving the efficiency and transparency of commodity marketing. Warehouse receipts are easily transferable by merely endorsing it to the new holder. Same reasons causing bank to lend against are the motive for traders to purchase warehouse receipts – there is no risk that stored commodity in public warehouse would be unavailable to the warehouse receipt owner. Warehouse receipts are providing safe trading in commodity with a special importance on commodity exchanges where futures contracts are settled by delivering warehouse receipts (Mahanta, 2012).

Efficient public warehouse system has the potential to reduce risks and transaction costs in collateralised financing, which may result in broad-based access to such a financing at lower costs.

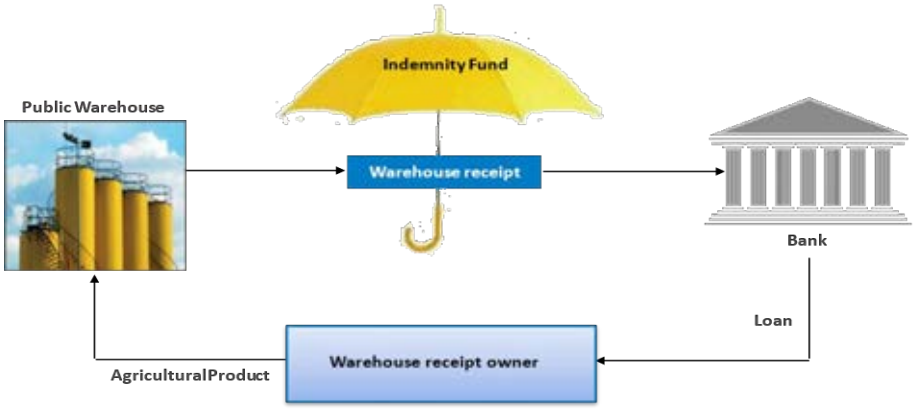
Warehouse receipts can be issued as single or two-part documents. Two-part warehouse receipt at one page contains information on stored commodity, while second part can be detached and serve for data on ownership transfer and pledge. In order to collect commodity owner must present both parts of the warehouse receipt. According to Höllinger and Lamon (2009) single document has an advantage over two-part document because there is possibility of losing detached parts of warehouse receipts triggering unnecessary recovery procedure.

Core elements for successful public warehouse system include:

- Regulatory legal framework is a milestone. Attempts to develop public warehouse without legal framework were proven to be inefficient. Practices in Russia, Turkey and other countries were the banks or commodity exchanges attempted to organise public warehouses based on contractual obligations rather than legal framework were proven to be less efficient;
- Institutions in charge of the licensing and public warehouse supervision;
- Performance guarantees with Indemnity fund in place;
- Introduction of electronic warehouse receipts;
- Farmers, traders, processors, banks familiar with the public warehouse system;
- Public support in the form of the subsidies of loan interest rate against warehouse receipts, storage costs for warehouse receipts owners, favourable decision on loan against warehouse receipts ratings, public warehouse involvement in state grain reserves storage, tax incentives for investors in warehouse receipts, etc.

Figure 1. is presenting lending against warehouse receipts mechanism.

Figure 1. Lending against warehouse receipts mechanics



Source: Kovačević & Zakić, 2016.

Another precondition for well-developed public warehouse system, transferring from paper to electronic warehouse receipts, is exceptionally important. Electronic warehouse receipt is secured from forgery. Data on warehouse receipts are available in

the real time preventing frauds and breaking all the geographical barriers as exchange of documents is not needed (which is especially important for commodity exchange trading). Electronic warehouse receipt can be split or enlarged instantly, reducing transaction costs. In electronic warehouse receipts' environment surveillance is improved as inspection service can monitor, in real time, public warehouses activities (Kovačević et al., 2016).

Nowadays blockchain technologies start to be important digital assets for public warehouses. Blockchain based electronic warehouse has various advantages over traditional one according to research results of Yuanjian et al. (2019) and Su and Wang (2020).

Because of importance of public warehouses, especially for agribusiness sector in developing countries, United Nations Commission on International Trade Law (UNCITRAL) is developing universal legal framework for warehouse receipts. It argues that most developing economies have sufficient warehousing infrastructure and secondary markets but lack a modern warehouse receipts law (Dubovec, Elias, 2017)

Serbian public warehouse system is established by the Law on public warehouses for agricultural products enforced in 2009.

Serbia's regulatory framework has been built on best worldwide practice. It includes Ministry of agriculture and water management of the Republic of Serbia (MoA) as a licensing and supervisory institution. In addition, Indemnity fund is established being in charge of guaranteeing delivery of stored commodities. Efficient out-of-court enforcement procedure in the case of public warehouses default is emended.

Warehouse receipts in Serbia are in two-part paper form printed by the National Bank of Serbia (NBS).

Eligible products for public warehouse storages are grain and oilseeds as well as frozen fruits and vegetables.

Materials and methods

To provide objective results, the following methods were used:

- Questionnaire for commercial banks;
- Desktop research;
- Descriptive statistics;
- Comparative analyses.

Main data source was Indemnity fund of the Republic of Serbia.

From the total of 33 licensed banks in Serbia (NBS, 2021), 19 banks responded to the questionnaire. Survey was conducted between January15TH and January 28TH 2021.

Questionnaire included 5 statements to be rated as follows:

Please rate importance of public warehouse guarantee performance for financing against warehouse receipts.

1) Please rate importance of the supervision of the public warehouses by special inspection service for financing against warehouse receipts.
2) Please rate importance of the efficiency of enforcement procedure in the case of the borrower under warehouse receipt for financing against warehouse receipts.
3) Please rate importance of the Central bank rating on loans against warehouse receipts for financing against warehouse receipts.
4) Please rate importance of the loans against warehouse receipts interest rate subsidies for financing against warehouse receipts.

Respondents could chose the answer from the offered rating scale ranging from 1 – lowest impact, to 5 – highest impact.

The analysis was based on four research hypotheses:

H1: Warehouse receipts represent instrument for overcoming agricultural collateral constrains and enhancing agricultural financing.

H2: Efficient public warehouse system has to be based on established legal framework, rather than contractual obligation among stakeholders.

H3: Efficient public warehouse system has to be based on proven institutional settings: licensing and supervision, guarantee performance and public supports.

H4: Only products that can be stored easily for longer period of time and which quality can be determined at the time of commodity deposition are suitable for public warehouse system – namely grains and oilseeds.

Results

Based on the data from the Indemnity fund of the Republic of Serbia, we analysed the situation in the Public warehouse system in the period 2010-2020. Questionnaire aimed to capture banks attitudes towards the core elements of the warehouse receipt system. The results are presented in the following tables and processed through descriptive statistics.

Table 1. Grain and oilseeds public warehouses' licensed capacities in tonnes in period 2015-2020

Year	Month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2010	0	0	0	0	0	0	6866	6866	6866	6866	6866	6866
2011	6866	6866	14866	14866	14866	14866	19866	24616	29616	29616	29616	22750
2012	32616	32616	32616	38616	38616	42476	61026	63826	83826	80762	80762	73896
2013	76996	76996	76996	76996	62996	62996	77996	71996	107996	110996	110996	120496
2014	117496	117496	117496	117496	117496	117496	121996	120646	120646	84646	77960	77960
2015	68460	68460	68460	68460	68460	59360	48860	34000	34000	34000	14000	14000
2016	14000	14000	14000	14000	14000	14000	14000	11000	11000	11000	11000	11000
2017	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000
2018	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000
2019	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000
2020	11000	11000	11000	11000	11000	11000	11000	11000	0	0	0	0
Average	**34037.33**											
St. Dev.	**36336.71**											

Source: Indemnity Fund of the Republic of Serbia, 2021

Public warehouse cold storage for frozen fruit and vegetables was registered in the period July 2011 to July 2012 in capacity of 900 t (Indemnity Fund of the Republic of Serbia, 2021).

Table 2. Number of grain and oilseeds Public warehouses in period 2015-2020

Year	Month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2010	0	0	0	0	0	0	2	2	2	2	2	2
2011	3	3	4	4	4	4	5	6	7	7	7	5
2012	7	7	7	7	7	7	12	1.3	14	14	14	13
2013	12	12	12	12	12	12	13	12	12	14	15	17
2014	14	14	14	14	14	14	15	14	14	13	11	11
2015	9	9	9	9	9	8	5	3	3	3	2	2
2016	2	2	2	2	2	2	2	1	1	1	1	1
2017	1	1	1	1	1	1	1	1	1	1	1	1
2018	1	1	1	1	1	1	1	1	1	1	1	1
2019	1	1	1	1	1	1	1	1	1	1	1	1
2020	1	1	1	1	1	1	1	1	0	0	0	0
Average	**4.79**											
St. Dev.	**5.04**											

Source: Indemnity Fund of the Republic of Serbia, 2021

Only one cold storage public warehouse is licensed in the period July 2011 to July 2012 (Indemnity Fund of the Republic of Serbia, 2021).

Table 3. Questionnaire results – banks attitudes regarding the core elements of a public warehouse receipt system

	Guarantee performance	Inspection service	Enforcement procedure	Central bank rating	Interest rate subsidies
Average mark	4.89	4.84	4.84	4.68	4.58
St. Dev.	0.32	0.50	0.37	0.67	0.84

Source: Authors' survey

Discussions

It can be concluded based on the presented results that public warehouse system in Serbia had two phases. First one was ranging from the beginning to the 2014. In this period number of public warehouses significantly rose. Total value of loans against warehouse receipts was around EUR 50 million, with around 20% lower interest rate compared to similar loans and shorter issuance time (Indemnity fund of the Republic of Serbia, 2021).

Second phase, starting from the end of 2014, when two large scale frauds in two public warehouses occurred, significantly affected local public warehouse system that did not recover until today. From the mid 2020 there are no licensed public warehouses in Serbia.

Based on the worldwide practice and results from this paper the necessary preconditions for successful system of public warehouses are identified including adequate legal settings, business environment and government support.

According to the results of the survey from the point of view of banks, guarantee performance is the most important segment of the public warehouses, followed by the effective enforcement procedure, efficient inspection service, favourable central bank rating for loans against warehouse receipts and government subsidies for financing based on warehouse receipts.

The aim of this paper was to analyse the core elements of a warehouse receipt system in Serbia and to draw conclusion on reasons for failure and future activities for reconciliation of this important system. Total of 8 core elements of a warehouse receipt system was recognised and current state in Serbia is analysed and compared to the worldwide practice.

1. Public warehouse system in Serbia is based on the **legal settings and relevant law**. Government legal settings is the most appropriate one having advantages over private warehouse system based on contractual obligations. According to Höllinger and Rutten (2009) countries with fully established public legal framework such as USA, Bulgaria, Hungary, Slovakia and Lithuania, etc. have more efficient and successful warehouse systems. Countries with a partially developed warehouse receipt system such as Romania, where Indemnity fund is missing, are significantly lagging behind the first group of countries. Finally, countries without government legal framework that are relying on contractual obligations with private stakeholders i.e. Russian Federation, Turkey etc. cannot build sufficient level of trust to land against public warehouses receipts.[4]

2. Licensing and supervision. Clear responsibility for licensing and supervision of the public warehouses is exceptionally important (Miranda, et al., 2019). Licensing has the role in building integrity and keeping solvency of public warehouses.

In Serbia is applied the most common practice – Ministry of agriculture is in charge of licensing and supervision of the public warehouses. Licensing requirements include: capital requirements, required business indicators, minimal storage capacity, and technical requirements (warehouse manager must not be criminally convicted, equipment, storage capacities, etc.). All stakeholders having interest in warehouse receipts are granted the access to an third party laboratory for dispute resolution. Supervision of the public warehouses is emended by the Law to the special inspection unit within the MoA. The main reason causing the deterioration of the Serbian public warehouse system is that special inspection unit has never been effectively formed in practice, leaving public warehouses without proper on-site inspection.

4 The most common organisers of the private warehouse systems are commodity exchanges aiming to secure delivery of goods and banks aiming to use stored goods as collateral.

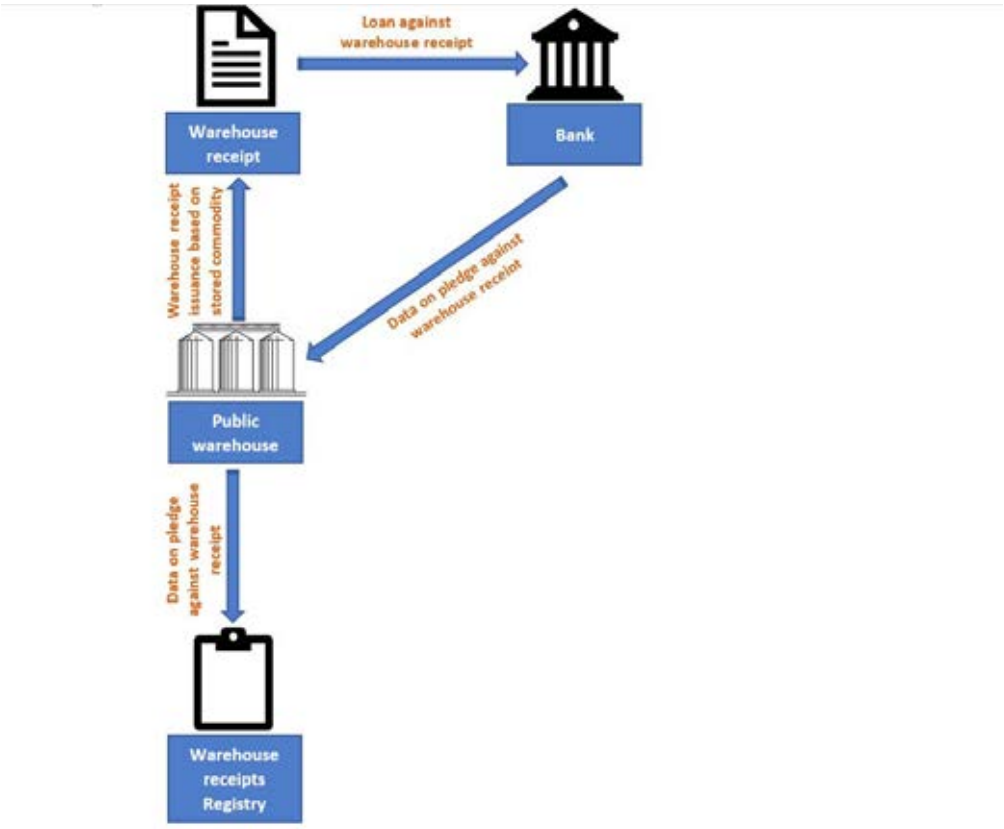
3. Eligible products for public warehouses are only suitable products that can be easy stored with minimal quality losses and shrinkage over longer period and with accurate quality assessment at the time of commodity deposition (Höllinger, Rutten, 2009). Successful public warehouse systems worldwide are the ones with grain and oilseeds. Serbia besides grain and oilseeds introduced cooling houses for frozen fruits and vegetables. Main goal was to provide financing for raspberry producers, but theoretical knowledge is proved and these alternative products are abandoned due to the challenges in the quality determination (quality cannot be determined at the time of deposition, needs to be frozen and classified prior to quality determination, etc.). Serbian experience can serve as a valuable lesson learned.

4. Eligible warehouse receipt owners in Serbia are all parties including public warehouses that can issues warehouse receipts for their own stored commodity. Serbia has applied USA liberal system based on negative experience in other countries such as Bulgaria who banned public warehouses to issue warehouse receipts for own commodity (Kovačević et al., 2016). This ban proved to be inefficient in practice causing fictive third persons to take position in warehouse receipts without real risk reduction effect. Based on conducted analyses Serbian system can be recommended.

5. Warehouse receipt form. In Serbia warehouse receipt is double-component documents in printed form. The NBS is printing warehouse receipts with counterfeiting protection. In order to withdraw commodity from the public warehouse owner has to present both parts. Experience like Bulgarian, USA, Canada's etc. where the warehouse receipts are single documents are pointing out that it is better solution due to potential problems caused with the loss of one part of the document (Höllinger, Rutten, 2009).

After pledge endorsing bank is sending data on loan against warehouse receipt and relying on the public warehouse to enter pledge data in the paper register of warehouse receipts that represents significant risk for the bank (Figure 2).

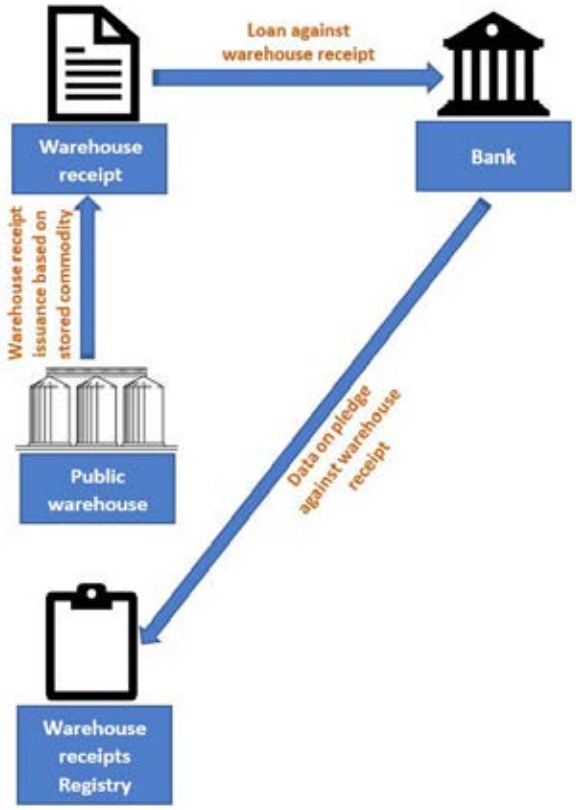
Figure 2. Lending against warehouse receipts in paper warehouse receipts Registry environment



Source: Authors

Another important issue is transferring warehouse receipts in electronic form. This is challenging due to the warehouse receipts individual nature. Serbia takes interesting path by developing in 2011 software with FAO supporting electronic Registry of the warehouse receipts (Figure 3).

Figure 3. Lending against warehouse receipts in electronic warehouse receipts Registry environment



Source: Authors

This system is semi-electronic warehouse receipt system leaving public warehouse receipts in paper form, while warehouse receipt register is kept in electronic form. This registry could significantly lower the risk of fraud[5] and can be example for countries aiming to establish gradually the public warehouse system. Electronic Registry has never been introduced in the Serbian public warehouse system (Kovačević et al., 2016).

6. Guarantee performance in Serbian public warehouse system is in accordance with best practice. Indemnity fund is established in charge of collecting monthly fees from public warehouses with aim to have sufficient capital to indemnify in 5 business days person having legal interest in the warehouse receipt in the case of the public warehouse default to deliver commodity. Additionally, Serbian system embedded mandatory warehouse insurance i.e., for flood, fire, etc. Most of the public warehouses like Bulgarian are insuring on voluntary bases. Based on the conducted analyses it may

5 Banks and traders can access Registry and check warehouse receipt status, bank are allowed to endorse pledge on the warehouse receipt directly in Registry, etc.

be seen that Serbian system has advantages in standardisation easing pledge and trade. Valuable lesson from Serbia is that Indemnity fund has to have initial government capitalisation in order to be able to perform strong guarantee performance from the system establishment. When two frauds occurred in Serbian warehouses Indemnity fund did not have sufficient funds to indemnify lenders. Bulgaria can serve as a positive example, since at the beginning government provided interest free loan to the Indemnity fund for the period of three years. Debt was repaid on time.

7. Central bank decision on loan against warehouse receipts rating. In 2011, NBS set an "Adequate credit rating" for loans against warehouse receipts. This decision achieved a double effect. First, commercial banks, when issuing loans that have a commodity pledge as collateral, are required to deposit only 5% of the loan amount to the NBS, which allows lower interest rates due to reduced commitment of funds. Another effect achieved by the aforementioned decision of the NBS is that a signal is sent to commercial banks that the warehouse receipt is a first-class commodity security (Kovačević, Zakić, 2016).

8. Subsidies to public warehouses/loans against warehouse receipts. The European Bank for Reconstruction and Development (EBRD) approved in 2011 EUR50,000,000 through a "risk-sharing system" for three commercial banks, intended for loans issued on the basis of warehouse receipts (Kovačević et al., 2013).

9. Other supports important as impulse for public warehouses came from the Commodity reserve directorate decision in 2013 automatically accepting public warehouses as government warehouses, while unlicensed warehouses had to meet the requirements of the Directorate. In 2013 Commodity reserve directorate withdraw this decision leaving public warehouses obliged to go through guaranteeing and licensing procedure twice. Common EU practice is to use public warehouses for intervention and other government reserves.

The research conducted in this paper supports the assertion of the stated four research hypothesis. Warehouse receipts are potential viable instrument for overcoming agricultural collateral constrains and enhancing agricultural financing. Efficient public warehouse system has to be based on established legal framework, rather than contractual obligations among stakeholders but also proven institutional settings: licensing and supervision, guarantee performance and public supports. Finally, only products that can be stored easily for longer period of time and whose quality can be determined at the time of commodity deposition are suitable for public warehouse system.

Conclusions

Public warehouse receipt system emerged as a proven practice in many countries. Lending against warehouse receipts allows the use of stored commodity as a pledge for short term loans. In this way, one of the most significant limiting factors in the development of the agribusiness sector, the chronic lack of funds, can be successfully overcome. Warehouse receipts also have a positive impact on banks by creating new

asset classes. Of particular importance is the positive impact of warehouse receipts on the improvement of commodity trading, where delivery in stock exchange trading is done exclusively through warehouse receipts. Based on the conducted analyses, it can be concluded that the Serbian public warehouse system is based on a complete and in practice confirmed legal framework. Additionally, the Serbian system benefited from the positive loan against warehouse receipts NBS rating, Commodity reserve directorate decision to recognize public warehouses as a government storages and subsidies for loans against warehouse receipts. All of these activities are reasons for explosive development of the public warehouses till 2014. Lessons learned from Serbia show that proper legal framework needs to be followed with full implementation. Deterioration of the public warehouse system came as a result of not established inspection service, lack of Indemnity fund initial capitalisation and Commodity reserve Directorate revoking of public warehouses recognition as a government warehouses.

Analysis conducted in this paper is the first comprehensive scientific research on Serbian public warehouse system. It is aimed to serve as a roadmap for Serbian warehouse system improvement while in parallel it can be useful for developing and other countries striving to establish efficient public warehouse systems.

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Conflict of interests

The authors declare no conflict of interest.

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REGIONAL FEATURES OF RURAL UNEMPLOYMENT IN RUSSIA

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ABSTRACT

The research is aimed at typologizing the regions of Russia in terms of unemployment with a view to improving regional economic policy. The typology of regions was done using the method of groupings. This enabled the authors to distinguish between rural areas including the level of employment. The authors revealed that the major negative trend in the labor market was the decrease in the number of agriculture jobs, which caused the release of labor and the increased unemployment rates in rural areas. Grouping the regions based on the indicator of employment of the rural population in agricultural sector allowed the authors to identify three types of regions (with high, medium and low unemployment rates) for further use as a criterion for differentiating the state policy of regulating the labor market in rural areas (active and passive).

Introduction

The need for the formation of sustainable socio-economic systems is an objective necessity for the development of modern society. The vital tasks involve the alleviation of poverty in all its forms and the fight against inequality. Therefore, reducing unemployment is becoming increasingly important. The dramatic changes in the Russian economy in recent years have had a significant impact on all areas, including the functioning of agriculture and rural areas. There has been an increase in

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the production of crops and livestock. However, this is still not coming close to solving the problem of unemployment.

Rural areas make up a significant part of the natural, demographic and economic potential, and play an important role in the formation and functioning of the labor market of any state. In the Russian Federation, the area of agricultural land constitutes about 400 million hectares (23.4% of the total territory).

According to the Federal state statistics service of the Russian Federation, 37.6 million people (25.6% of the total population) lived in rural areas in 2018, including 20.1 million people of working age. The Federal state statistics service of the Russian Federation (2020) summed up the results of a sample survey of the labor force, according to which the total number of the unemployed in 2018 accounted for 3.6 million people, while the unemployment rate stood at 4.8%. The number of the unemployed living in rural areas constituted 1.4 million people (37.6% of the total), and the unemployment rate of the rural population was 8.6%, which is almost twice the average level for the economy (Rosstat, 2020).

At the same time, the results of the HSE research for the centre of Strategic research stated that, "even in the worst times of deep economic downturns, unemployment did not show any signs of "catastrophic growth". According to a survey by the public opinion Foundation, 53% of Russians assess the unemployment rate as high, 48% argue that unemployment is growing where they live. Only 8% notice its decline (Dailymoneyexpert, 2016).

The modern paradigm of the formation of the agrarian economy determines the differentiation of the majority of rural areas according to the degree of economic development and living conditions of the population. This makes it necessary to differentiate rural areas considering the level of employment. This will enable us to develop feasible solutions in the field of regulating the unemployment rates of particular regions, taking into account the individual characteristics of their functioning. These facts prompted the authors to analyze the Russian labor market and evaluate certain regional features in order to justify possible directions of its regulation.

Literature review

There are different interpretations and approaches to the study of the factors that determine the causes and nature of rural unemployment. There are three main reasons for it: the size of the rural population (Ball et al., 2013); the decline in output (Ilyin et al., 2012); and the level of wages (Krivoschekova, 2016; Smirnova, 2019). The latter explains high rural unemployment by the low quality of vacant jobs (poor working conditions, low pay, delayed wages, lack of prospects, etc.). At the same time, it is noted that the rural labor market is characterized by stagnant unemployment with a high proportion of young people.

The model of interaction between rural and urban labor markets plays an important role in understanding the rural unemployment. Originally it was formulated by Todaro (1969) and further elaborated by Harris & Todaro (1970). According to this model,

migration from rural to urban areas correlates with the level of wages in various sectors. Bearing this model in mind, Hicks et al. (2017) showed that there are significant productivity gaps between the agricultural and non-agricultural sectors and examined the implications for sectoral labor redistribution. Ulf et al. (2019) drew conclusions related to the heterogeneity of the wage curve between urban and rural areas, as well as the higher elasticity of unemployment wages in urban areas than in rural areas.

Vakulenko & Gurvich (2015) created a model describing the relationship between labor productivity, real wages and unemployment on the Russian labor market, and also confirmed that there was a rather high degree of correlation between these factors, which is often observed in other countries.

The Russian labor market is characterized by high intensity and duration of job search (Kylgydai, 2018). Also it is characterized by intensive labor movement between employers, which indicates significant inter-firm mobility (Gimpelson et al., 2016). However, intra-company movements (vertical movement of employees on the intra-company ladder of jobs) is significantly lower (Gimpelson et al., 2014), which suggests a rather low intra-company mobility.

The movement of labor between sectors and regions in Russia is comparatively lower than in other countries (Vakulenko, 2020). This justifies low scale of intersectoral and interregional interaction against considerable spatial dispersion of settlements and low population density. An indirect confirmation of low mobility in Russia is the relatively high inter-regional differences in unemployment rates and wages (Guriev & Vakulenko, 2015). This fact can be a serious risk factor for the growth of unemployment in certain regions of the country.

According to the research by Koretskaya-Harmash (2016), the growing demand for labor is largely met by migration growth. This process exacerbates the structural imbalance of supply and demand on the Russian labor market (Trotsuk & Nevzorova, 2015) as a result of the discrepancy between the professional and qualification qualities of applicants to open vacancies (Vasilyeva, 2017). It is obvious that technological development in the near future will reduce the need for the use of unskilled migrant labor, although it may contribute to the growth of unemployment (Grebenyuk, 2020).

The Russian researchers are focused on the social aspects of unemployment. Unemployment is often considered to be one of the major causes of long-term poverty (Sadykov, 2018, Maleva et al., 2020). The authors focus on discriminatory business practices related to individuals of pre-retirement age (Lukyanova & Kapelyushnikov, 2019, Chernykh et al., 2020) and problems of employment of the young population (Mongush, 2018, Smirnova, 2019), considering them as risks of unemployment.

Researchers address the issue of rural unemployment and its social implications. Rural unemployment is seen in agricultural policy development as an obstacle to improving the well-being of rural communities. For example, Mirzoev (2016), Smirnova, (2019) show the role of agriculture in providing the rural population with employment and

income. Tatarova (2019) emphasizes the need to subsidize unemployment in agriculture in order to preserve the population and the social structure of rural areas.

Bondarenko & Tatarova (2019) examined the rural labor market, grouped the territorial entities of Russia and showed the actual inequality of various subjects of the Russian Federation in terms of unemployment. All regions in these studies were divided into three groups based on the indicator "Rural unemployment rate", the authors concluded their apparent differentiation. Indeed, a significant excess of the analyzed indicators over the national average is a sign of a deterioration in the situation on the labor markets of the regions and requires further research as well as practical actions from the state.

Problem statement

Long-term and heavy rural unemployment in Russia, serious discrepancies in the reasons for the formation of rural unemployment and the socio-economic implications prompted the authors to consider the processes occurring on the Russian labor market as well as assessing certain regional features in order to justify the directions of its regulation.

The hypothesis of the study is based on the assumption that in addition to natural factors of the labor market, there are regional characteristics of rural areas which have a significant impact on rural unemployment. In this paper, the authors attempt to:

- identify the specific features typical of the labor market in rural Russia;

- systematize available analytical data on the causes and patterns of the dynamics of rural unemployment;

- conduct a typology of the territorial differentiation of rural unemployment in the regions and identify certain segments with similar employment parameters;

- justify plausible solutions to the problem of rural unemployment, taking into account the regional characteristics of the rural labor market.

The purpose of this study was to typologize the regions of Russia in terms of unemployment with a view to improving regional economic policy.

Materials and methods

The authors used statistical and analytical materials of the Federal state statistics service of the Russian Federation, the Ministry of agriculture and the Federal service for labor and employment of the Russian Federation for the period 2005-2018, as well as materials from academic research, scientific conferences and periodicals to assess the condition of rural unemployment in Russia.

The authors used the grouping method to solve the problem of typifying regions for unemployment, which was justified by Rabinovich (1973) and supported in the works of Rakhmankulov & Gabitov (2009), Chemezova (2013).

The grouping is based on the system of indicators of labor activity, employment and unemployment, set out in the recommendations of the Resolution concerning statistics of work, employment and labor underutilization, the Ninth International Conference of Labor Statisticians. The authors also relied on the study of Bondarenko & Tatarova (2019), where the regions of Russia were divided into three groups based on the indicator "Rural unemployment rate".

According to the authors, the grouping should be supplemented with indicators for assessing both the average unemployment rate in the formed groups and the factors affecting it, as well as the peculiarities of the functioning of the rural labor market. Thus, the authors expanded the initial set of features of rural employment and unemployment in the regions based on data published in the statistical collections of the Federal State Statistics Service of Russia.

The grouping feature was the employment rate of the rural population of working age in agricultural production (lea), which allows the authors to trace the impact of the development of agriculture and the availability of jobs on the unemployment rate in rural areas:

$$le^a = \frac{e^a}{w^a} * 100 \quad (1)$$

where e^a- employed in agricultural production; w^a- rural population of working age.

The authors identified the following significant features: the share of the rural population in the region; gross agricultural output per 1 rural resident; the general un-employment rate in the region; the unemployment rate in rural areas.

The authors find the value of the interval gap (h) for the given groups based on the maximum (p_{max}) and minimum (p_{min}) values of the multidimensional average for the distribution of subjects into groups:

$$h = (p_{max} - p_{min}) / n \quad (2)$$

Further, the authors performed interval sorting of the elements of the group by intervals:

$$i_1 = (p_{min};\ p_{min} + h)$$

$$i_n = (i_{n-1} + 0.1;\ p_{max}) \quad (3)$$

where n – number of intervals; i=1,…,n .

The authors grouped regions by intervals in accordance with the average values of the effective feature ($\bar{Y}$):

$$\bar{Y} = \frac{\sum_{i=1}^{n} y_i}{n} \tag{4}$$

where i=1,…, n.

The authors assume that the statistical population under study consists of n units (groups) with k essential features. The authors calculate the arithmetic mean of the attribute for each indicator. The result is a set of average values, the number of which is equal to the number of indicators used for analysis:

$$\bar{X}_1 = \frac{\sum_{i=1}^{n} x_{j1}}{n}, \bar{X}_2 = \frac{\sum_{i=1}^{n} x_{j2}}{n}, \ldots \bar{X}_k = \frac{\sum_{i=1}^{n} x_{jk}}{n} \tag{5}$$

where i=1,…, n; j=1,…, k.

For practical implementation of this procedure, the authors used the STATISTICA 13.3 application software package.

The authors created a typology of regions based on the employment rate in agricultural production applying the algorithm proposed by Animitsa et al. (2009), as well as the analysis of the results obtained. The potential loss of gross regional product as a result of exceeding the natural unemployment rate is determined by the authors based on the dependence of employment and gross national product (GNP), identified by Okun (1962). The authors justify various options of the state policy for regulating the labor market in relation to different types of regions, taking into account the methods of forecasting economic systems considered in the Ginis (2009) research.

Results and Discussion

The labor market in rural areas of Russia has specific features related to the location of rural settings and the economic conditions of employment. A significant part of rural settlements function on the basis of the synchronous territorial formation of administrative entities and agricultural production organizations formed in the Soviet period on geographically coinciding territorial spaces. Agriculture in most regions is still the main source of employment for rural people. As a result, the rural economy can be described as multisectoral.

In rural areas, there is a high proportion of workers employed in large agricultural enterprises in the total number of economically active population. This, in turn, causes territorial dispersion and isolation of regional labor markets. As a rule, there is no more than one agricultural enterprise in each setting. If the scale of such firms is reduced or the production activity is discontinued, a significant proportion of the working-age population of such settlements is out of work. Low territorial availability of jobs against low horizontal and vertical mobility complicates the movement of labor. As a result, even if there are no vacancies within this enterprise, there is no free movement

of employees to other enterprises. People who have lost their jobs end up losing hope of finding them, even if they want to look for them, in other words, they add to the number of economically passive people. According to the authors, the spatial limitation of land resources also affects the formation of the rural labor market. The lack of the chance of additional involvement of land in the production process makes it impossible to ensure a marginal increase in output, and, consequently, the expansion of vacancies within each specific enterprise without changing the technological structure. This makes it difficult to regulate unemployment in rural areas by influencing commodity markets, as mentioned by, for example, Keynes (1936), Kolodziejczak (2018), Piton & Rycx (2019).

The recovery of the Russian economy in recent decades, accompanied by serious structural changes in the labor market, contributes to the reduction of the rural population (table 1).

Table 1. Labor force, employment and unemployment in rural areas of the Russian Federation, thousand people[6]

Indicator	2005	2010	2015	2016	2017	2018
Rural population	38619	37772	37985	37887	37772	37553
Rural population of working age[1]	22742	22218	21192	20826	20507	20149
Persons who are not part of the labor force	4953	5136	4648	4383	4321	4449
The labor force	17789	17082	16544	16443	16186	15700
including employed people	15952	15185	15158	15052	14825	14350
some of them are employed in agricultural production	7489	6049	5507	5481	5074	4936
unemployed	1836	1897	1386	1391	1360	1350
Unemployment rate in rural areas,%	10.3	11.1	8.4	8.5	8.4	8.6
Employment rate (employed to working-age population),%	70.1	68.3	71.5	72.3	72.3	71.2
Level of employment of the labor force in agriculture,%	42.1	35.4	33.3	33.3	31.3	31.4
The ratio of the unemployed to the total of those employed in agriculture and the unemployed,%	19.7	23.9	20.1	20.2	21.1	21.5

Source: compiled by the authors according to Rosstat (2019)

In the period from 2005 to 2018, the rural areas population decreased by 1.1 million people, and the working-age population declined by 2.6 million people, reducing from 59.1% to 54.6 %. According to data, unemployment in rural areas decreased in 2018 to

6 men aged 16-59 years, women-16-54 years

1.3 million people. The unemployment rate has decreased from 10.3% to 8.6 % of the active population, but is still well above the optimal level. Unemployment in rural areas is largely stagnant. Half of the unemployed have been looking for work for six months or more, more than a third have been seeking a job for more than a year (Rosstat, 2019).

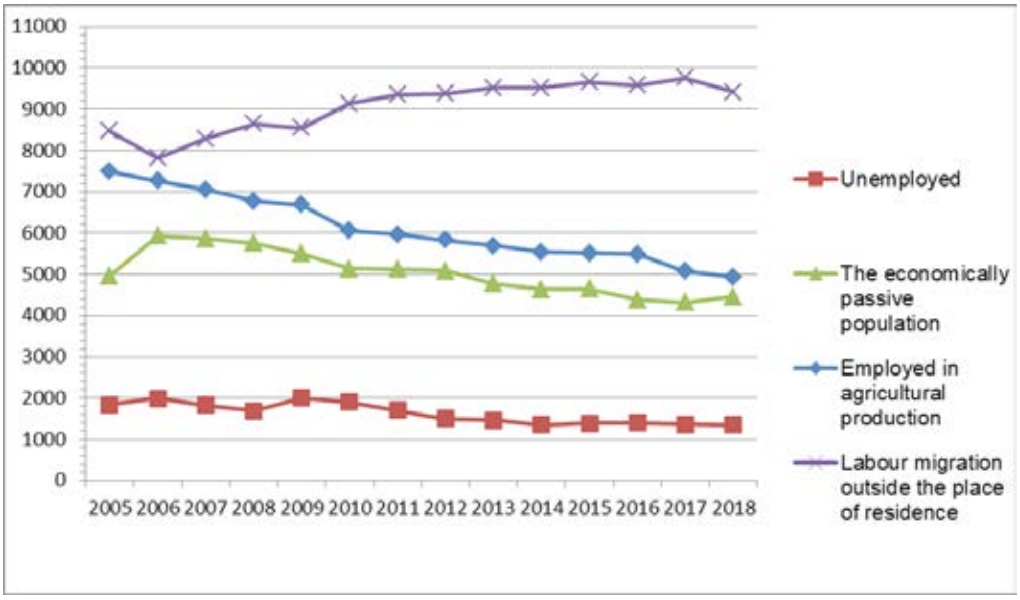
The decrease in unemployment contributed to an increase in the proportion of people who are not part of the labor force (economically inactive population) from 21.7% to 22.1%, and their number accounted for about 4.5 million people. According to the data of the Rosstat employment survey (2019), about 1 million people of working age expressed a desire to work. However, according to the ILO methodology, they were not classified as unemployed because they were either not looking for work or were not ready to start work during the survey period. This is the so-called "hidden unemployment".

A negative trend in the labor market is the reduction in jobs in agriculture,the main source of employment in rural areas. The total number of people employed in agricultural production for the period 2005-2018 decreased from 7.5 to 4.9 million people, or by 34%. The employment rate in rural areas decreased from 42.1% to 31.4%. The release of labor occurs against the background of structural optimization of agricultural production (Babushkin et al., 2021) and growth in labor productivity (Feng et al. (2017), Feng et al. (2018), Bondarenko & Tatarova (2019), Grebenyuk (2020)).

From 2005 to 2018, the number of large commercial organizations decreased by 2.7 times – from 20.4 to 7.6 thousand. There are processes of bankruptcy and liquidation of inefficient agricultural enterprises. Bankrupt enterprises are taken over by more stable farms, and divisions of large companies are often created on their territory. Every year, the number of jobs eliminated in agricultural organizations significantly exceeds the number created. According to Rosstat (2019), 76.9 thousand jobs were made redundant in 2018, while only 62.6 thousand jobs were created, which is 22% less.

The economically active population, released as a result of ongoing processes, migrates in search of work to more prosperous regions, most frequently to urban areas, since individual entrepreneurs and farms are not able to provide enough jobs (Karpunina et al., 2019; Dubovitski & Klimentova, 2019). Labor migration outside of the place of residence in rural areas during this time increased from 8463 million people to 9413 million people. The level of employment in non - agricultural production increased by 12.4 percent, from 47.6% to 60.0 %. The economically passive population is almost the same as those employed in agricultural production (Fig.1).

Figure 1. Structural distribution of the working-age rural population, %



Source: compiled by the authors according to Rosstat (2019)

In our opinion, the lack of vacant jobs within the place of residence creates forced unemployment. The high level of unemployment cannot be explained by an increase in the rural population (Malthus, 1836; Ball et al., 2013) or by a decline in output (Ilyin et al., 2012). This does not happen due to high (Say, 1880; Pigou, 1933) or low level of wages (Vakulenko & Gurvich, 2015, Krivoschekova, 2016; Smirnova, 2019), although it is lower than the level of industrial sectors in the country, but still slightly increases.

The growth of labor productivity in agriculture reduces the need for the available amount of labor in rural areas. This correlates with the conclusions of Marx (1867) about the additional population compared to the average need for capital.

Lack of work is a crucial factor that determines both high unemployment and the movement of the labor force in the labor market. There is a redistribution of the rural population from the agricultural sector to other sectors under the influence of a narrowing demand for labor from agriculture. In this case, this indicates the limited functionality of the Todaro (1969), Harris & Todaro (1970) model of labor migration, supported in modern research by Hicks et al. (2017), Ulf et al. (2019), in which migration from rural to urban areas is attributed to differences in wage levels in different regions and sectors.

In these circumstances, only a third of the rural population is provided with work at their place of residence. The supply of labor is three times as much as the demand, which destroys the classical idea of a labor market that operates on the basis of the ratio of supply and demand. In this case, the assumption of Pissarides (2000), which explains unemployment on the labor market as a result of coordination and bargaining between

firms and workers, does not work. Neither employees nor unions have bargaining power. Firms completely dictate the terms and conditions of employment. This is the decisive factor in determining the level of wages in agriculture, rather than the nature of negotiations (as Blanchard, 2006). In this case, deregulation of the labor market, including the reduction or elimination of the minimum wage (Beck (1999), Blanchard (2006), Freeman (2005), Burgess & Turon (2010)) can negatively affect unemployment, which poses serious threats to the economy. This is a special case of the development model, when the growth of production in the agricultural sector is not accompanied by an increase in employment in it. In this situation, as shown by Fields (1980), the results of growth in the form of increased income are distributed only among a narrow segment of the population, which leads to increased inequality and social disadvantage in society.

The grouping of regions with the allocation of segments with similar employment parameters enabled the authors to create a typology of the territorial differentiation of rural unemployment in Russia.

The authors chose the level of employment in agricultural production as a grouping feature. The minimum value of the grouping attribute (p_{min}) was 4.8%, and the maximum value (p_{max}) was 28.0%. For a generalized description of the level of employment, the authors identified three groups. Interval value (h) for specified groups based on (p_{max}) and (p_{min}) is:

$$h = \frac{4.8-28.0}{3} = 7.7$$

The intervals were:

$$i_{\ 1} = (4.8;\ 4.8 + 7.7 = 12.5)$$

$$i_{\ 2} = (12.5 + 0.1 = 12.6; 12.5 + 7.7 = 20.2)$$

$$i_{\ 3} = (20.2 + 0.1 = 20.3; 28.0)$$

The average values of the grouping attribute ($(\overline{Y})$) and the aggregate of average values, analyzed indicators ($\bar{X}$) for groups are presented in table 2.

Table 2. The grouping of Russian regions on employment of rural population in agricultural production, 2017

Indicators	Groups of regions by the share of people employed in agricultural production			Average for the Russian Federation
	up to 12.5	12.6-20.2	more than 20.3	
Number of regions [2]	40	33	12	85
The share of people employed in agricultural production in the total rural population of the region, %	9.69	15.41	22.25	13.46
Percentage of rural population in the region, %	24.05	29.76	26.41	26.54
Gross agricultural output per 1 rural resident, thousand rubles (USD)	100.1 (1540)	160.6 (2471)	192.5 (2962)	135.9 (2091)
Overall unemployment rate in the region, %	4.7	6.3	5.7	5.2
The unemployment rate in rural areas,%	8.9	8.6	6.3	8.4

Source: compiled by the authors according to Rosstat (2019)

The analysis of Russian regions in terms of employment in agricultural production confirms the dependence of the unemployment rate in rural areas on the development of agriculture and the availability of jobs in it. Higher employment in agriculture correlates with lower unemployment. The first group of regions with a high level of unemployment consists mainly of industrial-type regions and is the most numerous and is characterized by a low share of the rural population engaged in agricultural production (about 10%). It has the lowest volume of agricultural production per 1 rural resident and the highest level of rural unemployment, which is almost twice as high as the total for these regions. Some of the subjects of this group are highly urbanized territories of the northwestern and central parts of the country, including Moscow, Leningrad, Kaluga, and Tula regions. The other part is the northeastern regions with unfavorable natural and climatic conditions for agriculture, including Tyumen, Tomsk regions, the Komi Republic, Yakutia, Khakassia, etc. The same group includes the regions of the North Caucasus, where the level of employment in agriculture is low, and the unemployment rate is one of the highest – from 13% to 15%.

The second group with an average level of unemployment involves 33 regions with mixed-type economies, where the average level of employment in agricultural production is about 15%. It includes the subjects with the largest share of the rural population, sufficiently developed industrial and agricultural production, and an average unemployment rate in rural areas of 8.6%. This group includes Oryol, Vologda, Samara, Bryansk, Lipetsk regions, etc.

The third group with low unemployment includes mainly agricultural regions with developed agricultural production. Agricultural production per 1 rural resident is 1.4 times higher than the average in Russia. These are Volgograd, Voronezh, Tambov regions, the Mordovia Republic and a number of others. It has the highest share of

people employed in agricultural production (22.3%), and the lowest level of rural unemployment, which does not exceed 6.3% on average.

In 12 regions of Russia, the rural unemployment rate exceeds 10%, in 6 of them it is higher than 12%, and in 4 it is higher than 14%. The high level of unemployment negatively affects the volume of the gross regional product, preventing it from reaching its potential level. At the same time, the losses are quite significant. The natural unemployment rate in various studies is often assumed to be between 5 and 6% (Gognac, 2015). Friedman (1968) puts it at 5.5%. This is consistent with the conclusions of the centre for market research of the national research University Higher school of Economics that the unemployment rate in Russia at 5.8% is close to natural (RG, 2020).

The authors calculated the excess of the optimal values of the unemployment rate (Δlu) based on the actual unemployment rate (lu_f) in certain regions and the natural unemployment rate (lu_n) of 5.8%:

$$\Delta lu = lu_n - lu_f$$

According to the conclusions of Okun (1962), each percentage increase in the level of unemployment above its natural level reduces output by 3.2% compared to the level that could have been achieved if unemployment had been at the natural level, the potential loss of regional gross product is:

$$y = 3.2\Delta lu$$

The amount of gross regional product lost in the regions with the highest level of rural unemployment annually ranges from 13.4 to 44.4% of its actual level. And this problem requires an immediate solution. In addition, employment directly affects the level of poverty of the population. If a third of the economically active population is provided with work, and the rest either do not have work or are forced to leave their place of residence in search of it, it will be impossible to ensure a decent standard of living in rural families in the near future.

According to the authors, the policy of regulating employment in rural areas of Russia should contribute to the fullest use of demographic potential, maintain a balance between supply and demand on the labor market, and improve the standard of living of the rural population. To do this, it is necessary to create institutional, economic and legal conditions for the rational functioning of the rural labor market and the sustainable development of the agricultural economy as the main sphere of employment in rural areas.

Regulation of the labor market is possible through the implementation of measures of passive and active state policy. Passive policies are meant to protect people affected by unemployment. Material support for the unemployed should be socially acceptable while maintaining incentives for active job search. Unfortunately, the country had a relatively low level of compensation for professional and social risks. Most of them are provided for the ILO Convention no. 102 “On minimum standards of social security”,

adopted by the ILO General conference on 28 June 1952 and which Russia has not yet ratified. Starting from January 1, 2019, the minimum allowance was increased to 1,500 rubles (about $ 20), and the maximum – to 8,000 rubles (about $ 114), which is still far from the living standard. Passive policy measures aimed at increasing material support for the unemployed should be implemented in the regions of group 3 with developed agricultural production and low unemployment in rural areas.

A more effective, active employment policy aimed at regulating the level and duration of unemployment is needed in the regions of the 2nd group with an average unemployment rate and especially the 1st group with a high unemployment rate. It is aimed at creating conditions for the expansion of agricultural production by various agribusiness entities. The role of agriculture in providing employment in rural areas and rural incomes is proven in the studies of Cejudo et al. (2016), Mirzoev (2016), Ivanov & Sokolova (2017), Ulf et al. ((2019), Tatarova (2019) for other countries. The creation and preservation of jobs in the agricultural economy should be facilitated by the involvement of unused arable land in production, as well as the expansion of labor-intensive industries, such as horticulture and vegetable growing, as well as a number of livestock industries, while meeting the necessary environmental requirements (Dubovitski et al., 2019).

At the same time, the expansion of the rural labor market requires accelerating the pace of rural economic diversification by promoting alternative non-agricultural activities in rural areas, which can take up human resources that do not find a place in the agricultural sector. Special attention should be paid to the development of agricultural processing industries, logistics infrastructure, production of construction materials from local raw materials and woodworking, rural tourism, folk crafts and crafts. It is necessary to use all available opportunities to engage the population in the activities of consumer cooperatives, including harvesting and processing of wild berries, mushrooms, medicinal plants and other natural raw materials. The effectiveness of consumer cooperatives has been proven by the experience of Russian regions (Kostyaev (2018), Pyanova et al. (2019)). However, an economic strategy aimed at stimulating economic growth and employment will be successful by stimulating the expansion of demand for consumer goods. Its dynamics depends fundamentally on the growth of real wages and real household incomes, which is confirmed by the conclusions of Muravyova (2018).

A mechanism to stimulate interest in creating new jobs is needed in regions with high rural unemployment. The authors believe that it is possible to use the concept of creating "free economic zones" with preferential business conditions in rural areas. At the same time, it is necessary to link the volume of state support for agri-business with the number of newly created jobs or with the maintenance of existing ones. It should be beneficial for employers to increase vacancies, rather than make employees redundant. Regarding measures of state support for rural areas, it is advisable to provide credit support for alternative activities of individuals and legal entities that create jobs in this area and register their activities in rural areas, and not only individual subsidiary farms, peasant farms and agricultural consumer cooperatives. A stimulating mechanism for

the development of non-agricultural employment in rural areas can be the use of the "tax holidays" mechanism for individual entrepreneurs and organizations registered and engaged in alternative activities in rural areas.

Conclusions

The authors analyzed the state of rural unemployment in the Russian regions and identified specific features of the rural labor market, including the mono-sectoral nature of the rural economy, the high proportion of workers employed in large agricultural enterprises, the territorial dispersion and isolation of regional labor markets, the low territorial availability of jobs and low horizontal and vertical mobility, the spatial limitations of the main factor of production (land resources).

The authors reveal the main cause of rural unemployment in Russia - the reduction of jobs in agriculture in the context of structural optimization of agricultural production and labor productivity growth. The release of the labor force affects the growth of forced unemployment and migration of the population to more prosperous regions in terms of job availability, most often to urban areas.

The authors typologize the territorial differentiation of rural unemployment in the regions with the allocation of segments with similar employment parameters. The determining influence of the development of agriculture on the level of unemployment in rural areas, the volume of gross output per 1 rural resident is revealed: an increase in the share of people employed in agricultural production in the regions contributes to a decrease in the level of unemployment and a grow in productivity per capita.

The authors argued that the problem of rural unemployment can be solved by implementing consistent economic transformations and taking into account the regional characteristics of the rural labor market. The authors propose two variants of state policy for regulating the labor market in relation to different types of regions: active (aimed at regulating the level and duration of unemployment) and passive (protection and material support for people affected by unemployment).

Conflict of interests

The authors declare no conflict of interest.

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APPLICATION OF WASPAS METHOD IN THE EVALUATION OF EFFICIENCY OF AGRICULTURAL ENTERPRISES IN SERBIA

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ABSTRACT

Recently, as it is known, the evaluation of the efficiency of agricultural enterprises is being more and more performed on the basis of multi-criteria analysis. With this in mind, this paper analyzes the efficiency of agricultural enterprises in Serbia based on the WASPAS method. The goal and purpose of this is to address this issue as thoroughly as possible and propose adequate measures to improve the efficiency of agricultural enterprises in Serbia in the future. The obtained results of empirical research using the given method show that the efficiency of agricultural enterprises in Serbia has recently significantly improved. It was the best in 2018. It was positively influenced by numerous macro and micro factors.

Introduction

The issue of measuring the efficiency of agricultural enterprises based on multi-criteria analysis is very current, complex and significant (Lukic, 2011; Lukic, 2018; Turskis, 2015, Vojteski Kljenak, 2019; Zhang, 2020; Bakić, 2020). Given this, the subject of research in this paper is the analysis of the efficiency of agricultural enterprises in Serbia based on the WASPAS method. The goal and purpose of this is to address this issue as thoroughly as possible and propose adequate measures to improve the efficiency of agricultural enterprises in Serbia in the future. This, among other things, reflects the

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scientific and professional contribution of this paper.

Recently, as it is known, an increasingly rich literature is dedicated to the analysis of the efficiency of companies from different economic sectors based on the WASPAS method. However, there are very few works of this type from the agricultural sector in Serbia (Chavas, 1993; Ashkan Hafezalkotob, 2018; Kolagar, 2019; Kutlu, 2019; Lukic, 2019, 2020a, b, c, d, e, f). In other words, in the literature in Serbia, there is, as far as we know, no comprehensive work dedicated to the analysis of the efficiency of agricultural enterprises in Serbia based on the WASPAS method (Petrovic, 2019). In this paper, based on the reputation of contemporary foreign literature, the efficiency analysis of agricultural enterprises in Serbia is performed using the WASPAS method for the first time. And that, among other things, reflects the scientific and professional contribution of this paper.

Research through the literature in this paper serves as a theoretical, methodological and empirical basis for a proper analysis of the efficiency of agricultural enterprises in Serbia based on the WASPAS method.

The basic hypothesis of the research in this paper is that continuous monitoring of the efficiency of agricultural enterprises is a prerequisite for improvement in the future: in our case in Serbia. This facilitates and indicates what adequate measures should be taken to achieve the target efficiency of agricultural enterprises in Serbia. In this, in the methodological sense of the word, the application of the WASPAS method plays a significant role.

The research is based on data from the Business Registers Agency of the Republic of Serbia, "produced" in accordance with relevant international standards and comparable globally. There are therefore no restrictions in this regard.

Materials and methods

WASPAS (Weighted Aggregates Sum Product Assessment) was proposed by Zavadskas et al. (2012). It respects the unique combination of two well-known approaches to multi-criteria decision making (MCDM): the Weighted Sum method (WS) and the Weighted Product method (WP). The WASPAS method is used to solve various complex problems in multicriteria decision making (e.g., production decision making) (Chakraborty, 2014; Zavadskas, 2013a). An advanced fuzzy WASPAS method has been developed to solve complex problems in the face of uncertainty.

The WASPAS method procedure consists of the following steps (Urosevic, 2017):

Step 1. Determine the optimal performance rating for each criterion.

The optimal performance rating is calculated as follows:

$$x_{0j} = \begin{cases} \max\limits_{i} x_{ij}; & j \in \Omega_{max} \\ \min\limits_{i} x_{ij}; & j \in \Omega_{min} \end{cases}, \quad (1)$$

where:

x_{0j} denotes the optimal performance rating of the *i*-th criterion,

Ω_{max} denotes the benefit criterion (the higher the value, the better),

Ω_{min} denote a set of cost criteria (the lower the value, the better),

m denotes the number of alternatives (i=0,1,...,m), and

n denotes the number of criteria (j=0,1,...,n).

Step 2. Determine the normalized decision matrix.

The normalized performance rating is calculated as follows:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{x_{0j}}; & j \in \Omega_{max} \\ \frac{x_{0j}}{x_{ij}}; & j \in \Omega_{min} \end{cases}, \qquad (2)$$

where:

r_{ij} denotes the normalized performance rating of the *i*-th alternative in relation to the *j*-th criterion.

Step 3. Calculate the relative importance of the *i*-th alternative based on the WS method.

The relative importance of the *i*-th alternative, based on the WS method, is calculated as follows:

$$Q_i^{(1)} = \sum_{j=1}^{n} w_j r_{ij}, \qquad (3)$$

where:

$Q_i^{(1)}$ denotes the relative importance of the *i*-th alternative in relation to the *j*-th criterion, based on the WS method.

Step 4. Calculate the relative importance of the *i*-th alternative, based on the WP method.

The relative importance of the *i*-th alternative, based on the WP method, is calculated as follows:

$$Q_i^{(2)} = \prod_{j=1}^{n} r_{ij}^{w_j}, \qquad (4)$$

where:

$Q_i^{(2)}$ denotes the relative importance of the *i*-th alternative in relation to the *j*-th criterion, based on the WP method.

Step 5. Calculate the total relative significance for each alternative.

The total relative significance (common generalized criterion of weight aggregations of additive and multiplicative methods) (Zavadskas, 2012), is calculated as follows:

$$Q_i = \lambda Q_i^{(1)} + (1-\lambda) Q_i^{(2)} = \lambda \sum_{j=1}^{n} w_j r_{ij} + (1-\lambda) \prod_{j=1}^{n} r_{ij}^{w_j} \quad (5)$$

where:

λ coefficient $\lambda \in [0, 1]$.

When decision makers do not have preferences over the coefficient, the value is 0.5, and equation (5) is expressed as:

$$Q_i = 0.5 Q_i^{(1)} + 0.5 Q_i^{(2)} = 0.5 \sum_{j=1}^{n} w_j r_{ij} + 0.5 \prod_{j=1}^{n} r_{ij}^{w_j} \quad (6)$$

In this paper, for the purposes of applying the WASPAS method in the evaluation of the efficiency of agricultural enterprises in Serbia, the weighting coefficients are determined on the basis of the **AHP** (Analytical Hierarchical Process) method. With this in mind, we will briefly review the theoretical characteristics of the AHP method. The Analytical Hierarchical Process (AHP) method includes the following steps (Saaty, 2008):

Step 1: Forming a pair-wise comparison matrix

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (7)$$

Step2: Normalizing the pair-wise comparison matrix

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \ldots, n \quad (8)$$

Step 3: Determining the relative importance, i.e. the weight vector

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^{*}}{n}, i, j = 1, \ldots, n \quad (9)$$

Consistency index - CI (consistency index) is a measure of deviation *n* from λ_{max} and can be represented by the following formula:

$$CI = \frac{\lambda_{max} - n}{n} \quad (10)$$

If CI <0.1, the estimated values of the coefficients a_{ij} are consistent, and the deviation λ_{max} from n is negligible. This means, in other words, that the AHP method accepts an inconsistency of less than 10%.

Using the consistency index, the consistency ratio CR = CI / RI can be calculated, where RI is a random index.

Results and Discussion

When measuring the efficiency of agricultural enterprises in Serbia using the WASPAS method, the following criteria were taken: C1 - number of employees, C2 - assets, C3 - capital, C4 - operating income and C5 - net profit. Alternatives were observed in the years: A1 - 2013, A2 - 2014, A3 - 2015, A4 - 2016, A5 - 2017, A6 - 2018 and A7 - 2019 (Calculation of the efficiency of agricultural enterprises in Serbia was performed using the WASPASSoftware-Excel). The obtained results are shown in the tables and figures below. Table 1 shows the initial data for measuring the efficiency of agricultural enterprises in Serbia for the period 2013 - 2019.

Table 1. Initial data for measuring the efficiency of agricultural enterprises in Serbia

	Number of employees	Assets	Capital	Operating income	Net profit
2013	36015	570352	305601	315477	21418
2014	33256	641869	353052	316220	17515
2015	33498	688188	382718	321608	16960
2016	32244	781508	480683	352715	20392
2017	32023	815393	508124	330809	20936
2018	32330	846778	523357	349616	32466
2019	31247	874451	544362	350328	19932

Note: The number of employees is expressed in whole numbers. The data are expressed in millions of dinars. Companies from the agriculture, forestry and fisheries sectors are included.

Source: Serbian Business Registers Agency

Table 2 shows descriptive statistics of initial data for measuring the efficiency of agricultural enterprises in Serbia.

Table 2. Descriptive Statistics

Descriptive Statistics				
	N	Minimum	Maximum	Mean
1 Number of employees	7	31247.00	36015.00	32944.7143
2 Assets	7	570352.00	874451.00	745505.5714
3 Capital	7	305601.00	544362.00	442556.7143
4 Operating income	7	315477.00	352715.00	333824.7143
5 Net profit	7	16960.00	32466.00	21374.1429
Valid N (listwise)	7			

Source: Author's calculation done by using the SPSS software program

Data from descriptive statistics show that in 2018, the best performances of agricultural companies were in Serbia. Net profit was above average.

Table 3 shows the correlation matrix of initial data used to measure the efficiency of agricultural enterprises in Serbia.

Table 3. Correlation matrix

Correlations					
		1	2	3	4
1 Number of employees	Pearson Correlation	1	-.918**	-.905**	-.749
	Sig. (2-tailed)		.004	.005	.053
	N	7	7	7	7
2 Assets	Pearson Correlation	-.918**	1	.996**	.868*
	Sig. (2-tailed)	.004		.000	.011
	N	7	7	7	7
3 Capital	Pearson Correlation	-.905**	.996**	1	.879**
	Sig. (2-tailed)	.005	.000		.009
	N	7	7	7	7
4 Operating income	Pearson Correlation	-.749	.868*	.879**	1
	Sig. (2-tailed)	.053	.011	.009	
	N	7	7	7	7
5 Net profit	Pearson Correlation	-.141	.429	.441	.491
	Sig. (2-tailed)	.763	.337	.322	.264
	N	7	7	7	7
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

Source: Author's calculation done by using the SPSS software program

There is a significant correlation between the initial data, apart from net profit. In order to increase the efficiency of agricultural enterprises in Serbia in the future, it is necessary to manage profits as efficiently as possible. In addition to efficient marketing management, the application of modern concepts of cost management in agricultural companies in Serbia has a significant role in that.

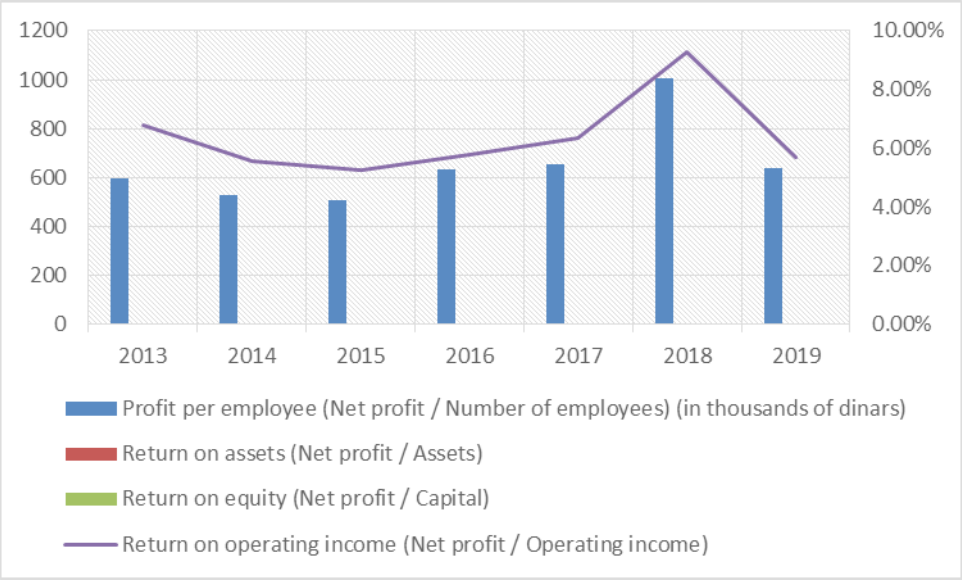
Table 4 and Figure 1, in order to make the efficiency analysis as complex as possible, show the ratio analysis of agricultural enterprises in Serbia.

Table 4. Ratio analysis

	Profit per employee (Net profit / Number of employees) (in thousands of dinars)	Return on assets (Net profit / Assets)	Return on equity (Net profit / Capital)	Return on operating income (Net profit / Operating income)
2013	594.6967	3.76%	7.01%	6.79%
2014	526.6719	2.73%	4.96%	5.54%
2015	506.2989	2.46%	4.43%	5.27%
2016	632.4277	2.61%	4.24%	5.78%
2017	653.7801	2.57%	4.12%	6.33%
2018	1004.207	3.83%	6.20%	9.29%
2019	637.8852	2.28%	3.66%	5.69%

Source: Author's calculations

Figure 1. Ratio analysis



Source: Author's calculations

The ratio analysis shows that the best performances of agricultural companies in Serbia were in 2018. In that year, for example, the highest profit per employee was achieved.

The weighting coefficients of the criteria are shown in Table 5 and Figure 2. They were determined using the AHP method. (The calculation was performed using the software program AHPSoftware-Excel.)

Table 5. The weighting coefficients of the criteria

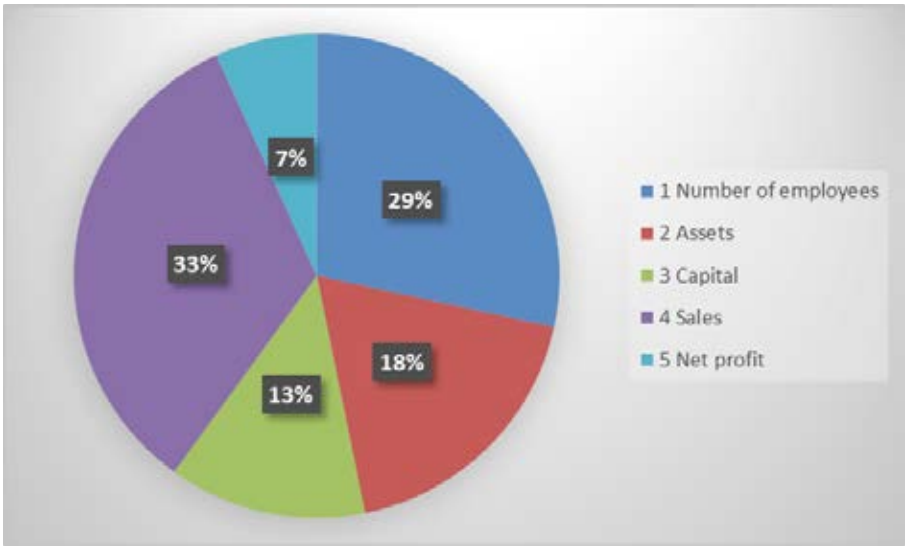
Table	Criterion		Weights
	1	Number of employees	28.4%
	2	Assets	18.4%
	3	Capital	13.2%
	4	Sales	33.2%
	5	Net profit	6.8%

Result										
	Eigenvalue				Lambda:	5.223		MRE:	33.2%	
	Consistency Ratio	0.37	GCI:	0.18	Psi:	6.7%	CR:	5.0%	MREest	33.4%

Matrix		Number of employees	Assets	Capital	Sales	Net profit	normalized principal Eigenvector
		1	2	3	4	5	
Number of employees	1	1	2	3	1/2	4	28.43%
Assets	2	1/2	1	2	1/2	3	18.37%
Capital	3	1/3	1/2	1	1/2	3	13.18%
Sales	4	2	2	2	1	3	33.23%
Net profit	*5*	*1/4*	*1/3*	*1/3*	*1/3*	*1*	*6.80%*

Source: Author's calculation using AHPSoftware-Excel

Figure 2. Weighting coefficients of the criteria



Source: Authors' calculations

According to the importance of the observed criteria, sales come first. They follow in order: number of employees, assets, capital and net profit. This means that improving sales management can significantly affect the efficiency of agricultural enterprises in Serbia.

The initial decision matrix is shown in Table 6.

Table 6. Initial matrix

Initial matrix					
weights of criteria	0.284	0.184	0.132	0.332	0.068
kind of criteria	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**
A1	36015	570352	305601	315477	21418
A2	33256	641869	353052	316220	17515
A3	33498	688188	382718	321608	16960
A4	32244	781508	480683	352715	20392
A5	32023	815393	508124	330809	20936
A6	32330	846778	523357	349616	32466
A7	31247	874451	544362	350328	19932
MAX	36015	874451	544362	352715	32466
MIN	31247	570352	305601	315477	16960

Source: Authors' calculations

The normalized decision matrix is shown in Table 7.

Table 7. Normalized matrix

Normalized matrix					
weights of criteria	0.284	0.184	0.132	0.332	0.068
kind of criteria	1	1	1	1	1
	C1	**C2**	**C3**	**C4**	**C5**
A1	1.0000	0.6522	0.5614	0.8944	0.6597
A2	0.9234	0.7340	0.6486	0.8965	0.5395
A3	0.9301	0.7870	0.7031	0.9118	0.5224
A4	0.8953	0.8937	0.8830	1.0000	0.6281
A5	0.8892	0.9325	0.9334	0.9379	0.6449
A6	0.8977	0.9684	0.9614	0.9912	1.0000
A7	0.8676	1.0000	1.0000	0.9932	0.6139

Source: Authors' calculations

The weighted normalized decision matrix is shown in Table 8.

Table 8. Weighted normalized matrix

Weighted normalized matrix						
	C1	**C2**	**C3**	**C4**	**C5**	**Qi1**
A1	0.2840	0.1200	0.0741	0.2969	0.0449	0.8199
A2	0.2622	0.1351	0.0856	0.2976	0.0367	0.8172
A3	0.2642	0.1448	0.0928	0.3027	0.0355	0.8400
A4	0.2543	0.1644	0.1166	0.3320	0.0427	0.9100
A5	0.2525	0.1716	0.1232	0.3114	0.0439	0.9025
A6	0.2549	0.1782	0.1269	0.3291	0.0680	0.9571
A7	0.2464	0.1840	0.1320	0.3298	0.0417	0.9339

Source: Authors' calculations

Table 9 shows the exponentially weighted decision matrix.

Table 9. Exponentially weighted matrix

Exponentially weighted matrix	C1	C2	C3	C4	C5	Qi2
A1	1.0000	0.9244	0.9266	0.9636	0.9721	0.8024
A2	0.9776	0.9447	0.9444	0.9644	0.9589	0.8066
A3	0.9796	0.9569	0.9546	0.9698	0.9568	0.8303
A4	0.9691	0.9795	0.9837	1.0000	0.9689	0.9047
A5	0.9672	0.9872	0.9909	0.9789	0.9706	0.8990
A6	0.9698	0.9941	0.9948	0.9971	1.0000	0.9563
A7	0.9605	1.0000	1.0000	0.9977	0.9674	0.9270

Source: Authors' calculations

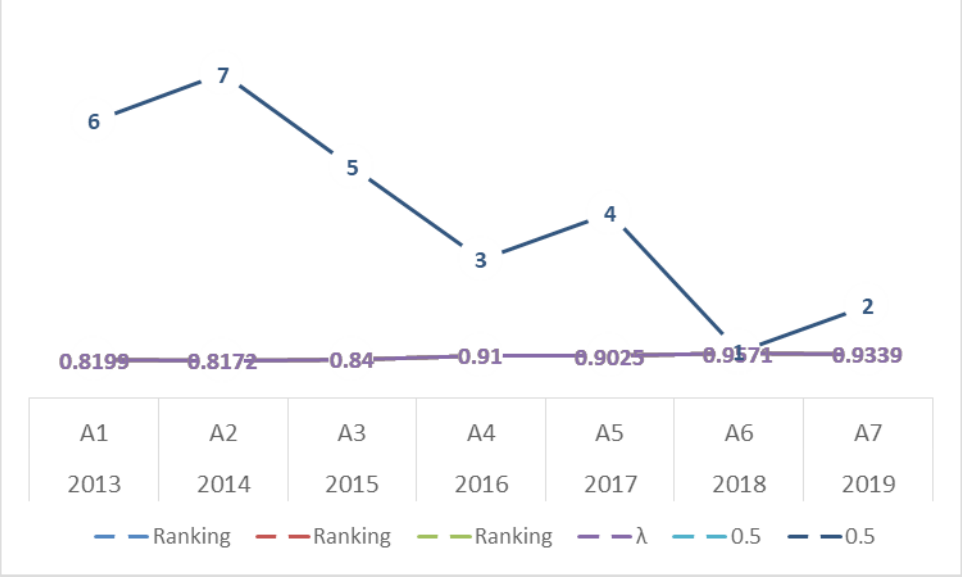
Table 10 and Figure 3 show the ranking of alternatives.

Table 10. Ranking of alternatives

	Ranking				λ	0.5	
	Alternatives	Qi1	Qi2	Qi	Qi		Ranking
2013	A1	0.8199	0.8199	0.8199	0.8199		6
2014	A2	0.8172	0.8172	0.8172	0.8172		7
2015	A3	0.8400	0.8400	0.8400	0.8400		5
2016	A4	0.9100	0.9100	0.9100	0.9100		3
2017	A5	0.9025	0.9025	0.9025	0.9025		4
2018	A6	0.9571	0.9571	0.9571	0.9571		1
2019	A7	0.9339	0.9339	0.9339	0.9339		2

Source: Authors' calculations

Figure 3. Ranking of alternatives



Source: Authors' calculations

The obtained results of the research on the efficiency problems of agricultural enterprises in Serbia on the basis of the WASPAS method show that the highest efficiency was achieved in 2018. They are therefore identical with the results of descriptive statistics and ratio analysis. The order of all other years is as follows: 2019, 2016, 2017, 2015, 2013 and 2014. The efficiency of agricultural enterprises in Serbia has been at a satisfactory level lately. This was positively influenced by numerous macro and micro factors (general economic conditions, stable exchange rate, low inflation, low bank interest rate, subsidies and grants, reduced unemployment rate, increased living standards, regulation of the labor market of farmers, increasing understanding of the importance of insuring agriculture from adverse climate change, increased placement of agricultural products on foreign markets and branding of agricultural products. general economic conditions, stable exchange rate, low inflation, low bank interest rate, subsidies and grants, reduced unemployment rate, increased living standards, regulation of the labor market of farmers, increasing understanding of the importance of insuring agriculture from adverse climate change, increased placement of agricultural products on foreign markets and branding of agricultural products, increased production of organic products, application of modern technology in agriculture).

Conclusions

Based on the conducted analysis of the efficiency of agricultural enterprises in Serbia on the basis of the WASPAS method, the following can be concluded:

Agricultural companies in Serbia were the most efficient in 2018. The order of all other years is as follows: 2019, 2016, 2017, 2015, 2013 and 2014. The efficiency of agricultural enterprises in Serbia has been at a satisfactory level lately. This was positively influenced by a number of macro and micro factors, such as: general economic conditions, stable exchange rate, low inflation, low bank interest rate, subsidies and grants, reduced unemployment rate, increased living standards, regulation of the labor market of farmers, increasing understanding of the importance of insuring agriculture from adverse climate change, increased placement of agricultural products on foreign markets and branding of agricultural products. It plays a significant role the increasing production of organic products, the application of modern technology in agriculture, and the development of cooperatives.

Empirical research in this paper has shown that the WASPAS method is very suitable and simple for evaluating the efficiency of agricultural enterprises. Given that, as well as that there is a developed software program and available empirical data (Agency for Business Registers of the Republic of Serbia, Statistical Yearbook of the Republic of Serbia and others), it is recommended that it be used in the future to continuously evaluate the efficiency / performance of agricultural enterprises in Serbia. This provides an adequate basis for taking appropriate measures in order to achieve the target efficiency of agricultural enterprises in Serbia.

Conflict of interests

The authors declare no conflict of interest.

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TRADITIONAL FOOD PRODUCTS VS. GLOBAL ECONOMY: CONSUMER PESPECTIVE

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ABSTRACT

The Osijek-Baranya County at the east part of Croatia, generally is known as lowland region in whose economy agriculture and food industry are of great importance. Eastern Croatia abounds in various traditional products, mainly based on smoked pork. The goal of this paper is to identify consumers' attitudes and behavior towards east Croatia traditional food products (TFP). Furthermore, the model for market power evaluation of each east Croatia TFP is created according to consumers¨ preferences and attitudes results. The research was performed in Osijek-Baranya County in spring 2019. The sample was consisted of 500 randomly chosen respondents older than 18 via self-fulfilled questionnaire survey. In paper is used descriptive, parametric and non-parametric statistics. People in East Croatia have a positive attitude to TFP of their region. Survey results related to supply, quality, demand and price willingness are used to modelling coefficient for East Croatia TFP commercialization. This coefficient can help producers and policy makers to decide easier about the most perspective production from market point of view. According to the survey results, production of kulen, cottage cheese, ham, honey and sausages are the most promising.

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Introduction

Traditional food products (TFP) are an important part of European culture, identity, and heritage (Guerrero et al., 2009). Within the European food market, traditional food products represent a growing segment. A traditional food product is a product frequently consumed or associated to specific celebrations and/or seasons, transmitted from one generation to another, made in a specific way according to gastronomic heritage, naturally processed, and distinguished and known because of its sensory properties and associated to a certain local area, region or country (Vanhonacker et al., 2010 b). Traditional foods reflect cultural inheritance and have left their imprints on the respective dietary patterns, despite the fact that contemporary lifestyles do not encourage their preservation in our daily lives and customs (Trichopoulou et al., 2007). Slimani et al. (2002) reported that despite the fact that we are living in a world of globalization, different dietary patterns between countries do exist, although they are narrowing as reported by Trichopoulos & Lagiou (2004). These differences should be welcomed as they represent an acknowledgment of our traditions. In most cases, the variety in dietary habits derives from the fact that inhabitants had to adapt to climatic conditions. In order to produce more food for themselves, people have developed methods of farming, processing and preserving suitable foods. As time passed and societies developed, the dietary choices become integral part of the culture and nutritional choices, including traditional foods as parts of their collective identity as also indicated by Behar (1976). Guerrero et al. (2010) emphasizes that Southern European regions tended to associate the concept of "Traditional" more frequently with broad concepts such as heritage, culture or history. Central and North European regions tended to focus mainly on practical issues such as convenience, health or appropriateness. However, the time criterion is recently connected with traditional food. So, Sajdakowska & Zakowska – Biemans (2009) indicates that the European Commission use the term "traditional" in relation to those food products, which have been present in the EC markets for a particular period during which they were handed down from generation to generation. At the same time, it is suggested that such a time period should correspond with a period ascribed to one generation and last at least 25 years. Furthermore, traditional food is characterized as the food conformable with the practices established or having specifications formulated before World War II.

Traditional food is a food of a specific feature or features, which distinguish it clearly from other similar products of the same category in terms of the use of ''traditional ingredients'' (raw materials or primary products) or ''traditional composition'' or ''traditional type of production and/or processing method'' (Trichopoulou et al., 2007)

According to Trichopoulou et al. (2007) it was necessary to define the term traditional because it is a precondition to highlight food that is considered traditional on food composition declarations. Two directives prescribe topic local/traditional food traded in EU: Council Regulation No 2081/92 (Commission of the European Communities, 1992a) regarding "protection of geographical indications and designations of origin for agricultural products and foodstuffs". Later (2006) this directive was substituted

by Council Regulation No 510/06 ‘‘On the protection of geographical indications and designations of origin for agricultural products and foodstuffs’’ (Commission of the European Communities, 2006a). Also, in 1992 was prescribed Council Regulation No 2082/92 ‘‘On Certificates of Specific Character for agricultural products and foodstuffs’’ (Commission of the European Communities, 1992b), while this directive was substituted by Council Regulation No 509/06 of 20 March 2006 ‘‘On agricultural products and foodstuffs as traditional specialties guaranteed’’ (Commission of the European Communities, 2006b).

Furthermore, the same authors (Trichopoulou et al., 2007) claim that these directives have a goal to ensure a simple system to protect the names of food on traditional of geographical base. The directives about ‘‘PDO - Protected Designation of Origin’’ and ‘‘PGI - Protected Geographical Indication’’ has been successfully applied resulted in registration of many European foods. On the other hand, the third designation – TSG or Traditional Specialty Guaranteed is not implemented so much, and very few foods is registered by TSG label. The reason can be regulation 2082/92 that lacking in distinction of definition of the term ‘‘traditional’’, so this resulting in a disability to ensure the exclusive registration of traditional foods, especially applies to composite foods.

These quality schemes are developed to protect producers and consumers from inferior, copycat goods in order to only approved consortium members can be users of a registered name (Balogh et al., 2016). According to Giovannucci et al. (2009, cited in Vandecandelaere et al., 2021) the trade value of food with geographical labels exceeds 50 billion of USD. Many of these products are very famous, such as tea Darjeeling tea or cheese Parmigiano-Reggiano. Many of that goods earn their status based on geographical indication registration.

Vanhonacker et al. (2010a) researched the characteristics of European TFP consumers regarding their socio-demographics characteristics, opinions, life-style as well as behavior. They also conclude that consumption and importance of traditional food in the EU south is more pronounced than in EU north. They also concluded that TFP consumer’s characteristics are: middle-aged to elderly, conscious about health, ethnocentric, food connoisseurs, who know food and love to cook

On the other side, EU farmers confront worsening terms of trade and declining real incomes, and generally remain dependent on direct payments and other subsidies for survival (European Commission, 2014). Rural areas in the NMS are more dependent on agriculture as a source of income and employment, with opportunities for gainful employment in the non-farm rural economy relatively scarce (Davidova et al., 2013). Gellynck & Kuhne (2008) explore innovations implemented by SMEs in the traditional food sector and how chain network members are contributing to this process. Their results show that the members of traditional food chain networks focus mainly on product innovation and least on organizational innovation. Collaboration between the chain network members is an important factor for enhancing the innovation competence of the firms. However, the collaboration intensity depends on the position of the members

in the chain network. However, the ability of TFPs to contribute to improved farm incomes, without recourse to subsidies, depends on whether consumers are willing to pay a premium for them compared to cheaper alternatives. In other words, with TFPs not receiving any direct, supplementary subsidies, additional value added has to come on the demand side but the willingness of consumers to pay for such goods, and specific attributes that may be attached to them, remains unclear (Balogh et al., 2016). Benedek & Balázs (2016) paper draws attention to the importance of the national level in the local development planning, which is needed to harmonize national development processes with wider European initiatives.

Gellynck et al. (2012) analyzed the market orientation of SMEs (N=150) by investigating their marketing management capabilities in the traditional food sector. Most of the SMEs in the sample lack marketing management capabilities, even if a considerable proportion of the firms considered report good marketing capabilities that lead to a market orientation. The weakest step of market orientation is the dissemination of generated intelligence. Indeed, SMEs lack marketing organizational activities, namely in planning and implementation of marketing strategy.

Croatian traditional products for a long time have been neglected because of the unfavorable legislative framework and lack of initiative. Over the last few years, the offer of these products as well as the number of involved manufacturers has been increasing due to the Government and Local Government Initiative, which have stimulated projects to revive TP production and supply. Croatia is tourist country with pure environment and beautiful nature as well as country abundant with wealth of traditional local products. But, Croatia hasn't sufficient supply of such products to satisfy the domestic food and touristic markets. The reasons for such situation is in the fact that production technology of the majority of domestic food products reply on a traditional technology or recipe of a small number of family farms in the Croatian regions. In addition, there is less interest in TP in restaurants due to higher TP prices, while foreign consumers are hardly familiar with these products because of inadequate promotion of Croatian gastronomic offer (Renko & Bučar, 2014).

Nevertheless, a small number of traditional products with its quality and originality, based on traditional technology, found the way to many consumers and acquired characteristics of superior specialties in Slavonia cuisine, Mediterranean and continental cuisine. In addition, the prices of these products and their market position have become one of the major driver trends of increasing family farms' interest for the production of local products in all Croatian regions. Traditional products can be classified into three groups: primary agricultural products, traditional (processed) products and traditional dishes. In this paper we mostly discuss about traditional processed products of East Croatia, because those traditional products are the most famous and known in this region.

The sample was consisted of respondents from Osijek-Baranya on east of Croatia. Osijek-Baranja County is known as lowland region where agriculture and related industries are the most important for economy.

The goal of this paper is to identify consumers' attitudes and their behavior towards east Croatia traditional food products (TFP). Furthermore, the model for market power evaluation of each east Croatia TFP is created according to survey results. The model is used to evaluate market potential of east Croatia TFP. This model can be used for other regions/products as well.

Materials and methods

The research was performed in spring 2019 and represents a repeated survey from 2012 (Zmaic et al., 2014) on the sample of 500 randomly chosen respondents from Osijek-Baranya County older than 18 via self-fulfilled questionnaire survey. The questionnaire contained questions about: familiarity and preferences regarding traditional food products, the frequency, place and occasion of purchase and consumption of traditional East Croatia food products, quality evaluating of the most prominent TFP of East Croatia, supply satisfaction, price willingness and the overall importance of TFP for local community and development.

Statistical analysis was performed using SAS System for Windows. Descriptive statistics (frequencies, cross-tabulations) and non-parametric tests (Mann-Whitney for two-independent samples) are used in order to identify the statistical significance of demographic variables on overall opinion of importance of TFP. The level of significance is set at $p<0.05$. Nominal scale data were analyzed by two sample chi-square test. This test is used for examination of the independence of two variables or factors, randomness and goodness-to-fit. Analysis of variance (ANOVA) and Tukey test with a level of confidence of 95% were performed ($p<0,05$) for the Likert scale data: opinions regarding supply from 1 to 3 (1=oversupply, 2=sufficient supply, 3=insufficient supply), quality from 1 to 5 (1=lowest rating, 5=highest rating), buying frequency of TFP from 1 to 4 (1=never, 2=rarely, 3=sometimes, 4= often) and willingness to pay (%). In order to show statistical differences according to mentioned variables of TFP, the letter notification is used. Between values containing the same letter there is no statistical difference (for example a and ab). Values containing all different letters show differences which is statistically significant (for example a and bc). Variable value letter notification is ascending (for example a is the lowest value, b is higher, etc.).

Some results derived from this research we used to rank some TFP of East Croatia according to commercialization potential/power (supply, demand, quality and price willingness). For each TFP is taken into account average value of survey regarding supply (1-3), TFP quality (1-5), demand (1-4) and the average value for willingness to pay (%) divided by 10.

$$\text{TFP coefficient for commercialization} = S + Q + D + PW/10$$

where: S = supply, Q = quality, D = demand, PW = price willingness. This model allows to rank TFP taking into account consumer opinion regarding TFP importance.

Results and discussion

Croatian TFP compete for other food products on the global market because of its technological, nutritional and organoleptic specificities, quality and specialty. The system of registration and protection of names of agricultural and foodstuffs with the designation of origin or geographical indication and the designation of traditional reputation is regulated by the Law on Authentication, Geographical Indications and Trademarks of Agricultural and Food Products (National Newspaper 2012) is in compliance with EU regulation. Later is adopted Regulation on protected certificates of origin, geographical indications and guaranteed traditional specialties of agricultural and food products (National Newspaper, 2015). These regulations govern the area of product registration at the national level. By joining the European Union, Croatia get one year to protect its products according to the European Union legislation. Labels in EU Member States are awarded on the basis of Council Regulation (Commission of the European Communities, 2006a and 2012). Since 2015 when first Croatian product is registered, now there is 60 endogenous products in European DOOR database (Database of Origin and Registration). DOOR database divide products according to product type: food, wine, spirit drinks and aromatized wine. From total number, for 55 Croatian products registration is finalized (registered), 1 product is in objection stage (published) and for 10 products documentation is submitted and registration process just follow (applied). The most dominant registration certificate for Croatian traditional products is PDO (Protected designation of origin) – 31, followed by PGI (Protected geographical indication) - 17. For GI (Geografical indication), there is 7 products, and that certification is related only to spirit drinks and aromatized wine. There is no one Croatian product in TSG group (Traditional Specialties guaranteed). Among 55 fully registered products, there is only 7 from East Croatia region where the research was conducted – Slavonska kobasica (Slavonian sausage), Slavonski med (Slavonian honey), Slavonski kulen/kulin (Slavonian kulen) and Baranjski kulen (Baranya kulen), wine Istočna kontinentalna Hrvatska (East Continental Croatia), wine Slavonija (Slavonya) and spirit drink Slavonska šljivovica (Slavonian slivovica). Eastern Croatia has many traditional food products, but the most important are TFP made from smoked pig meat (kulen, smoked Slavonian ham, sausages, smoked bacon, greaves, svargl), Slavonia brandy-rakija, cottage cheese and honey (Zmaić et al., 2014). Most of the population, especially in rural areas produce these products themselves for their own needs. Croatian traditional products have been forgotten for many years by the agricultural policies, agricultural experts and science. Unfavorable legal framework and lack of incentives additionally hampered the development of TFP production and sales. So, the economic benefits of these products were actually very small. The last 10 years, the supply of TFP and a number of TFP producers increased. Government and the local communities have prompted increasing number of projects to revive production and encourage sales of TFP. One of the most important initiatives is the process of protecting geographical origin of agro-food products. However, it is still a pioneering work, with very small quantities and limited resources of distribution.

Sample description

In a total sample of 500 respondents, a similar number of male and female respondents participated. In terms of age structure, young respondents up to the age of 35, participated the most (55.2%). The educational structure of the respondents consisted mostly of less educated respondents (high school and lower). In the sample dominated urban population with an average family size of slightly less than 4 members, and an average income of around € 900 *(Table 1.).*

Table 1. Socio-demographic characteristics of respondents

		N	Valid N	%
Gender	**Male**	265	500	53.6
	Female	231		46.4
Age	**15-25**	199	500	39.8
	26-35	76		15.2
	36-45	74		14.8
	46-55	95		19.0
	>55	56		11.2
Education	**High school or less**	323	493	65.5
	College	117		23.7
	Faculty	53		10,8
Family size (average)			497	3.8 persons
Residence	**Rural**	169	496	34.1
	Urban	327		65.9
Monthly income (average)			450	6689.5 HRK*

Source: own research

* Croatian kuna (HRK); 1 EUR = 7,40 HRK (https://www.hnb.hr/, 14.6.2019.)

Traditional vs. modern agricultural products

Among the first questions in the survey, was the question regarding consumers' preferences for either conventional, either traditional agricultural products. This question was set as an introductory question with the aim of seeing the initial preference for traditional in relation to modern agriculture products. About half of respondents prefer traditional agriculture products (54,3%), 37,6% are irrelevant and only 7,3% of respondents prefer conventional, modern agriculture products. Also, we try to see is there some differences between subjects regarding their demographic characteristics (gender, education etc.). A chi-square analysis was performed to examine a possible significant association between the gender and preference toward different types of agricultural products, but significant association was not observed, $\chi 2$ (2, N = 489) = 0.56, p=0.75. The similar situation was regarding age and level of education. But when respondents were divided according to income group, and combined with different other demographic characteristic, there is some associations between the lowest income group (<400€) and level of education where respondents are mostly irrelevant either traditional or conventional agricultural products (60%) of they even prefer modern

agricultural products (40%) - $\chi 2$ (8, N = 5) = 25.546, p=0.001. The similar situation is observed between this income group and level of education where respondents with college diploma are more irrelevant than any other group of respondents $\chi 2$ (4, N = 4) = 10,074, p=0.39. Probably their answers are different because of the small number of respondents in those groups.

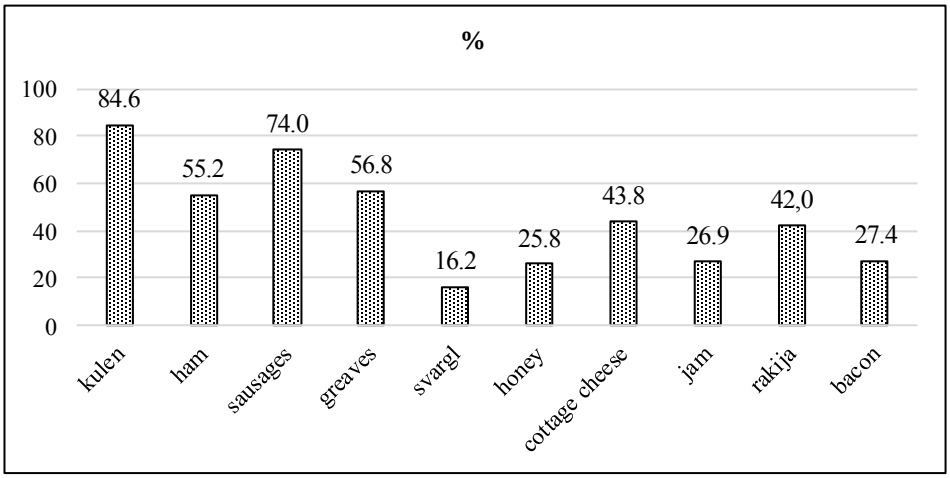
Attitudes of respondents towards TFP

According to the similar research from 2012 (Loncaric et al., 2015) respondents have generally positive attitude towards TFP. The advantages of TFP they evaluated 4.37 in average (on Likert scale from 1 to 5) while the disadvantages they rated 3.57. According to them, the most important advantages of TFP are better taste, originality and quality, while high cost and not sufficiently recognizable TFP labeling are the main disadvantages. The least significant disadvantage of TFP is the lack of supply, what is connected to production of TFP on many farms in rural areas, but also with an emphasized initiative of the Government and local administration what resulted in positive effects in the food supply. These results were expected, since East Croatia TFP is well known to their respondents in terms of recipe, technology and taste. Furthermore, results indicated that consumers consider TFP as important for the benefit of the wider community, particularly on its role for conservation of culture and heritage, as well as necessity for better respect and status of TFP by society. In this context Florek & Gazda (2021) stated that investment in promotional and marketing activities for supporting TFP affect wider economic development of region and if community participate in TFP development it leads to more sustainable economic development too. TFP importance can be enhanced by actors in local community and strengthened by marketing activities.

Familiarity and preferences towards TFP

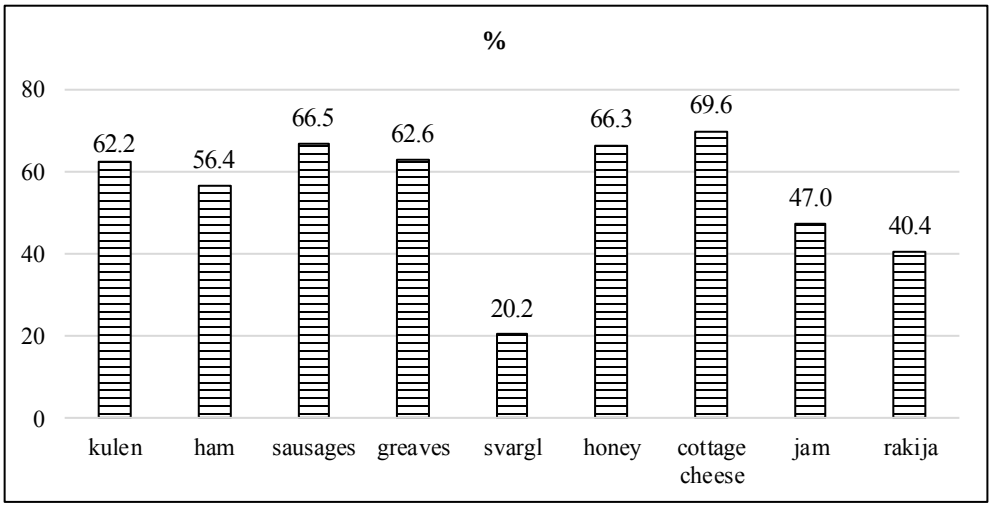
Consumers' associations towards traditional products of East Croatia were primarily related to kulen, sausages, greaves, ham, cottage cheese and rakija, slightly less on the bacon, honey, jam and svargl. These answers respondents should fill in by themselves (Figure 1).

Figure 1. TFP according to consumer opinion – filled in answers (%)



Another issue was related to traditional products that consumers actually buy and consume (Figure 2). In this case answers were already offered. Answers regarding TFP on both questions (open question and offered TFP) match with slightly difference regarding bacon suggested by the consumers, because bacon was not mentioned in offered answer as TFP.

Figure 2. TFP according to consumer opinion – offered answers (%)



We can notice different frequency of answers compared to the previous question, in which the greatest share was related to the cottage cheese and honey. Honey and cheese present exception. East Croatia is mostly recognized for crop production, while livestock production is not so present to that extent (milk and cattle-meat industry), so it is not surprising that consumers buy those products more, because they do not produce it.

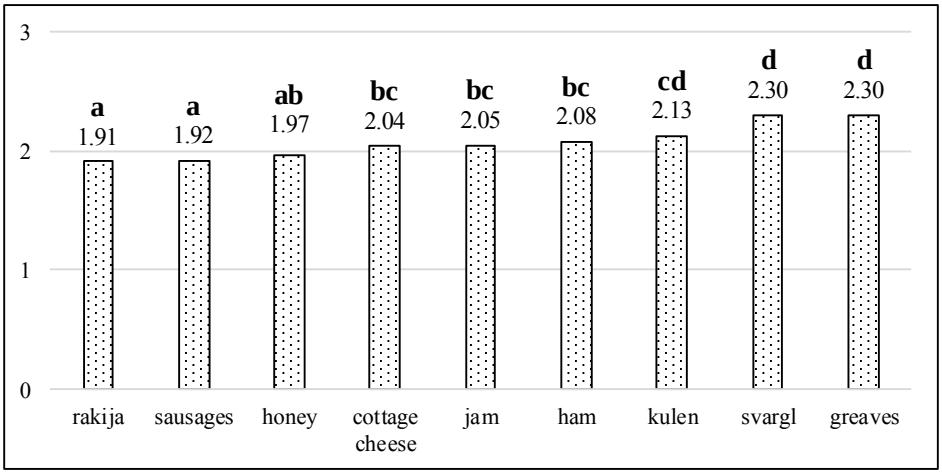
TFP purchase place and consuming & buying occasions

Currently, the respondents mostly buy TFP on green markets (34,7%) and directly from producers (32.0 %). TFP are rarely purchased at supermarkets (16,4%), specialized shops (9.3 %) and on agro-tourism farms (7.7 %). Chi-square analysis obtained a significant association between monthly income and favorite current purchase place of TFP $\chi 2$ (16, N =330) = 34.33, p=0.005. According to that, respondents with higher family income (>1600 €) prefer more purchasing TFP directly from producers. When it comes to the buying occasions, consumers buy and consumer TFP mostly at home as regular meal (69 %), on celebrations (47%) and during holidays (38 %). TFP is less frequently used as a gift (12 %) or as part of a restaurant offer (6 %). The most preferred purchase place for consumers is direct purchase at TFP producer's farms (41.4%), less on city greenmarkets (20.8%), while significant association has been observed between the level of education and the most suitable TFP purchase place, $\chi 2$ (8, N = 394) = 19.09, because p=0.014. This is in line with Balogh, 2016 & Benedek 2016. Among the respondents with the lowest education, monthly income significantly affects the choice of the most suitable places of purchase TFP, $\chi 2$ (16, N = 237) = 32.82, p = 0.008, since they prefer purchase directly from farmers more than other consumers.

Market power of East Croatia TFP

In order to create model for evaluating market power of East Croatia TFP, we calculate results regarding supply, quality, buying frequency (demand) as well as willingness to pay. In order to evaluate results for supply, the highest rating was given to products with lowest supply (3), for the TFP product with sufficient supply was given grade 2, and the lowest rating was given to products considering oversupply (1). The reason for such grading is that products with lowest supply have great potential for increasing production, or they have higher resorption power. According to results represented in Figure 3, the lowest grade in terms of supply was given to rakija (1.91) and sausages (1.92). The reason for such results probably is that most or population in rural areas make those products for their own needs. Statistical analysis showed that ratings for rakija and sausage are statistically different from rating products that have the highest ratings in terms of supply ($P<0.05$*), such as kulen (2.13), svargl (2,30) and graves (2.30).

Figure 3. TFP supply (1=oversupply, 2=sufficient supply, 3=insufficient supply)

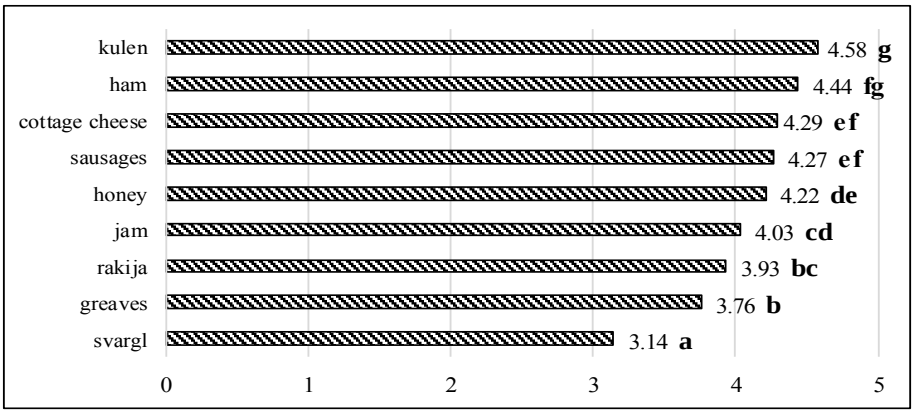


*Scale data (1-3) were analyzed using one-way analysis of variance (ANOVA and Tukey HSD test). Values containing same letter have not difference statistically significant, values with the different letter have difference statistically significant ($p<0,05$)

Product quality is a growingly and significant aspect for the traditional food producers. In fact, insisting on the quality has arising as a solid opportunity of growth on international markets. The use of quality related to the place of origin to differentiate a product can be understood as particular brand strategy (van Ittersummet al., 2003). Traditional foods, apart from being vehicles of our culture, may also possess health qualities, since tradition rarely honors foods which are not palatable and healthy (Trichopoulos & Lagiou, 2004). Espejel et al. (2007) found a direct effect of perceived quality of traditional food on satisfaction, loyalty and purchasing intention. In our research respondents rated TFP quality high, too.

Regarding quality of east Slavonia TFP (rated on Likert scale from 1 to 5), respondents consider svargl and greaves as products with lowest quality, probably due to the high fat content. Consumers consider honey, sausages, cheese, ham and kulen as products with highest quality. Those products ratings scale was from 4,2 to 4,6. Statistically significant differences between products when it comes to quality criteria were confirmed on 0.05 level ($P<0,05$*). The data are shown in Figure 4.

Figure 4. TFP quality evaluation according to consumers (Likert scale 1-5; 1=lowest rating, 5=highest rating)



*Likert scale data (1-5) were analyzed using one-way analysis of variance (ANOVA and Tukey HSD test). Values containing same letter have not difference statistically significant, values with the different letter have difference statistically significant (p<0,05)

Respondents buy cottage cheese and honey the most frequently. It is expected, because East Croatia is not known in milk and honey production. All other products many people in this region produce by themselves. Consumers' willingness to pay is in correlation with TFP quality. Respondents stated they are willing to pay more than 25% for kulen, ham, cheese, honey and sausages as opposed to svargl and greaves (13.7 and 17.5 % respectively). There is statistically confirmed differences between greaves and svargl (lowest rank) and kulen (highest rank). *Table 2.* shows purchase frequency of selected products and willingness to pay.

Table 2. Consumers' buying frequency of TFP (1=never, 2=rarely, 3=sometimes, 4= often) and willingness to pay higher price for traditional products (%)

	TFP buying frequency		Willingness to pay	
	Average 1-4	ANOVA and Tukey HSD*	Average (%)	ANOVA and Tukey HSD*
svargl	1.79	a	13.7	a
greaves	1.90	a	17.5	b
rakija	2.13	b	25.1	cd
kulen	2.42	c	30.0	d
jam	2.46	c	23.7	c
ham	2.46	cd	27.7	c
sausages	2.68	d	26.0	cd
honey	2.93	e	26.3	cd
cottage cheese	3.02	e	27.5	cd

** Scale data (1-4) and data (%) were analyzed using one-way analysis of variance (ANOVA and Tukey HSD test). Values containing same letter have not difference statistically significant, values with the different letter have difference statistically significant (p<0.05)

De Roest & Menghi (2000) differ the position of the small niche market traditional products and traditional products marketed on national or international markets related to price making. They stated that the small niche market products operate in many cases on almost monopoly markets, where producers, because of the exclusivity of the product, can raise their prices relative to the price of competing product without losing sales. They face what is essentially a downward sloping demand curve. The products marketed on (inter-) national markets on the contrary, at times have to face fierce competition from industrially produced substitutes. They are thus indirectly subjected to the same price-cost squeeze as their industrial substitutes. East Slavonia traditional products certainly belong to the first group.

When all of these results are summed up, we calculated coefficient for commercialization of each TFP *(Table 3).*

Table 3. Evaluation of market power (commercialization coefficient) for east Croatia TFP

	Supply	Quality	Demand	Price	Commercialization coefficient	Rank
kulen	2.13	4.55	2.42	3.00	12.13	1.
ham	2.08	4.44	2.48	2.77	11.77	3.
sausages	1.92	4.27	2.68	2,60	11.47	5.
greaves	2.30	3.76	1.90	1.75	9.72	8.
svargl	2.30	3.14	1.78	1.37	8.59	9.
honey	1.97	4.22	2.93	2.63	11.75	4.
cottage cheese	2.03	4.29	3.02	2.75	12.10	2.
jam	1.05	4.03	2.46	2.37	9.91	7.
rakija	1.91	3.93	2.13	2.51	10.47	6.

This coefficient can help producers to decide easier about the most perspective production from market point of view. Also, it can help policy makes to decide what production should be supported taking into account consumer perspective. According to this model, production of kulen, cottage cheese, ham, honey and sausages are the most promising TFP in Eastern Croatia.

Final question was to evaluate the importance of TFP for local economy. The average score (on scale from 1 to 5) was pretty high – 4.40. This is in line with Borowska, 2010 and Balogh, 2016 research. A Mann-Whitney test indicated that importance of traditional agricultural products was greater for the people who live in the city (Mean Rank=254.69) than for people living in villages (Mean Rank=230.70), U=24562.0, p=0.04. It is expected because most people in rural region see these products as ordinary products because they produce it for their own needs.

Conclusions

People in East Croatia have a positive attitude to TFP of their region (4,40 on 1 to 5 Likert scale). East Croatia's TFP are very favored by its residents what is the reason that we didn't find many differences in statistical dependences of some demographic groups and their positive preferences towards TFP. It should be considered in TFP

market preparing to increase consumers' confidence towards TFP. Croatia is a tourist country and as such it should nurture and promote domestic indigenous products in order to use this potential, both promotionally and financially. Commercialization coefficient ranked east Croatia TFP according to consumer's point of view on supply, demand, quality, buying frequency and willingness to pay. This coefficient can help producers to decide easier about the most perspective production from market point of view. According to the results, production of kulen, cottage cheese, ham, honey and sausages are the most promising. It also can be the guide for agricultural policy makers to give priority to some TFP when it comes to the process of protecting geographical indication of TFP.

Conflict of interests

The authors declare no conflict of interest.

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MANDATORY AUDIT OF FINANCIAL STATEMENTS: DOES AGRICULTURAL SECTOR DIFFER FROM OTHERS?

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ABSTRACT

The main purpose of this paper is to determine if there are any differences when it comes to the type of opinion and content of audit reports between agricultural and other public companies (non-agricultural). Research sample consists of 398 public companies, and this number makes up about 70% of the total number of public companies listed on the Belgrade Stock Exchange. The sample was divided into two groups; one comprising companies from the agriculture, forestry and fishing sector (29); while the second group consists of public companies from other sectors (369). The research results indicate that companies in the first group received unqualified auditor's opinions more often than second group companies. The similarity between the first and the second group is the dominant use of auditing services of domestic companies with an average share of 64.70% compared to the international and Big 4 auditing companies.

Introduction

The result of auditing process is an audit report which discloses an expert professional opinion on the quality of the accounting information contained in audited financial statements (Ljubisavljevic, Jovkovic, 2016). Namely, audit opinion explains whether client's financial statements present financial position, results of operations, and cash flows in a fair and objective manner, and in accordance with adopted financial reporting framework (Louwers et al., 2018). Obviously, audited financial statements are of an

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importance for continuous business and management of public companies, but they also serve as a base for investment-related and other decisions (Gabric, Bosnjak, 2017). Auditor's opinion from the auditor's report is of significance to both internal and external parties who are interested in company's operation (Butler et al., 2004). Key public company's stakeholders are existing and potential investors, lenders and other creditors, and they are at the same time primary users of general purpose financial statements and accompanying audit reports. Investors and other financial statement users will consider information presented in financial statements, together with information from other sources (information disclosed on client's website and other electronic information, information-gathering agencies, industry reports, newspaper and magazine articles etc.) (Atrill, McLaney, 2011). On the other hand, management is able to generate financial information from within a company, and therefore do not rely solely upon these financial statements (Melville, 2019). Remaining stakeholders might use general-purpose financial statements, but these statements are not prepared for their needs in the first place. Therefore, it can be presumed that potential investors and other stakeholders are main users of financial statements that seek useful information concerning financial position, financial performance and cash flows of audit client. Previously stated explains the reason why audit of general purpose financial statements is mandatory for companies whose securities are traded publicly in accordance with the Law on the Capital Market (Securities Commission Republic of Serbia, 2019). Public companies serve as an example of good practice in all economies and therefore their financial reporting should be of the highest quality. If investors are able to make a proper decisions based on high quality financial reporting and auditing, that will lead to efficient functioning of capital and other markets and otherwise assist in promoting efficient allocation of scarce resources in the economy (Rosenfield, 2006; Stanković et al., 2019), (Atrill, McLaney, 2011). One of the most important parts of audit reports is the opinion that auditor expresses in it. This has been subject of research by many authors, for example authors (Stanisic et al., 2019) report that Serbian business entities mostly received unmodified opinions (approx. 70%, depending on the year of issue), while the remaining were modified opinions. An adverse opinion was issued to only 1% of sampled entities. However, small number of authors dealt with the actual content of the auditor's reports. It is safe to assume that the content of auditor's report will differ from one business entity to another i.e. from one type of auditor's report to another. Likewise, differences in the contents of auditor's reports will probably depend on the industry sector in which audit client operates. It can be presumed that industry specific sectors will require a certain type of knowledge and experience from the auditor. Previous will be reflected on the planning; execution of activities within auditing process; gathering of auditing evidence; and ultimately opinion issued. Accordingly, we can now define research question: What are the aspects in which audit reports for agricultural, forestry and fishing public companies differ in type and content from the audit reports of other public companies (non-agricultural) and which audit companies performed the audit?

Literature review

It is vital to note that public companies in the territory of the Republic of Serbia operate in very specific market conditions, particularly companies in the agricultural sector (Popovic et al., 2017). The Serbian capital market is a developing market with very low market capitalisation compared to stock exchanges in the developed countries. In terms of market capitalisation i.e. main indicator of the size and volume of turnover at the stock exchange, the total market capitalisation of the agriculture, forestry and fishing companies amounted to €128,233,904 which is equal to 3.12% of the total market capitalisation of the observed companies (Belgrade Stock Exchange, 2019). On average, these companies had the market capitalisation of €4,421,859. When it comes to other industries, total market capitalisation amounted to €9,958,473,474 whereas the average market capitalisation was €10,727,570. Consequently, it is might be difficult for all public companies to attract potential investors, and especially the ones from agriculture. Despite the fact that agriculture is an essential element of the global economy, it is often neglected by regulations due to focus on rapidly growing sectors (Fischer, Marsh, 2013). However, the nature of the demand for agricultural produce results in the fact that the agricultural industry has its own place in the economic development (Lloyd, Malcolm, 1997), (Muhammad, Ghani, 2014). Namely, unlike other sectors, the agricultural sector is characterised by a constant demand whereas the demand in other sectors is of volatile nature. According to the rolling forecast for 2020, the agricultural population will have a 9.3% share in the total population in the region (FAOSTAT, 2019). The foregoing implies that the agricultural sector, both in the region and in Serbia, has potential for development.

When it comes to research regarding audit reports of Serbian business entities, three research papers were considered. The first paper is focused on business entities that operate on the territory of the city of Kragujevac. Authors (Ljubisavljevic et al., 2014) selected a sample of 58 medium and large companies, whose audit reports were analysed for the period 2010 - 2012. Research results showed that there is a correlation between the size of the entity and the type of opinion issued in the auditor's report, as well as between the entities that operated with positive / negative net result and the type of opinion expressed in the audit reports. Authors (Jovkovic, Djordjevic, 2018) analysed differences between audit opinions issued to clients from financial and real sector (manufacturing business entities) for the period from 2011 to 2017. The research showed that unmodified opinions were the least present in the real sector, ie. modified opinions were more dominant in the real sector (24%) compared to the financial sector (banks 3.45% in 2017, insurance companies 0% in 2017). Authors concluded that financial result of sampled entities was in correlation with the issuance of unmodified auditor's opinions. Namely, unmodified opinions were mostly issued to profitable entities: banks (84%), insurance companies (90%) and manufacturing entities (87%) in 2017. Qualified opinion is not in correlation with the achieved result, because the number of clients that operated with profit is the same as the number of the ones that operated with loss. The remaining opinions, disclaimer of opinion and adverse opinion, were

issued to non-profit entities solely, as accumulated losses threaten the going concern assumption. The last research (Jovkovic, 2018) analysed the reports of independent auditors of financial statements of insurance companies for the period 2009 – 2016. All insurance companies were divided in two groups; clients that have always received unmodified opinion in the observed period, and clients that at least once in the period had some form of qualification. In addition, research results showed that companies with unmodified opinions mostly operated with profit, had foreign capital, and one of Big 4 companies did audits of their statements.

When it comes to neighbouring countries, we have found two research papers that deal with the content of audit reports. The first one covered 32 companies operating in Bosnia and Herzegovina. Authors (Kondic, Poljasevic, 2015) analysed the published auditor's reports of these companies which are listed on the Banja Luka Stock Exchange. Results show that auditors often drew the users' attention to information disclosed in financial statements which were not prepared in accordance with International Financial Reporting Standards (IFRS) and which could have resulted in a modified opinion. The research proved that as much as 59% of auditor's reports included emphasis of matter paragraph. In accordance with the auditing standards (regulation), emphasis of matter was issued when it was questionable if audit client was able to continue its business in accordance with going concern assumption. Authors (Gabric, Bosnjak, 2017) conducted their research on a sample of companies operating on the capital market of Bosnia and Herzegovina in the period from 2010 to 2014. The research results indicated that the most significant misstatements were balance sheet items such as fixed assets, inventories and short-term accounts receivable. Likewise, research showed that a significant number of misstatements by companies from Bosnia and Herzegovina were related to the valuation of items of property, which resulted in hidden (latent) losses in financial statements.

The evidence that the ability to continue in accordance with going concern assumption is not an issue solely for developing companies is found in the research conducted on the territory of the United States of America. Namely, the authors (Butler et al., 2004) analysed a total of 7,093 modified auditor's opinions for the period between 1994 and 1999 (approximately 1,200 annually). It was noted that there was a clear connection between modified opinions and abnormal accruals of the companies operating according to going concern assumption. The authors (Lin et al., 2011) presented data that explained why 11% of the companies listed on China's stock exchanges, received modified audit opinions for the period 1992-2009. The authors specified three reasons: incentives for applied earnings management technique; poor quality of financial reporting; and poor budgeting control. In addition, it was noted that the clients with modified opinions generally received more funding from their related entities after such opinions were issued.

The matter researched in this paper was not the focus of attention of foreign authors; however, a large number of them conducted research on the relationship between individual items of financial statements and the type i.e. the content of the auditor's report. For example, authors (Butler et al., 2004), (Francis, Krishnan, 1999), (Bartov

et al., 2000), (Bradshaw et al., 2001) point out that there is a relationship between abnormal accruals and modified auditor's opinions. Somewhat scarce literature in this area includes no prior works dealing directly with the agricultural industry and therefore this paper is a contribution to this scientific literature. It is safe to assume that the issues this paper is concerned with are topical matters which are insufficiently researched both in domestic and regional literature.

Research methodology

For the purpose of this research, 398 annual reports/companies listed on the Belgrade Stock Exchange (BELEX) in the Republic of Serbia were selected. These companies operate as open joint-stock companies. At the time of this research, a total of 582 public companies were listed on this market. Companies without publicly available financial statements and/or auditor's reports were excluded from research sample. The elimination of such companies decreased research sample to 398 companies, comprising nearly 70% (68.38%) of all legal entities listed. With the aim of gaining an insight into current results of the disclosed mandatory audit reports for companies operating in different sectors, the sample was divided into two groups: agriculture, forestry and fishing public companies and other public companies (non-agricultural). The later group consists of companies from all other sectors, including financial sector (banks, insurance companies and other financial institutions).

The following table shows research sample structure according to the company size and industry sector each business entity operates in. As suspected, the highest share belongs to manufacturing entities and micro and small entities represent app. 70% of the sample.

Table 1. Sample structure (company size and industry sectors)

Industry sectors	Number of public companies		Size			
			Micro	Small	Medium	Large
Manufacturing	128	32.16%	34	44	30	20
Mining	7	1.76%	2	1	3	1
Financial and insurance activities	11	2.76%	1	/	2	8
Wholesale and retail trade	61	15.33%	38	14	4	5
Real estate activities	12	3.02%	10	1	/	1
Construction	49	12.31%	22	14	10	3
Agriculture, forestry and fishing	29	7.29%	6	13	9	1
Electricity, gas and steam supply	0	.00%	/	/	/	/

Industry sectors	Number of public companies		Size			
			Micro	Small	Medium	Large
Transportation and storage	20	5.03%	6	6	6	2
Professional, scientific and technical activities	22	5.53%	10	6	6	/
Accommodation and food service activities	23	5.78%	9	12	2	/
Information and communication	14	3.52%	9	3	2	/
Administrative and support service activities	9	2.26%	6	2	1	/
Education	4	1.01%	2	2	/	/
Other service activities	4	1.01%	3	1	/	/
Arts, entertainment and recreation	1	0.01%	/	1	/	/
Water supply and sewerage	3	0.75%	2	1	/	/
Human health and social work activities	1	0.01%	1	/	/	/
Total	398	100%	161	121	75	41
	100%	/	40.45%	30.40%	18.84%	10.30%

Source: Authors' research

Having in mind that a certain number of public agriculture companies did not disclose auditor's reports, the sample that refers to companies operating in the agriculture, forestry and fishing sector comprised 29 out of 42 agricultural public companies in total at the time of research. The sample of the agriculture, forestry and fishing companies has a 4% share in the total number of companies on the Serbian market (SBRA, 2019). Financial statements and the related auditor's reports of the sampled companies were taken from the database maintained by the Serbian Business Registers Agency (SBRA, 2019) for 2017, which was the reporting year. It is important to note that auditor's reports referred to individual and not consolidated financial statements. Having in mind that the reporting currency for these financial statements was Serbian dinar (RSD), the amounts were converted to a more stable currency (EUR) at the mean exchange rate prevailing on 31st, December 2017.

The primary method used in this research was the content analysis. The said method implies a broad use of qualitative research technique focused on the systematic review of collected data (Hsieh, Shannon, 2005). Qualitative content analysis can be an important alternative to the classical quantitative analysis in the case when the author is working in an interpretative paradigm (Zhang, Wildemuth, 2019). The following section of the paper will present research results and short discussion.

Research results and discussion

As mentioned before, audit opinion is an essential part of the audit report, therefore our analysis started there. Each audit report has been read carefully and audit opinion has been noted, either based on the audit opinion paragraph or based on the wording auditor used when issuing the opinion. Table below shows the research results on the type of opinions issued to agriculture, forestry and fishing companies and their share in the total number of opinions.

Table 2. Audit opinion type of Serbian public companies operating in agriculture, forestry and fishing sector in 2017

Audit Opinion	Number of opinions		% in total number
Total unmodified opinion	17		58.62%
Unmodified opinion without emphasis of matter	9	52.94%	31.03%
Unmodified opinion with emphasis of matter	8	47.06%	27.59%
Total modified opinion	12		41.38%
Qualified opinion	7	58.33%	24.14%
Disclaimer of opinion	4	23.53%	13.79%
Adverse opinion	1	8.33%	3.45%
Total audit opinions	29		100%

Source: Authors' research

As can be noticed, more than half of these companies (close to 60%) received unmodified audit opinion on their audited financial statements. Out of 17 companies with unqualified opinions, less than half received unqualified opinions with explanatory paragraph, without modifying the report. The total number of companies which were issued modified opinions was dominated by companies which received qualified opinions (as much as 58.33%). When it comes to the disclaimer of opinion, as much as 23.53% of companies obtained this type of audit opinion. Finally, only one public company in the agricultural industry received an adverse opinion. Further on, the table below shows the research results in terms of the type of opinion issued to the rest of the companies and their share in the total number of opinions.

Table 3. Audit opinion type of other Serbian public (non-agricultural) companies in 2017

Audit Opinion	Number of opinions		% in total number
Total unmodified opinion	175		43.97%
Unmodified opinion without emphasis of matter	89	50.86%	22.36%
Unmodified opinion with emphasis of matter	86	49.14%	21.61%
Total modified opinion	223		56.03%
Qualified opinion	139	62.33%	34.93%
Disclaimer of opinion	75	33.63%	18.84%
Adverse opinion	9	4.04%	2.26%
Total audit opinions	398		100%

Source: Authors' research

The preceding table indicates that slightly more than half of public companies in non-agricultural sectors received a modified opinion (56.03%) on their audited financial statements. It has to be mentioned here that results, for both groups of companies, differ from research previously cited, where close to 70% of sampled entities got unmodified opinion (Stanisic et al., 2019). In terms of the type of modified opinion, it is noticeable that qualified opinions were dominant with as much as 62.33% of the total number of modified opinions. Of the same number of modified opinions, almost 33.63% of companies received a disclaimer of opinion, which is an indicative situation of the circumstances in which the auditors were unable to obtain sufficient audit evidence to form their opinions. Finally, as much as nine public companies from other sectors received adverse opinions on their published financial statements - the reason for which these companies would probably be removed from developed capital markets. When comparing research results in terms of the type of opinion received by public companies operating in the agriculture, forestry and fishing sector and those received by companies in other sectors, the situation swings in favour of the former group. The structure of modified opinions is very similar, though adverse opinions have a significantly lower share.

When it comes to audit company that issued audit report, in this paper, two types of companies providing audit services have been differentiated: domestic i.e. Serbian companies, which are not branches of foreign audit companies; and international audit companies (including Big 4 companies). It can be assumed that clients more often choose domestic companies probably due to lower rates, but also because of the peculiarities of certain business activities, including agriculture and similar activities. Accordingly, the table below shows the research results in terms of types of auditor hired to conduct a statutory audit of the sampled companies.

Table 4. Type of auditors of sampled public companies

	Agriculture, forestry and fishing	**%**	**Other industries**	**%**
Domestic audit companies	20	68.97	223	60.43
International audit companies	9	31.03	146	39.57
Total	29	100	369	100

Source: Authors' research

The previous table shows that the majority of public agriculture, forestry and fishing companies used the services of domestic audit companies (68.97%). These companies probably had more confidence in domestic auditors because of the national legislation, which these companies should be more familiar with. When it comes to companies from other industries, they more often opted for domestic audit companies (60.43%), as well. International audit companies were hired by public companies operating in the agriculture, forestry and fishing sector in only nine instances (out of which six belong to Big 4). When it comes to companies operating in other industries, results were different, as international audit companies had a 39.57% share.

Comparative analysis of differences in explanations or reasons for emphasis of matter provided by auditors in their reports will be in focus next. Previous is of fundamental importance for the understanding of the published auditors' opinions and for the high-quality analysis of audited financial statements. Based on the results of this research, it can be noticed that auditors specify just several situations as emphasis of matter reasons.

Table 5. Emphasis of matter reasons in auditor's reports in the agriculture, forestry and fishing sector

	Unmodified opinion	Unmodified opinion with explanatory paragraph	Qualified opinion	Disclaimer of opinion	Adverse opinion	Total	Average
Valuation of property, plant and equipment	/	/	4	4	/	8	12.12%
Going concern assumption	/	3	1	4	/	8	12.12%
Disclosures (in notes to financial statements)	/	3	2	2	/	7	10.61%
Inventories valuation	/	1	3	2	/	6	9.09%
Recognition and valuation of liabilities	/	/	2	3	1	6	9.09%
Transfer pricing report	/	1	2	3	/	6	9.09%
List of assets	/	1	1	3	/	5	7.58%
Account payable valuation and impairment	/	/	2	1	1	4	6.06%
Provisions recognition and valuation	/	1	1	1	1	4	6.06%
Bankruptcy reorganisation	/	2	/	1	/	3	4.55%
Mortgage and warranty	/	1	1	/	1	3	4.55%
Revaluation	/	/	2	/	/	2	3.03%
Valuation of biological assets	/	/	1	1	/	2	3.03%
Accounting policies and procedures	/	1	1	/	/	2	3.03%
Total	0	14	23	25	4	66	100.00%

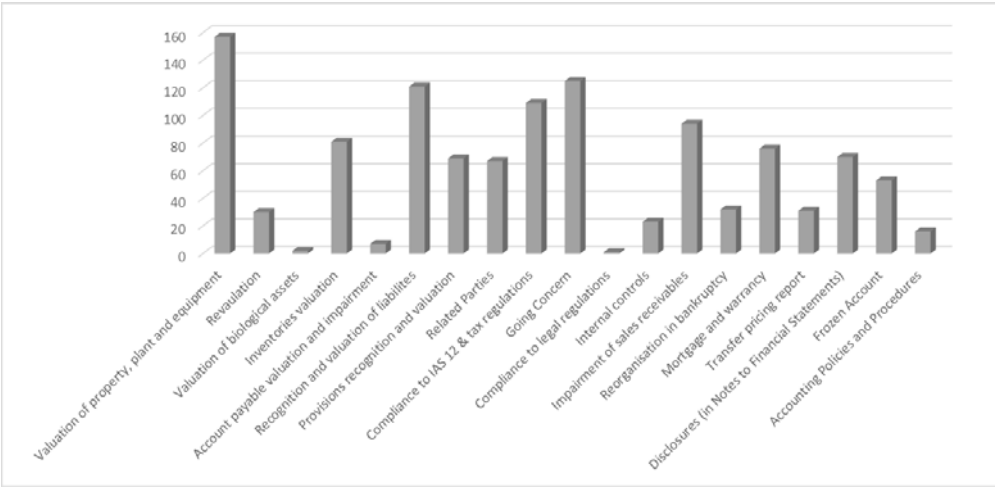
Source: Authors' research

As expected, when auditor issued an unmodified opinion, there were no additional information on emphasis of matter, because financial statements are true and fair. However, when an auditor issues an unqualified opinion, i.e. an unmodified opinion with explanatory paragraph, the auditor indicates that there is information that would have been of importance for the understanding of the financial statements. There are nine situations described in emphasis of matter paragraph in unmodified opinion reports that have been identified in this research; and the most common were: Going concern and Disclosures (in the notes to financial statements). However, when

an auditor issues a modified opinion, the reasons for emphasis of matter increases. When all types of modified opinions are taken cumulatively, there are 52 emphasis of matter that are indicated in such opinions, which is 78.79% of the total sample. When qualified opinions are concerned, all situations are present, however the most often cited is Valuation of property, plant and equipment. Furthermore, auditors who issued a disclaimer of opinion also indicate this situation, and in equal number of reports, they express doubts concerning the client's ability to continue their business according to a going concern assumption. Having in mind that adverse opinions had the smallest share in the total number of opinions issued, the number of reasons for such opinions was thus smaller and included only following: Recognition and valuation of liabilities; Account payable valuation and impairment; Provisions recognition and valuation; and Mortgage and guarantees.

When it comes to the sample of 369 public companies operating in other sectors and listed on the Belgrade Stock Exchange in 2017, the results show differences to some extent. Namely, the structure of reasons cited in auditor's reports for other public companies was the same as for companies operating in the agriculture, forestry and fishing sector when it comes to the type of audit opinion issued. However, unlike the first group of companies, the most common issue cited for the second group of companies that received unqualified opinions with explanatory paragraph was Going Concern, followed by Recognition and valuation of liabilities; Mortgage and guaranties; and Valuation of property, plant and equipment.

Figure 1. Reasons for emphasis of matter in auditor's reports in other public companies (non-agricultural)



Source: Authors' research

Other public companies had 1,164 cases of emphasis of matter reported in total. When all types of modified opinions are taken in aggregate, there were a total of 1,062 cases of emphasis of matter described, which makes 86.62% of the total number of situations mentioned in the relevant auditor's reports. In qualified opinions, there were 548 cases

of emphasis of matter situations specified and the ones that occurred the most often were the same as in unqualified opinion with emphasis of matter (Valuation of property, plant and equipment; Going concern), only their frequency was higher. However, it is interesting to note that when the auditor issued a disclaimer of opinion, the number of issues specified by the auditor was lower for public companies in other sectors. Valuation of property, plant and equipment; Going concern; Disclosures according to IAS 12; Bankruptcy and financial restructuring; were mentioned to a considerably lesser extent. As can be expected, when the auditor issued an adverse opinion on audited financial statements, the number of issues specified by auditor was lower compared to the agricultural, forestry and fishing sector. In this case, auditors expressed concerns regarding going concern assumption, disclosed value of fixed assets and impact that mortgages and guarantees issued have on the client's business.

Having in mind that in addition to qualitative differences there may be quantitative differences in the relevant auditor's opinions, comparative analysis of the number of pages and paragraphs contained in auditor's reports per type of auditor and type of audit report will be presented next.

Table 6. Auditor's reports per type of auditor and industry

Industry sectors		Agriculture, forestry and fishing		Other industries	
		Average number of pages	Average number of paragraphs	Average number of pages	Average number of paragraphs
Auditor type	Domestic	2.95	13.1	3.43	15
	International	5	19.6	4.68	20.11
Auditor opinion type	Unmodified opinion	2	8.44	2.21	8.58
	Unmodified with explanatory paragraph	2.88	12.35	2.52	11.05
	Modified opinions	3.25	14.58	3.6	16.03

Source: Authors' research

In terms of the type of auditor (domestic and international) in agriculture, forestry and fishing sector, it can be noted that auditor's report was issued on 3.98 pages on average. In terms of the average number of paragraphs, auditor's reports on average mainly consisted of 16.35 paragraphs. The situation was similar in public companies in other sectors. Auditor's report issued for public companies in other sectors was on average 4.06 pages long with the average number of paragraphs of 17.56. When it comes to types of auditor's opinion (Unmodified Opinion, Unmodified with Explanatory Paragraph and Modified Opinions), it can be noticed that the number of pages changed with the type of opinion, both for public companies in the agricultural sector and for public

companies in other sectors. Having in mind the obligation of the auditors to specify the grounds for forming an opinion, the length of the report for modified opinions became increasingly longer the more unfavourable the type of opinion was. The same applies to companies in other sectors.

Conclusion

Development of agricultural and other environmental performances has become an essential element of sustainable growth policies in countries across the world; and it is certainly an important economic sector in Serbia (Zecevic, et al., 2019). This paper examined the extent to which the audit results differ between companies operating in the agriculture, forestry and fishing sector and the companies in other sectors. The sample used in research comprised 398 public companies: 29 public agriculture, forestry and fishing companies and 369 public companies in other sectors that account for 70% of all public companies listed on the Belgrade Stock Exchange. When it comes to the first group of entities, research results show that 17 companies (58.62%) received an unmodified opinion on audited financial statements, including opinions with emphasis of matter. In the other group of companies (non-agricultural), majority of companies received modified opinion on audited financial statements with a 56.03% share. Regarding the type of auditor selected by the clients, it is interesting to notice that the public companies operating in the agriculture, forestry and fishing sector and the companies in other sectors generally decide to use the services of domestic audit companies. When it comes to emphasis of matter situations cited in auditor's reports for companies in agriculture, forestry and fishing industry, the majority of matters were in relation to Valuation of property, plant and equipment and Going concern. The emphasis of matter most cited in auditor's reports of companies from other sectors were Valuation of property, plant and equipment and Going concern. Likewise, related to valuation process, the matter of Recognition and valuation of liabilities has occurred also in these reports, which altogether points out that valuation of assets and liabilities might be one of the most complex areas of financial reporting and thus one that is perceived with a greater risk of misstatements by auditors. Other papers and researches that deal with the content of the auditor's reports and financial reporting practices in the Republic of Serbia pointed this issue. For example, authors (Obradovic et al., 2018) found that Revaluation of property, plant and equipment and Capitalisation of post-purchase costs of property, plant and equipment are areas that are considered to be particularly complex or problematic by respondents from Serbia. Furthermore, it seems that Serbian business entities also struggle with Disclosures in notes to financial. Namely, two separate research papers show that relatively significant number of Serbian business entities did not or did not clearly disclose the model for subsequent measurement of owner-occupied Properties, plant and equipment; Investment properties; as well as Goodwill (Karapavlovic et al., 2020), (Spasic, 2018). The same has been proved by authors (Dencic-Mihajlov, Spasic 2016) that claim that there is a low level of both mandatory and voluntary disclosures of Serbian public companies. The insufficiently developed market may have an impact on the company's decision to opt out of acquiring the services of Big 4 companies. Namely, only 0.32% of all companies

in Serbia are large entities, 1.29% is medium-sized entities, 9.42% are small entities and 88.98% are micro-entities (SBRA, 2019). The situation in the sample companies is different as the large entities have an almost 11% share, medium-sized entities have a 19% share, with the rest being small (about 30%) and micro-entities (40%). When observing the share which differently sized companies have in the selection of the type of auditor, it can be noted that the structure is roughly similar, which means that the size of an entity has no impact on the selection of a certain type of auditor. It can then be concluded, for example, that micro and large entities have an equal probability of choosing a Big 4 company or any other audit company. To conclude, despite the peculiarities of the agricultural activities, it seems that the results obtained do not show that auditors are required to adapt considerably the process of data collection and opinion-forming for clients from agriculture, forestry and fishing, as their financial statements suffer from almost the same issues as the ones from other sectors. The results of this research should be taken with caution having in mind that public companies involved in the agricultural activity do not represent a significant part of companies whose securities are traded in the Belgrade Stock Exchange. Finally, research in this field in the future could be focused on the analysis of the timeframe needed for disclosure of auditor's reports.

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Conflict of interests

The authors declare no conflict of interest.

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IMPACT OF DIFFERENT FACTORS ON THE FARMERS' DECISION TO INSURE CROP PRODUCTION

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ABSTRACT

The aim of the paper is to consider and analyze the impact of subsidies levels and other economic and general factors on the farmers' decision to insure their crops. The paper applies the model of logistic regression in order to determine the statistically significant influence of certain factors on the decision of farms. The subject of the research is general and economic data from agricultural holdings in the FADN sample in Serbia for 2018. The sample includes farms that deal with specialist field crops, specialist grazing livestock and mixed crops-livestock production. The survey was conducted on a sample of 819 households, of which 99 households reported insurance costs (12.1%). The results of the research show that with higher subsidy level the probability that farms will insure their production reduces. On the other hand, with an increase of economic size and farm net value added per annual working unit the probability that farms will be insured also increases.

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Introduction

Land performs many key functions that are vital for life (environmental, economic, social and cultural) (Popović et al, 2015). Changing weather conditions, as a consequence of global environmental problems, greatly affect the life of an ordinary person, as well as his work activities. According to research, as much as 80% of the world economy is subject to the influences of the weather factor (Auer, 2003).

Agriculture (especially plant production) is an extremely important branch of the economy that is largely dependent on weather conditions. Considering that it is performed outdoors, ie it has a biological character, the influence of weather on the achieved results in plant production is much more pronounced in relation to other economic branches. It is certain that in the future there will be increasing temperature fluctuations, as well as pronounced oscillations in the amount of precipitation, which will increase production risks in agriculture. In recent years, due to globalization and market liberalization, there has inevitably been an increase in price risks borne by farmers. At the same time, there is an increase in financial risks due to the increase in their indebtedness (Ivanović, Marković, 2018). In this regard, it is necessary to properly manage the risks in agriculture in order to mitigate or completely eliminate their negative effects.

Crops production represents an important activity for land exploitation (Vasilescu et al., 2010). Risks in crop production can be internal and external. Within internal risks, production, financial and personal are dominant. External risks are conditioned by the influence of external factors: market and political conditions. In the case of risk management instruments on the agricultural holding (internal), we distinguish between: risk avoidance, risk diversification and creation of reserves. External instruments include risk transfer and crop and fruit insurance. The most commonly used risk management instruments in agriculture are: insurance, funds for compensation of damages from various weather disasters and joint insurance funds (Marković, 2013).

Insurance, according to the number of risks, can be divided into: insurance against one, several or all types of risks. Crop and fruit insurance systems can also be divided into: insurance related to results on agricultural holdings and insurance based on data related to a specific region or administrative unit. Based on the method of risk compensation, insurance differs from crops and fruits damage to insurance based on time indices (Herbold 2007).

Crop insurance is a very important measure for managing risks in crop production, as it can avoid the possibility of losses due to adverse factors (natural disasters - drought and floods; non-catastrophic weather risks - hail, lightning, storms, frost; then diseases and pests, fire, theft, price variability and quality factors of production, product price volatility, rising interest rates, etc.). In this way, agricultural holdings (AH) that have secured their production have the possibility of compensating for possible losses and enabling the continuation of the production process.

Insurance in agriculture significantly reduces the risk in production and farmers have a greater opportunity to achieve a positive financial result. However, insurance, as a model of risk management, has not largely taken root in domestic farms, since in Serbia only about 12% of the total area under agricultural crops is insured (Poljoprivrednik, 2019; Jokić, 2020). It is certain that the Republic of Serbia (RS) does not have a developed insurance system in agriculture, and the main reasons are: insufficient information of farmers, uncertainty regarding compensation in case of insured event, questionable assessment of damage, relatively long period of time from insured event until the appraiser goes to the field, the attitude of the farmers „it will not happen to me", etc.

Serbian agricultural insurance coverage is more prevalent among legal entities, which annually insure about 50% of cultivated areas. However, for individuals, ie agricultural household, which are dominant in domestic conditions, the level of crop insurance is at a much lower level - only about 3% (Poljoprivrednik, 2019).

The state is trying to increase the representation of insurance in agriculture with incentives for legal entities and individuals. Namely, 40-45% of the paid insurance premium reduced by the amount of tax is subsidized. In the area of Moravica, Zlatibor, Kolubara, Podunavlje and Šumadija administrative districts, the recourse can be a maximum of 70% of the paid insurance premium reduced by the amount of tax (Subsidies in agriculture, 2017) However, despite this, many farmers are reluctant to insure their crops, considering it an unnecessary expense.

Taking into account the results of previous research, the aim of the research in this paper is to consider and analyze the impact of subsidy levels and other relevant factors on the decision of farms to insure their crops. The subject of the research is general and economic data from farms in the FADN sample in RS in 2018. These are farms that are primarily engaged in specialist field crops, specialist grazing livestock and mixed crops-livestock production.

The paper is conceived in such a way that it first gives an overview of the research done in the previous period in order to indicate the importance of the topic. The following section describes the procedure for defining the representative sample and model used in the paper. Then the obtained research results are presented, and at the end conclusions and recommendations are given.

Literature review

Coble, Barnett (2013) point out that the level of subsidies is one of the most important factors influencing the decision of farms to insure their crops. However, there are different attitudes in the literature, ie many other factors that influence the decision of agricultural producers. According to available research (Afroz et al., 2017; Ghazanfar et al., 2015; Wang et al., 2015; Falola et al., 2013) the most frequently mentioned are: farm owner experience, farmer training, yield variability, total income, farm size, etc.

Velandia et al. (2009) in their research show that farms that have more of their own utilised agricultural area (UAA) do not often decide to insure their crops. Also, farms that generate significant income from other activities (greater than $ 50,000), or for which agricultural activity is not the primary source of income, generally do not insure their crops.

Enjolras et al. (2012) performed a comparative analysis of two similar insurance systems in France and Italy based on FADN data. The authors point out the size of the farm (expressed as used agricultural land) and the diversification of production (expressed by the number of crops cultivated), as factors that decisively influence the insurance of production. Financial variables, leverage and rates of return on capital, have no statistically significant impact.

Tarasov (2013) observes the influence of the interest rate on the decision to insure agricultural production on the example of Ukraine, as a developing country, and the United States as a developed country. The results of the research showed that in developing countries (Ukraine) there is a need for significant subsidies for the cost of insurance premiums in order to enable the development of the agricultural insurance market due to high interest rates. In the United States, where the agricultural insurance market is at a much higher level, the government allocates significant funds to reimburse insurance premium costs, while interest rates are at a relatively low level.

Di Falco et al. (2014) believe that diversification of plant production can be an adequate substitute for insurance, which is an economic way of protection. This claim stems from research conducted on the basis of FADN data from farms in Italy, where the authors found that diversification of production and insurance can be equally important instruments for managing risk at the farm level. Also, the authors point out that in areas that are more exposed to weather risks, there is an increase in the demand of farmers for crop insurance.

Was, Kobus (2018) found that the decision of farms to insure their crops is largely conditioned by the compensation received in the previous period and significant reductions in the realized yield in previous years. In addition to these factors, the mentioned authors emphasize the significant influence of the value of agricultural production, production intensity and land quality. On the other hand, they found that the impact of subsidy levels was not statistically significant.

Materials and methods

The research in this paper is based primarily on FADN[6] data for RS for the last year for which data exist (2018), as well as for the previous (2017) year, where necessary (financial result of the previous year). The FADN questionnaire, which is used to collect data from agricultural holdings, contains, among other things, data on agricultural insurance on farms that entered the FADN sample.

6 FADN (Farm Accountancy Data Network) is a network for collecting production, economic and financial data from agricultural holdings. In the Republic of Serbia, the establishment of the FADN system began in 2011 and since 2015 the system has become operational and data are relatively reliable. (*www.fadn.rs*).

In 2018, there were a total of 1,647 commercial agricultural holdings in the FADN sample in the Republic of Serbia. Since the aim of the analysis is to determine the influence of various factors on the decision of farms to insure their crops, only those types of farms that have arable production as dominant (external realization) or as a raw material for further production on the farm (internal realization) were considered. In our case, these are farms: specialist field crops (TF 15-16), specialist grazing livestock (TF 45-48), mixed crops-livestock production (TF 83-84).

For the purposes of this research, all farms of economic size over 250,000 euros SO[7] were classified into one group, due to the relatively small number of such AH in the sample and due to the clarity of the data. Also excluded from the sample are farms of economic size less than 4,000 euros SO, given that this is the lower limit of economic size in RS. After that, seven classes of economic size remained in the sample (tab. 1). 1% of farms were also excluded from the sample due to extreme value indicators, after which a total of 819 farms remained in the sample.

The influence of various factors on the decision of farms to insure their crops was analyzed by applying the binary logistic regression model. Binary logistic regression is a special type of regression model that is applied when the dependent variable (Y) is dichotomous, while the independent variables (X) can be numerical or categorical (Trushaj, Kushta, 2020).

The binary logistic regression model has the following form:

$$\pi(x) = \frac{e^{\alpha+\beta_1 X_1+\beta_2 X_2+...+\beta_k X_k}}{1+e^{\alpha+\beta_1 X_1+\beta_2 X_2+...+\beta_k X_k}} [1]$$

Where π(x) represents the expected value of Y for a given value of X, while the parameters α and $ß_{1,2,..k}$ correspond to the parameters α and ß1,2, ... k from the linear regression model, ie α represents the average initial level of the dependent variable, and ß regression direction coefficients that show the average change in logit per unit of change of the independent variable (Kvesić, 2012).

After calculating this expression, a transformation is applied, in order to linearize the given function, after which the function has the following form:

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha+\beta_1 X_1+\beta_2 X_2+...+\beta_k X_k [2]$$

The function is called logit and is linear by the parameters ßi, i = 1 ... k. The π value ranges from 0 to 1, while the logit value ranges from (-∞, + ∞), depending on the value of x (Hosmer et al., 2013).

The maximum reliability method is used to estimate the parameters in the logistic regression model (Tekić et al., 2020). Testing the significance of regression coefficients in the model is performed using the Wald test (Kleinbaum et al., 1998).

7 Standard Output (SO) – the economic size of the farm is expressed by the standard value of production during the accounting year (*www.fadn.rs*).

To assess the agreement of the model with the data, the following were applied: Omnibus test, Hosmer-Lemeshow test and classification matrix. In order to check the quality of the model, Cox and Snell and Nagelkerke pseudo R^2 were also calculated (Walker, Smith, 2016).

The dependent variable in the model is defined as the use of a particular type of crop insurance. The observed dependent variable is categorical, ie it is coded with: NO = 0 or YES = 1, which is the answer to the question: "Does the farm insure its crops?" The answer to this question was obtained based on whether the farm showed insurance costs or not. Out of the total number of households (819), 99 of them reported insurance costs, which represents a relative share of 12.1%.

Based on the available literature and previous research on this topic, taking into account, of course, the limitations of the database in this particular case, independent variables, ie factors whose influence is observed were defined (tab. 1).

Table 1. Independent variables in the model

No.	Independent variables	Label
1	Region	*(1)* Belgrade region
		(2) Vojvodina region
		(3) Region of Šumadija and Western Serbia
		(4) Region of Southern and Eastern Serbia
2	Economic size (SO)	*(1)* 4,000 – 8,000 €
		(2) 8,000 – 15,000 €
		(3) 15,000 – 25,000 €
		(4) 25,000 – 50,000 €
		(5) 50,000 – 100,000 €
		(6) 100,000 – 250,000 €
		(7) > 250,000 €
3	Subsidy level (%)	Total subsidies - excluding on investments (SE 605)
		Total revenue (SE 131 + SE 605)
4	Farm Net Value Added per annual working unit (SE 425)	Farm Net Value Added (SE 415)
		Total labour input (SE 010)
5	Production intensity	Total inputs (SE 270)
		Total Utilised Agricultural Area (SE 025)
6	Financial result of previous year (2017)	*(1)* Net profit (SE 420)
		(2) Net loss (SE 420)

No.	Independent variables	Label
7	Farmers' experience	*(1)* Not shown
		(2) < 1940
		(3) 1940 - 1949
		(4) 1950 - 1959
		(5) 1960 - 1969
		(6) 1970 - 1979
		(7) > 1979
8	Farmers' education	*(1)* Practical experience
		(2) Basic education
		(3) Full education

Source: Authors'

The paper also uses standard tools of descriptive statistics: arithmetic mean, extreme values (min. and max.), coefficient of variation. Statistical data processing was performed using the SPSS 20 program. Of course, standard methods of business analysis (analysis and comparison) are applied, as well as descriptive, ie the method of logical reasoning.

Results

Out of a total of 819 farms in the sample, 99 farms reported insurance costs, which means that 12.1% of farms insure their crops. The average value of insurance costs on farms in the RS is RSD 137,514 (*tab. 2*). There is a large range between the minimum and maximum value, as well as high variability of data, which is explained by the fact that in the sample there are farms of different economic sizes that certainly have significantly different expenses for insurance costs. This is justified having in mind that the economic size of the farm was taken as a criterion when assessing the impact of various factors on the decision of farms to insure their crops.

Table 2. Descriptive statistics

Descriptive statistics	Number of holdings	Mean	Interval of variation		Coefficient of variation (%)
			Minimum	Maximum	
Cost of insurance	99	137,514	10,000	2,909,578	232.3
Subsidy level (%)	819	6.7	0.0	38.7	95.3
FNVA per AWU	819	2,279,970	-564,172	23,819,360	127.9
Production intensity	819	162,024	12,750	3,151,111	114.2

Source: Authors' calculations

The share of subsidies in the total income of households is on average 6.7% on farms in Serbia. The highest level of subsidies is 38.7%, which means that a good part of the total income on the respective farm comes from state taxes. This is not the only case, and it is usually

noticeable in farms that deal with milk production and mixed plant and livestock production. The reason is the significant subsidies per head of livestock realized by the mentioned farms.

Farm net value added (FNVA) is an indicator of the economic performance of a farm that is very important when assessing business performance. It is expressed per annual working unit (AWU) in order to take into account the differences in compensation for labor on the farm (*Miljatović et al., 2020*). This indicator can also be negative, which is the case with farms that have made a gross loss (*tab. 2*).

Production intensity, expressed by input costs per UAA, averaged RSD 162,024 per ha of UAA. This intensity is significantly lower in farms engaged in farming compared to farms of predominantly livestock production type.

The logistic regression model was applied to assess the impact of certain factors on the decision of farms to insure their crops. The selection of predictor variables, ie independently variables in the model, was performed using the „stepwise" method, in order to determine their contribution in each step of the procedure. The selection of variables was performed in six steps, while only the results of the sixth step will be presented in the paper. The omnibus test was applied to test the performance of the model, ie „goodness of fit." The Hosmer and Lemeshow test was used to determine the quality of the model prediction (*tab. 3*).

Table 3. Omnibus tests of model coefficients and Hosmer and Lemeshow test results

Test	Step	Chi-square	df	Sig.
Omnibus test	Step 6	37.438	3	0.001
Hosmer and Lemeshow test	Step 6	11.163	8	0.193

Source: SPSS output

The results of the Omnibus test (*tab. 3*) show that there is a statistically significant difference between the model containing the selected variables and the model containing only the constant, ie the model is adequate for predicting the results ($p < 0.05$). The results of the Hosmer and Lemeshow test confirm the results of the Omnibus test (the indicator of good prediction in this test is $p > 0.05$).

By calculating the Cox and Snell's and Nagelkerke Pseudo R^2 coefficient, the fitting of the model was evaluated, i.e. it was assessed how well the model explains the data (*tab. 4*). Based on the value of the Pseudo R^2 coefficient, it can be concluded that the obtained model explains between 17.1% and 31.1% of the variance. Such a low level of explanation of variance shows that there are still many internal and external factors influencing the decision of farms to insure, which could not be included in the model. This is due to the fact that certain influencing factors, such as: distrust of farmers, fear of non-payment of the insured event, attitude „not me", regression of insurance costs, etc., do not exist in the FADN database or cannot be quantified. However, based on the review of research from the previous period and the considered specifics of the observed area, the paper defines variables that have a significant impact on the decision of farms to insure.

Table 4. Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
6	621,375	0.171	0.311

Source: SPSS output

The classification determines the accuracy indicators of the model, ie it evaluates how well the model predicts the categories of dependent variables (*tab. 5*). Based on the obtained results, it can be noticed that the model successfully classified 87.9% of all cases.

Table 5. Classification table

Insurance	Logistic regression	
	Not insured	Insured
Not insured	720	0
Insured	99	0
Total (%)		87.9

Source: SPSS output

The contribution of each predictor variable was tested by the Wald test. It is considered that the variable significantly contributes to the predictive capabilities of the model if p <0.05. Based on the presented results (*tab. 6*), it can be concluded that of all the observed predictor variables, three variables can be distinguished as significant predictors.

Table 6. Variables in the equation

Step	Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Step 6	Economic size	0.511	0.100	26.227	1	0.001	1.668
	Subsidy level	-0.045	0.021	4.678	1	0.031	0.956
	FNVA per AWU	0.001	0.001	4.621		0.032	1.001
	Constant	-3.384	0.404	70.235	1	0.001	0.034

Source: SPSS output

Based on the results of the Wald test, it can be concluded that significant predictor variables are economic size, subsidy level and FNVA per AWU (p <0.05), ie these three variables have the greatest influence on the decision of farms whether to insure or not, while for other variables it can be concluded that they are not significant predictors. Based on the calculated regression coefficients, the equation of the estimated logistic regression model has the following form:

$$\hat{Y} = -3.384 + 0.511\ Economic\ size - 0.045\ Subsidy\ level + 0.001\ FNVA\ per\ AWU$$

Based on the obtained results, it can be concluded that with the increase of the share of subsidies in the total income, the probability that crops will be insured decreases (Exp (B) <1). This claim can be explained by the fact that subsidies have a high share in the total income of farms that are less profitable, since the structure of income of successful

farms is dominated by sales revenues. Therefore, these farms are not willing to use the additional income generated from subsidies to pay the costs of insurance premiums.

The class of economic size and net value added per annual working unit directly influence the decision of farms to insure (Exp (B)> 1). This practically means that as the economic size of the farm increases and the economic performance (FNVA per AWU) increases, the probability that the farms will insure their crops increases.

Conclusion

Given the extremely low percentage of farms that insure their crops (12%) and the need to increase the share of insured farms, the survey identified factors influencing the decision of farms in RS to insure their crops. This is primarily to exclude the possibility of large losses due to weather conditions (production risks), but also personal, market, political and other risks that greatly affect agricultural production.

The biggest problem in the development of the insurance system in domestic conditions is the distrust of farmers, which in many cases is justified. This primarily refers to the too long wait of the appraiser to go out on the field after the insured event occurs, as well as to the questionable assessment of the damage given that the appraisers are not independent of the insurance companies. For these reasons, farmers often consider the cost of insurance premiums an undesirable and unnecessary expense.

Subsidizing insurance costs is also a topic that is given special attention when it comes to crop insurance. The state regresses up to 40% (in extreme cases even up to 70%) of insurance premium costs to farmers who choose to insure their crops. This is certainly a very important factor, which has an impact on the decision of farms to insure their crops. However, the authors believe that there is no significant room for improvement of this measure by the state and that the problem of low rates of agricultural insurance in our country primarily stems from other factors.

The paper shows that subsidy level, economic size and farm net value added per AWU are factors that influence the decision of farms whether to insure their crops or not. Economic size and FNVA per AWU affect directly proportionally, ie with the increase of these indicators, the probability that farms will be insured also increases. On the other hand, the impact of the subsidy level is inversely proportional, which means that with a larger share of subsidies in total income, the probability that farms will decide to insure their production decreases.

In domestic conditions, crop insurance becomes relevant only after the catastrophic damage that plant production suffers, and is a consequence of weather conditions (floods, hail, drought, etc.). The essence is to prevent potential losses that can be realized by farmers, and they are caused primarily by unstable weather conditions, but also by other risks in agriculture. This can be achieved only by increasing the share of insured farms and by emphasizing the importance of risk management in agriculture (primarily crop production) through various seminars, trainings, conferences, etc.

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Conflict of interests

The authors declare no conflict of interest.

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MODELLING OF GROWTH FACTORS OF COFFEE PROCESSING COMPANIES

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ABSTRACT

In this paper, the growth factors of coffee processing companies in the Republic of Serbia were analyzed by panel data technique. The growth was measured by changes in sales, while as explanatory variables were defined the following: export, size, capital turnover, revenue cycle, current ratio (liquidity ratio), debt ratio and return on assets. The empirical examination was conducted on the basis of 160 observations of financial statements of companies in coffee market. The results show that coffee processing companies in the Republic of Serbia have an average positive growth rate (1.08) during period 2015-2018. Growth of coffee processing companies is significant negatively related to size, revenue cycle and current ratio. On the other side, profitability measured as return on assets has positive significant impact on firm growth. The results show the performances of coffee processing companies during period 2015-2018 and the profile of growth factors as a prerequisite for company's development. This information can be useful for the large number of internal and external users of financial statements in the process of decision making.

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Introduction

Coffee is one of the world`s most traded commodities. It provides economic benefits for all the internationally dispersed participants of the global value chain, from growers to consumers. Coffee commercialization contribute to growth of total household incomes in the producing countries (Sharma et al., 2016). It also, contribute to growth of foreign exchange revenues, tax collection and GDP for more than 140 exporting countries of whole grain coffee and over 100 exporting countries of coffee (Silva, Leite, 2013). On the other side, it brings out huge profits for the processors and retailers mainly located in the importing countries. To achieve sustainable development of coffee sector, private and public targeted investments are required to boost the produced quantities and improve the quality premiums in international markets (Al-Abdulkader et al., 2018).

Coffee production is concentrated in many tropical and subtropical countries, mostly in the developing world. The total world production of whole grain coffee or green coffee beans amounted 170.9 million 60 kg bags in 2018/19 (International Coffee Organization, 2020a). The leading coffee producing countries were Brazil (62.9 million 60 kg bags or 36.8%), Vietnam (31.2 million 60 kg bags or 18.3%), Columbia (13.9 million 60 kg bags or 8.1%), and Indonesia (9.4 million 60 kg bags or 5.5%).

Most of the produced volume is exporting, providing substantial export earnings for the developing and least developed countries. The value exported in 2018 was estimated at US$30.6 billion (International Trade Centre, 2020). The largest share in value in the world`s coffee export in 2018 had Brazil (14.3%), Vietnam (9.4 %) and Germany (8.3%).

The global demand for coffee continues to grow. World coffee consumption reached 169.3 million 60 kg bags in 2019/20 (International Coffee Organization, 2020b). The major coffee consuming markets are still in the most developed countries, such as EU, with the market share of approximately 27%, and US with the market share of approximately 16.5% of the total world coffee market. It is important to point out that there is a growing domestic consumption in the exporting countries (1.7% CAGR from 2016/17 to 2019/20) and in the non-traditional coffee markets as well. Brazil, as the world leading coffee producing and exporting country, with the consumption of 22.3 million 60 kg bags or 13% in 2019/20 represented a third world`s consuming market.

The Serbian coffee market is expected to generate revenue of US$469 million in 2020 (Average Revenue per Capita of US$67.44), and growth by 4.3% annually (CAGR 2020-2025) (Statista, 2020). It is small and highly concentrated market. There is a gap between the two dominant manufacturers, Grand Prom and Strauss Adriatic, on the one side, and around 300 small domestic roasters on the other side. The main focus for all of them is the segment of traditional roast and ground coffee, which makes almost 90% of the total Serbian coffee market. The combined share of the largest two players accounts approximately 3/4 of the traditional roast and ground coffee market. The two major competitors in the Serbian coffee industry gained about 73% of total revenue during 2012-2015 (Nuševa et al., 2017). Primary focus of the few multinational companies which are present on the market is the segment of instant coffee.

The aim of paper is to investigate the factors that have impact on growth of coffee processing companies in Serbia. Growth as an increase in sales represents one of the precondition for business success and development. Financial statements represent the base for analysis business performances (see more: Hasanaj, 2019; Callado, Soares, 2014; Milić, Mijić, Jakšić, 2018). The analysis is based on 160 observations of financial statements of coffee processing companies during period 2015-2018. Financial statements provide information about position and business success. Based on panel data analysis the research analysis has to define which factors have significant impact on growth of coffee processing companies.

An overview of the Serbian coffee market

Coffee plays a special role in Serbia`s foreign trade. The country does not produce coffee, but imports, processes and exports it. Coffee import in Serbia was estimated at US$73,296 thousand or 31,580 tons in 2019 (International Trade Centre, 2020). The biggest share due to its value in Serbia`s import in 2019 had Brazil (14.5%), Italy (10.1%), Vietnam (6.7%), Uganda (4.7%), Switzerland (2.2%) and Greece (1.6%). As Serbia has small share of approximately 0.2 - 0.3% of the total world imports of coffee, it does not represent as significant market as some other countries.

Exported value of coffee by Serbia in 2019 accounted US$7,717 thousand or 1,255 tons (International Trade Centre, 2020). The major exporting markets due to its value in 2019 were Austria (19.2%), Montenegro (16.8%), North Macedonia (10.7%), Germany (8.1%), Bosnia and Herzegovina (7.4%) and Netherlands (5.5%).

Coffee is very popular beverage among Serbian consumers and the country is among the top countries in coffee consumption per capita. Coffee consumption is estimated around 35,000 tons per year. One of the biggest problems is the fact that around 15 to 20% of that is illicit, illegal or smuggled coffee. To address these issues, new legislation was introduced on 1 January 2018 (Ministry of finance of Republic of Serbia, 2017). All coffee products with more than 50 g net weight are obligated to have a banderole and processors need to pay excise taxes for them.

Of a great concern is the fact that there are no detailed declarations on the packaging showing the country of origin, health and sanitary safety standards, percentage of each coffee bean, etc. Coffees in Serbia are generally blends of Arabica and Robusta beans, with larger presence of Robusta. The highest quality and also priciest coffees and blends are pure Arabica. So, consumers in Serbia can be misled by the price or quality, or there may be a risk for their health. Constant education of consumers is very important for their safety.

Serbian consumers prefer roasted and groud (traditional, domestic, black, fresh, Turkish or Serbian) coffee, particularly the older generations. The younger generations are more in favour of instant coffees (including different mixtures), and that is one of the main reason that instant coffee segment rises. Revenue in the instant coffee segment amounts to US$386 million in 2020 (Statista, 2020). In the previous years, leaders in the

instant coffee segment in Serbia, Nestle Adriatic (part of Nestle) and Mondelez EAM (former Kraft Foods, part of Mondelez International), are facing strong competition from Grand Prom and Strauss Adriatic. The two domestic manufacturers are constantly monitoring the habits and attitudes of the consumers and implementing innovations such as development of new coffee brands, "mixes" and ways of consuming, coffee shops, coffee-to-go etc.

As consumer awareness about the sustainable development in coffee sector increases, niches of coffees carrying certification labels (Organic, Fairtrade, UTZ Certified, Rainforest Alliance, etc.) are experiencing growth, primarily in the developed countries (Nuševa, 2018). Due to many factors, such as: weak purchasing power, low consumer recognition, lack of awareness and education campaigns, insufficient adherence to quality standards and systems, etc., there is no significant demand for these coffees in Serbia yet.

Literature review

The aim of the business of the company is long-term business in the market and profit. In the conditions of market competition, frequent economic changes, the growth of the company is set as a prerequisite for the survival and development of the company in the market. Growth is one of the goals of company. Besides that, growth is one of the prerequisites for the achievement of other business goals such as increasing market share, reducing the business risk in market etc. The positive side of company growth is reflected not only on the particular company, but also on the industry and overall economy. Company growth lead to employment increase, economic growth etc. (see more: Poljašević, Mijić, 2017).

Information on the position and success of the company is presented in the financial statements. Financial statement analysis methods are used to obtain information about different performances of company (see more: Subačienė et al. 2018; Jakšić, Mijić, Zekić, Poljašević, 2015). Such information points to profitability, growth, leverage, debt, liquidity etc. Information is relevant to the various stakeholders in order to provide an adequate decision making (see more: Gulin, Grbavac, Hladika, 2016).

There are different definitions of company growth, as well as different variables that indicate growth. The growth of firm can be represented by the change of some variable over time (Machek, Machek, 2014). Growth can be defined in terms of revenue generation, value addition, and expansion in terms of volume of the business. It can also be measured in the form of qualitative features like marketposition, quality of product, and goodwill ofthe customers (Gupta, Guha, Krishnaswami, 2013). According to Gopinath (2012) firm growth is an increase in certain attributes such as sales, employment or profit between two points in time and is an important determinant of firms performance. The two most common variables that indicate growth are the change in sales and employment (Delmar, 2006; Daunfeldt, Elert, Johansson, 2014.). Shepherd and Wiklund (2009) determined the changes in sales as the most relevant and reliable variable of firm growth.

The firm growth can be result of organic or non-organic growth (Machek, Machek, 2014). Organic growth is the result of investments in an existing business, such as investments in the development of new products or services (Harabi, 2003). If the growth of a company is due to the merger or acquisition then it is a non-organic growth of the enterprise. Usually the growth through merger or acquisition processes leads to a significant increase in market concentration.

Investigations of the factors that influence firm growth has been the subject of examination by numerous authors. The impact of leverage ratio and variable whether the company had a loan request rejected by a bank or not on the growth of company was examined by Becchetti and Trovato (2002). They found out that leverage ratio does not have significant impact on growth, while the dummy variable has the significant impact on growth.

The factors that affect sales growth in Greek manufacturing small and medium sized enterprises were examined by using a panel data analysis. The results indicate that profitability, liquidity, reliance on long-term debt, employee productivity, fixed assets turnover and restricted sales credit terms have significant influence on firm growth (Voulgaris, Asteriou, Agiomirgianakis, 2003).

Hermelo and Vassolo (2007) conducted the research of determinants of firms's growth among the companies in Argentina. The results of regression analysis show that investment in newer technology, export and return on sale have significant impact on growth. On the other side, they found out that size of company does not have significant impact on firm growth.

The factors that affect growth of real estate investment trusts in US were investigated by using a panel data model of 148 REITs during the period 1993-2005. The results show that size, age and leverage are related to growth. The results show that young REITs have a better growth rate (Gopinath, 2012).

Fiala and Hedija (2015) used an ordinary least squares estimator to investigate the relationship between firm size and firm growth in the Czech Republic during 2007-2012. Size of company was measured by revenue, number of employees and total assets. The results show that there is a negative significant relationship between firm size and firm growth. Furthermore, the results are not influenced of the type of firm size indicator, because for all three used indicators are results very similar.

Materials and methods

The subject of the research in this paper is to determine how selected internal factors (export, size, capital turnover, revenue cycle, current ratio, debt ratio and return on assets) influence on growth rate of selected coffee processing companies in Serbia. According to the subject, the aim of this paper is to analyze growth of coffee processing companies in Serbia in context of internal factors which are outlined.

The study covers period from 2015 to 2018 (4 years) and includes 40 coffee processing companies. Total number of observation is 160. The data were collected from the Scoring database (Scoring, 2019). The sample is consist of financial statements of coffee processing companies in Serbia. Financial statements provide information about financial position and results of companies in the thousand of RSD.

In accordance with the subject and the aim of the research, the following hypothesis was set up:

H_1: Internal factors, such as export, size of company, capital turnover, revenue cycle, current ratio (liquidity ratio), debt ratio and return on assets have a significant impact on firm growth of selected coffee processing companies in Serbia.

The research is based on a panel regression analysis. Panel analysis is well suited for comparative data analysis because it allows researchers great flexibility in modeling the differences in the behavior of different subjects. The panel data analysis provide a solution for the data which are not sufficient for time series analysis and spatial analysis, because their pooling enable the data which give better research results (Aljinovic, Marasovic, 2012). Balanced panel data were used in the paper, since we have the same number of time series observations for each comparative unit.

There are a number of different models for panel data, however, in the broadest sense we can split into: a) 'Pooled OLS' model b)Fixed effect model and c) Random effect model. The Pooled OLS model is the simplest panel model, and is defined as:

$$Y_{it} = \alpha + \beta_1 \cdot x_{it1} + \beta_2 \cdot x_{it2} + \cdots + \beta_K \cdot x_{itK} + \varepsilon_{it}; i = 1,2,..,N; t = 1,2,...,T; \quad (1)$$

where N represents the number of observation units, T represents the number of time periods, x_{itK}, $k = 1, 2, ..., K$is the value of $k$of the independent variable, and of the observation unit at time t. The parameter α represents a constant that is the same for all observation units and does not change over time. $\beta_1, \beta_2, ..., \beta_K$ are the parameters to be estimated. ε_{it} is the error of the relation of the *i* observation unit in period t and it is assumed that $\varepsilon_{it}\varepsilon_{it}$ is independently and identically distributed random variables across units of observation and in time. With all this, the assumption is that all x_{itK} are independent with $\varepsilon_{it}$for all i, t, k.

The Pooled OLS model has the most limitations, so the mostly used regression models in panel analysis are the model of fixed effects or the model of random effects.

Growth as a dependent variable is measured as change in sales during two period. On the other side, on the basis of available data, the explanatory variables are defined as export, size, capital turnover, revenue cycle, current ratio (liquidity ratio), debt ratio and return on assets. Growth, export, capital turnover, current ratio, debt ratio and return on assets are represents as ratio. Size is represented as natural logarithm of total assets, while revenue cycle is represent as logarithm of the average number of days a claim is collected. List of variables used in panel models is given in *Table 1.*

Table 1. List of variables used in panel analysis

Variable name	Variable code	Type of variable	Definition	Explanation
Growth	Growth	Dependent	Firm growth during 2015-2018	$Sales_t$ / $Sales_{t-1}$
Export	Export	Explanatory	Export share in total sales revenues	Export share revenue / Sales
Size	Size	Explanatory	Size of company	Ln Total Assets
Capital turnover	CapTurn	Explanatory	Measures capital intensity of firm	Measures capital intensity of firm
Revenue cycle	RevCyc	Explanatory	Days in accounts receivable	Log The average number of days a claim is collected
Current ratio	CurrRatio	Explanatory	Company's ability to pay off its current liabilities	Current assets / Current liabilities
Debt ratio	Debt	Explanatory	Company's leverage	Total debt / Total assets
Return on assets	ROA	Explanatory	Company's profitability	Net income / Total assets

Source: Authors' illustration based on Walsh, 2003; Hasanaj, 2019.

Results

In *Table 2* is presented the descriptive statistics of the variables used in panel analysis. According to the results of descriptive statistics it can be concluded that coffee processing companies in the Republic of Serbia have an average positive growth during 2015-2018. Based on mean value the average rate is 8%, while based on median value the average growth rate is 5%. The examination of current ratio shows the wide range of liquidity of coffee processing companies. Current ratio according to the median value shows that coffee processing companies in the Republic of Serbia have problems in paying current liabilities on time. The results of debt ratio analysis show that in average coffee processing companies have more liabilities than capital. The positive average value of return on assets indicate that coffee processing companies in Serbia make a net income of 7% of total assets.

Table 2. Descriptive statistics for period 2015, 2018 and period from 2015-2018

Variable name	2015	2018	Period 2015 - 2018					
	Mean	Mean	Mean	Median	Minimum	Maximum	Std. Dev.	No. obs.
Growth	1.14	1.05	1.08	1.05	0.50	2.91	0.24	160
Export	0.05	0.06	0.06	0.00	0.00	0.99	0.17	160
Size	10.57	10.99	10.83	10.83	5.79	16.01	1.88	160
Capital turnover	2.19	1.87	2.07	1.48	0.21	12.13	1.86	160
Revenue cycle	1.59	1.59	1.59	1.67	-0.04	2.63	0.58	160

Variable name	2015	2018	Period 2015 - 2018					
	Mean	Mean	Mean	Median	Minimum	Maximum	Std. Dev.	No. obs.
Current ratio	2.15	2.27	2.29	1.51	0.27	12.96	2.08	160
Debt ratio	0.67	0.57	0.59	0.62	0.02	2.73	0.42	160
Return on assets	0.05	0.08	0.07	0.05	-0.55	0.45	0.11	160

Source: Author's calculation

Independent variables correlation was done to determine if there was a multicollinearity problem. A high correlation between individual variables may indicate the presence of multicollinearity. Multicollinearity can be a problem if the correlation between variables exceeds 0.80 (Field, 2005).

Table 3. Pearson correlation coefficient

Growth	Export	Size	Capital turnover	Revenue cycle	Current ratio	Debt ratio	Return on assets	
1	-0.041	-0.055	0.254	-0.203	-0.167	0.088	0.248	**Growth**
	1	0.343	-0.249	0.210	0.056	-0.161	-0.050	**Export**
		1	-0.236	0.102	0.128	-0.442	0.072	**Size**
			1	-0.555	0.005	0.118	0.173	**Capital turnover**
				1	0.205	-0.212	-0.139	**Revenue cycle**
					1	-0.506	0.101	**Current ratio**
						1	-0.142	**Debt ratio**
							1	**Return on assets**

Source: Authors

As we can see in *Table 3* none of the correlations are even close to the threshold value of 0.8, so we can conclude that there is no problem with multicollinearity.

The *Table 4* shows all three models.

Table 4. Panel models

Explanatory variables	Coefficient		
	Model 1	Model 2	Model 3
Const	1,0692	4,7420	1,1316
	(<0,0001)	(0,0004)	(<0,0001)
Export	0,0595	−0,5226	0,0739
	(0,6118)	(0,3986)	(0,6630)

Explanatory variables	Coefficient		
	Model 1	Model 2	Model 3
Size	−0,0014	−0,3003	−0,00581
	(0,8991)	(0,0055)***	(0,7322)
Capital turnover	0,0273	0,0061	0,0351
	(0,0283)**	(0,9063)	(0,0391)**
Revenue cycle	−0,0098	−0,2615	−0,0271
	(0,8025)	(0,0144)**	(0,6093)
Current ratio	−0,0220	−0,0265	−0,02281
	(0,0355)**	(0,0353)**	(0,0382)**
Debt ratio	−0,00185	0,0900	0,0035
	(0,9742)	(0,6084)	(0,9640)
Return on assets	0,5086	0,4196	0,4119
	(0,0035)***	(0,0621)*	(0,0286)**

Source: Authors

Note: - Model 1: Pooled OLS; Model 2: Fix-effects model;
Model 3: Random-effects; (GLS);

- *, **, *** indicate statistical significance at the 90% and 95% and 99% level of confidence.

When analyzing panel data, the most commonly asked question is whether it is better to use a fixed effect model or a random effect model. In order to answer on this question, the panel diagnostics was conducted and it is shown in the *Table 5*.

Table 5. Panel model diagnostic

Diagnostics	Null hypothesis	p value	Decision
Joint significance of differing group means:	The pooled OLS model is adequate	F(39, 113) = 3,2945 with p-value 0,000	A p-value less than 5% (0.05) counts against the null hypothesis that the pooled OLS model is adequate, in favour of the fixed effects alternative.
Breusch-Pagan test statistic	The pooled OLS model is adequate	LM = 13,1729 with p-value = prob(chi-square(1) > 13,1729) = 0,000284031	A p-value less than 5% (0.05) counts against the null hypothesis that the pooled OLS model is adequate, in favour of the random effects alternative.
Hausman test statistic	The random effects model is adequate	H = 27,4303 with p-value = prob(chi-square(7) > 27,4303) = 0,000278768	A p-value less than 5% (0.05) counts against the null hypothesis that the random effects model is adequate, in favour of the fixed effects alternative.

Source: Authors

The results of the panel diagnostics shown in the table above show that the fixed model is the most appropriate (Baltagi, 2005), so in the next section we will comment on the results obtained for this model.

The results of fixed-effects model is shown in *Table 6*.

Table 6. Fixed-effects model (Dependent variable: Growth)

Variable	Coefficient	Std. Error	t-ratio	p-value	
Const	4.7420	1.3066	3.6290	0.0004	***
Export	−0.5226	0.6167	−0.8474	0.3986	
Size	−0.3003	0.1062	−2.8280	0.0055	***
CapTurn	0.0061	0.0518	0.1180	0.9063	
RevCyc	−0.2615	0.1053	−2.4850	0.0144	**
CurrRatio	−0.0265	0.0124	−2.1310	0.0353	**
Debt	0.0900	0.1752	0.5137	0.6084	
ROA	0.4196	0.2227	1.8840	0.0621	*

Source: Authors

Note: - *, **, *** indicate statistical significance at the 90% and 95% and 99% level of confidence.

As we can see in *Table 6*, there are four of seven independent variables included in panel analysis that show statistically significance impact on growth as dependent variable:

a) size (−0.3003) shows negative impact on Growth at the level of significance of 1%

b) the average number of days a claim is collected (−0.2615) shows negative impact on Growth at the level of significance of 5%

c) current ratio as liquidity ratio (Acid test) (−0.0265) also shows negative impact on Growth at the level of significance of 5% and

d) return on assets (0.4196) shows positive impact on Growth at the level of significance of 10%.

According to results it can be conclude that hypothesis was partially accepted. The research results provide that four of seven selected variables have significant impact on growth.

Discussions

The aim of this paper was to analyze and investigate factors which have significant effects on growth of coffee processing companies in Serbia. According to the results of growth of coffee processing companies in Serbia during the period 2015-2018 it can be conclude that these companies have positive average growth rate of 8%. During the observed period the average rate of growth decreased from 14% in 2015 to 5% in 2018.

The results of panel data analysis indicate that size, revenue cycle, current ratio and return on assets have significant impact on the growth of coffee processing companies. On the other hand, variables such as export, capital turnover and debt ratio do not effect on growth of sales significantly.

The size has negative significant impact on the growth of companies. According to this it can be conclude that small companies have large growth rate. These results have to be explained by the absolute amount of sale and ratio of sales growth. Smaller companies can achieve larger rate of growth with the smaller absolute amount of sale in one period in difference with larger companies.

Revenue cycle has significant negative effect on the growth of coffee processing companies in Serbia. Results indicate that larger average number of days in which a claim is collected will reduce the rate of sales growth. These finding is according to the results of other authors (Voulgaris, Asteriou, Agiomirgianakis, 2003; Fiala, Hedija, 2015)

Current ratio as the representative of liquidity of companies indicate that there is negative significant relationship between current ratio and growth. These findings indicate that lower liquidity provides higher rate of companies growth. Liquidity of coffee processing companies in Serbia is higher than referent value (average current ratio is higher than 2.00 during the period 2015-2018). The lower liquidity of the fast growing firms is related to their basic fund demand-supply equation, which forces them to economize on use of funds in current asset holdings and to borrow from all possible sources, including banks and trade creditors (Voulgaris, Asteriou, Agiomirgianakis, 2003).

Return on assets has positive significant effect on sales growth. Higher level of return of assets indicates higher rate of sales growth. Coffee processing companies do not have high level of debt, so they rely on their ability to generate profits in order to grow.

Conclusions

The growth and growth factors of coffee processing companies in the Republic of Serbia was examined during period 2015-2018. An empirical examination is based on financial statements of coffee processing companies, and using of descriptive statistics and panel data analysis. The growth was measured as the changes in sales of companies, while as independent variables are used export, size, capital turnover, revenue cycle, current ratio, debt ratio and return on assets.

The results of growth analysis show that the coffee processing companies in the Republic of Serbia have an average rate of growth at the level of 8%. Beside positive growth rate, coffee processing companies have an average good performances such as return on assets. An average return on assets show that coffee processing companies make net income (profit) of 7% of total assets. Positive growth and return on assets represent the crucial prerequisites for future development of coffee processing industry in Serbia.

The results of panel data analysis show that size, revenue cycle, current ratio and return on assets have significant impact on growth. Size has negative significant impact at 99% level of confidence. That mean that small coffee processing companies have better growth rate. At absolute value the growth of these companies is much less than the growth of large companies. Revenue cycle and current ratio have negative significant impact on growth at 95% level of confidence. Less number of days of claim collection positive influence on growth rate. Negative relationship between current ratio and growth rate can be explained that high current ratio may indicate an inefficient use of cash and other short-term assets

(see more: Herawati, Fauzia, 2018). Return on assets is positively related to growth of company at 90% level of confidence. This mean that growth rate of return on assets is related to the increase in sales of coffee processing companies.

An empirical examination provides information about performances of companies from coffee processing industry. The large companies achieve the larger amount of sale, but measured the rate of growth sale it is smaller in difference to the smaller companies. In order to increase the growth rate companies rely on the larger profitability rate, and should make a little decrease of current assets (measured in according to the current debts) and should decrease the average day of a claim collection. These results can be of interest for a different type of users of financial statements such as potential inventors, suppliers, banks, managers, owners etc. in order to make a reliable and adequate business decisions. Also, these results point to the significant factors that have influence on growth of coffee processing companies which can be used as a part of creating a business policy of future growth and development of coffee processing industry.

Conflict of interests

The authors declare no conflict of interest.

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PRICE RISK MANAGEMENT IN THE WHEAT MARKET USING OPTION STRATEGIES

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ABSTRACT

Recently, the agricultural business is displayed a greater amount of risk because of price volatility growth. Consequently, it is necessary to have knowledge of how to regulate the risk of price fluctuations. This paper is concerned with the hedging techniques in the commodity market by the help of vanilla options. The main idea is to analyze option strategies with the ambition to demonstrate their utilization by hedging against increasing prices. Hedged buying price formulas are derived for every spot futures price. An additional contribution is considered for applying in the wheat trading. Chicago Mercantile Exchange products, i.e. wheat options on futures are investigated. The profitability of hedged scenarios is examined. A comparative analysis of the designed hedging variants is presented. Suggestions for potential wheat buyers are proposed.

Introduction

Over last decades, individuals and firms are connected with the price movements of agricultural products (wheat, corn, soybean etc.). Price risk management is beginning to be investigated for protective objectives. In line with the Covid-19 pandemic, prices in commodity market are very volatile and prices of most agricultural commodities are trended higher. The commodity market participants are pointed at the commodity price risk management, i.e., hedging. Hedging techniques used to manage commodity price risk are concerned with the potential scenarios for the futures commodity price development. Assume that the commodity buyer anticipates spot commodity price increase in the future. He selects the hedging against a future price fluctuation with aim to ensure acceptable buying price of a commodity. The main idea of hedging is to create hedged position using derivatives, especially options. Taleb (1997) characterizes derivatives as tools whose value depends on the value of some underlying asset. According to Hull (2011) an option indicates a right to buy (call option) or a right

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to sell (put option) an underlying asset at a strike price in a maturity for an option premium, i.e., price of an option. American-style options on agricultural commodity futures contract are available on the agricultural market. The buyer of call or put option can select various strike prices and maturities. Papers Cohen (2005); Hull (2019 and 2011); Kolb and Overdahl (2010) presents option strategies.

Nowadays, many scientific papers focus on price hedging. For example, agricultural producers can manage commodity risk following an unpredictable price development (see, e.g., Taušer, Čajka, 2014; Timková, 2018). Kuzman et al. (2018) studied derivatives and their trading in the context of agricultural sector. Also, Garcia, Leuthold (2004) dealt with agricultural commodity futures and options. Harčariková, Šoltés (2016); Harčariková, Šoltés (2017) investigated the hedging techniques in energy sector using option strategies created by vanilla and exotic options. For example, studies Šoltés, Harčariková (2015); Šoltés, Harčariková (2016); Timková, Šoltés (2019) analyzed new hedging option strategies. Djordjevic (2018) showed how weather derivatives are used to hedge in Winter Ski Tourism. On the other hand, Harčariková (2015) used derivatives in the design of new outperformance certificates in agricultural market. Investment certificates represent an innovative financial product suitable for every type of investor. Harčariková, Bánociová (2015); Šoltés, Harčariková (2015); Šoltés, Harčariková (2017); Šoltés et al. (2019), Timková (2016) analyzed using of options to the investment certificates formation.

Based on financial engineering principles, we analyze the option strategies and propose hedging possibilities. The purpose is to integrate options into the effective risk management strategies by agricultural buyers. Buyer are potential hedgers against a price growth. Following the review of existing theoretical framework mentioned above, this paper is focused on the application to real-traded Chicago Mercantile Exchange (CME) products, i.e., wheat plain vanilla options on futures.

The primary aim is to analyze option hedging strategies against increasing markets, i.e., Long Call, Short Combo and Vertical Ratio Call Back Spread strategy and perform their comparative analysis. The payoff profiles of individual vanilla option are used in the option strategy formation. Hedging variants available for managing a price growth hedge a maximum buying price, i.e., buying price ceiling. The profitability of the proposed hedging variants for all possible intervals of spot prices ate the maturity date is performed. The comparative analysis is presented as well. The suggestion for the potential buyers is indicated.

Materials and methods

Options as a type of derivative are new tools for potential investors and hedgers. These instruments can protect against price movements and are often used in the price risk hedging. Commodity options are options on futures contracts.

A futures contract is an agreement to buy or sell some underlying asset (e.g., commodity) during the maturity. All conditions of the commitment are standardized excepting the price.

The nature of the hedging with options on futures is in taking an opposite position in the spot market and futures market. The movement between the spot price and future price is not necessary equivalent and it is known as a basis. The basis at the specific date represents the distinction of spot and futures price. Positive basis change is illustrated in *Table 1*. Wheat spot price is at $6.20 per bushel and wheat futures price is at $6.50 per bushel in October 2020. The basis is $0.30 ($6.20 - $6.50). The buyer of wheat expects the price growth in the future. Therefore, he decides to buy September 2021 wheat futures contract at $6.50 per bushel in October 2020. Assume spot market price increase by $0.50 per bushel and futures price increase by $0.45 per bushel in August 2021. The basis is $0.25 under ($6.70 - $6.95). The buyer sells September wheat futures contract at $6.95 per bushel. Because the change on futures market position ($0.45 per bushel) is lower than the change on the spot market position ($0.45 per bushel), the buying price is $6.15 per bushel.

Table 1. Basis change

	Wheat spot market position	Wheat spot price	Wheat futures market position	Wheat futures price	Basis
October 2020	–	$6.20	buy September wheat futures contract	$6.50	$-0.30
August 2021	buy wheat	$6.70	sell September wheat futures contract	$6.95	$-0.25
Change	–	$-0.50	–	$+0.45	$+0.05
Buying price	–	–	–	–	$6.15

Source: Authors' calculations

Assume the agricultural buyer expects the wheat price increase in the future and decides to hedge using option strategies. Option strategies using in the risk management of the price growth are shown in *Table 2*. These strategies secure the maximum buying price for all possible futures price scenarios.

Table 2. Option strategies against a price increase

	Volatility	Risk
Long Call	bullish	low
Short Combo	bullish	high
Vertical Ratio Call Back Spread	bullish	low

Source: Authors' summary

Strategies noted above provide different risk management benefits for commodity buyers. The selection of the most effective price risk management is a process based on price expectation and investor's attitude to profit/risk. In this point of view, each strategy is characterized by some strengths and weaknesses, which the traders must identify if they decide to get into the hedging strategy. The part of results introduces option strategies used in the risk management as a hedging tool.

The approach is established on the payoff profile of option strategies Long Call, Shor Combo and Vertical Ratio Call Back Spread Strategy. Option strategies are formed by wheat options on futures contract. Futures contracts are more liquid and easier to trade than the underlying asset (wheat). We analyze and compare mentioned option strategies as a potential instrument to hedge a price growth in the wheat market.

The proposed hedging possibilities are applied to the wheat futures American-style options contract referred to September 2021. *Table 3* illustrates the call and put option premiums from October (14th October 2020 is the settlement date). All data are Obtained from the CME Group and one wheat option contract size is standardized as 5 000 bushels.

Table 3. Call and put option premiums of wheat options on futures

Call option premium $/per bushel	Strike price $/per bushel	Put option premium $/per bushel
0.762	5.70	0.234
0.700	5.80	0.273
0.643	5.90	0.315
0.590	6.00	0.365
0.541	6.10	0.413
0.495	6.20	0.467
0.454	6.30	0.526
0.416	6.40	0.590
0.382	6.50	0.654
0.350	6.60	0.722

Source: CME Group

The dataset consists of 10 real-traded vanilla call and put options. The strike prices of call and put options are in the range of 5.7 - 6.6. The currency is in $/per bushel. The prices per bushel are considered. Calculations do not consider transaction and any others charges. Basis $0.

Results

The main goal was to investigate the option hedging strategies against a price increase in the case of wheat market. We provided the analyses of hedging strategies and their comparison. The wheat buyer made the profit from the futures market position in order to cover the loss from the spot market position.

The first strategy which can be used in the price risk management is Long Call strategy (referred as LC). Long Call is elementary bullish strategy. By Long Call the option buyer has the right to buy a wheat futures contract at a strike price X at any time T during a maturity period. The buyer pays an option premium c_L to the option seller for the right of choice.

Option position is hedging instrument without physical delivery of the wheat in the futures market. The hedged price is the sum of the unhedged spot futures price at the time T and the payoff given by the option strategy hedged position. *Table 4* shows the unhedged and hedged buying price by Long Call strategy.

Table 4. Hedged buying price by Long Call strategy

Commodity price range	Unhedged price	Payoff from strategy	Hedged price
$S_T<X$	$-S_T$	$-c_L$	$-S_T -c_L$
$S_T \geq X$	$-S_T$	$S_T-X- c_L$	$-X-c_L$

Source: Authors' summary

Two scenarios can occur at the specific date in the future. If the spot price at the future date S_T is lower than the strike price, than the buyer will hedge the price $-S_T-p_L$. Otherwise, the call option will not be exercise and the buyer will hedge the price $-X-c_L$. The profit of hedging by Long Call strategy will gain if the price increases above $-X-c_L$. The premium in the amount c_L represents the maximum loss of hedging by Long Call strategy.

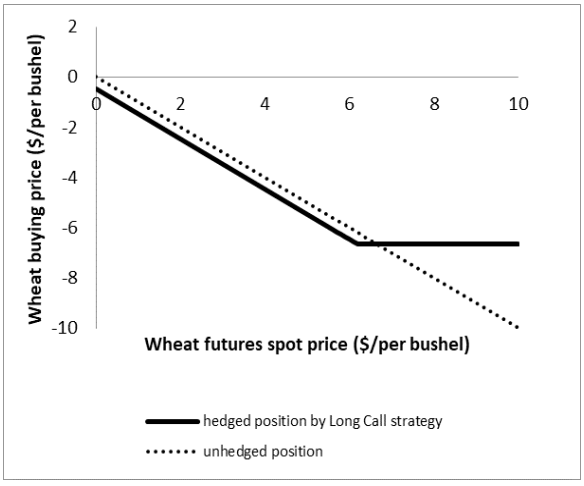
It was expected buying of September Wheat call option contract at the strike price \$6.2 per bushel for the option premium \$0.467 per bushel. *Table 5* illustrates hedged price and profit/loss from hedging as the difference between the final hedged wheat price and unhedged price at the future date T. If the difference is positive (more than 0), the hedged position is better than the unsecured position. Otherwise, if the difference is negative (less than 0), than the unsecured position is better. The comparison of the proposed hedging variants with the unhedged position based on the results noted into *Table 5* is graphically illustrated in *Figure 1*.

Table 5. Hedged wheat buying price by Long Call strategy

Commodity price range	Hedged price	Profit of hedging		Loss of hedging	
		Min	Max	Min	Max
$S_T<6.2$	$-S_T-0.467$	–	–	0.467	0.467
$6.2 \leq S_T \geq 6.667$	6.667	–	–	0	0.467
$6.667 \leq S_T$	6.667	0	∞	–	–

Source: Authors' calculations

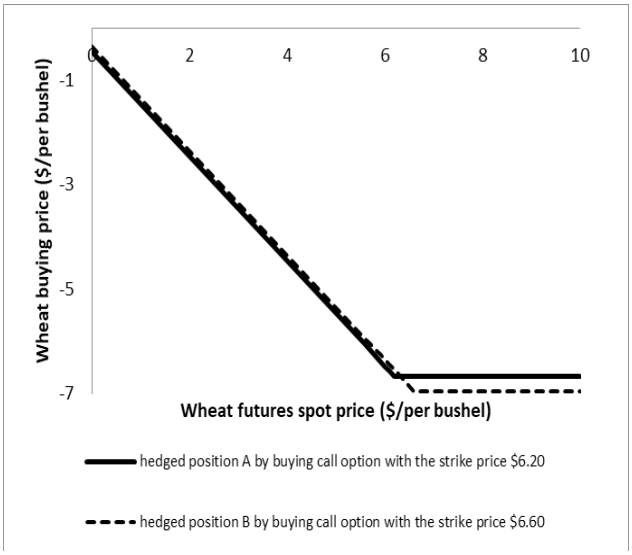
Figure 1. Hedged and unhedged wheat buying price by Long Call strategy



Source: Authors' calculations

If it was expected that the producer buyed a September wheat call option contract at the strike price $6.60 per bushel for the option premium $0.350 per bushel. The higher ceiling price level $6.667 per bushel would be established by the commodity buyer. Using options with various strike prices we could obtain different buying prices (see *Figure 2*). The price sensitivity of the specific strategy could be calculated. The higher strike price was, the lower call option premium was. If the strike price was lower, higher costs were needed for buying of options and therefore the lower buying price ceiling was ensured. Using Long Call strategy, the producer limited the maximum buying price without giving up the possibility to participate in the price drop.

Figure 2. Comparison of hedged positions by Long Call strategy with various strike prices



Source: Authors' calculations

Short Combo (referred as SC) is a bullish strategy that can be formed zero-cost. This strategy consists of selling a put option with a lower strike price X_1 and option premium p_{S1} and buying a call option on the same wheat futures contract with a higher strike price X_2 and option premium c_{L2} (see *Table 6*).

Table 6. Hedged wheat buying price by Short Combo strategy

Commodity price range	Unhedged price	Payoff from strategy	Hedged price
$S_T<X_1$	$-S_T$	$S_T-X_1+p_{S1}-c_{L2}$	$-X_1+p_{S1}-c_{L2}$
$X_1<S_T\leq X_2$	$-S_T$	$p_{S1}-c_{L2}$	$-S_T+p_{S1}-c_{L2}$
$S_T\geq X_2$	$-S_T$	$S_T-X_2+p_{S1}-c_{L2}$	$-X_2+p_{S1}-c_{L2}$

Source: Authors' summary

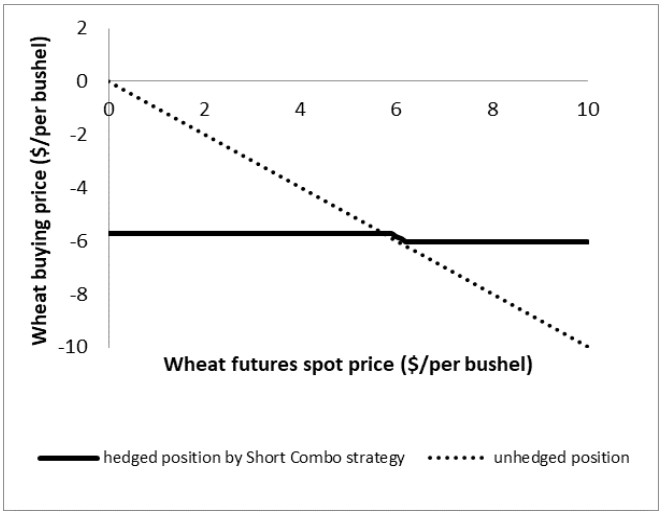
It was expected to buy a September Wheat put option contract at the strike price $5.90 per bushel for the option premium $0.643 per bushel and at the same time to buy a September Wheat call option contract at the strike price $6.20 per bushel for the option premium $0.467 per bushel (see *Table 7* and *Figure 3*).

Table 7. Hedged wheat buying price by Short Combo strategy

Commodity price range	Hedged price	Profit of hedging		Loss of hedging	
		Min	Max	Min	Max
S_T<5.724	-5.724	–	–	0	5.724
5.724≤S_T<5.9	-5.724	0	0.176	–	–
5.9≤S_T<6.2	-S_T +0.176	0.176	0.176	–	–
6.2≤S_T	-6.024	0	∞	–	–

Source: Authors' summary

Figure 3. Hedged and unhedged wheat buying price by Short Combo strategy

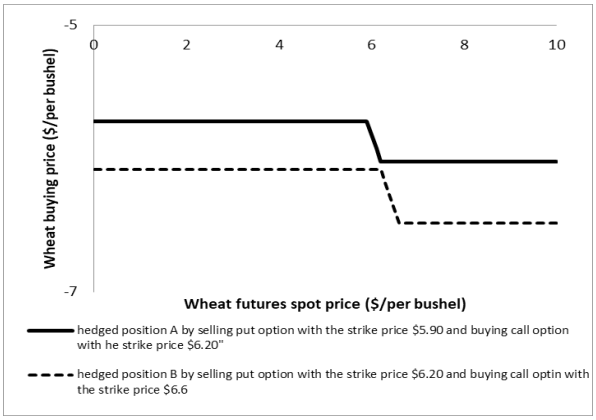


Source: Authors' calculations

In previous table and figure are shown the data for Short Combo strategy. By Short Combo, the agricultural hedger secured a lower price level ceiling because of the premium received for selling the put. But Short Put position limited the opportunity to participate in the price drop by establishing a price level floor. This buying price range was determined by the strike prices. Therefore, the choice of appropriate strike prices is very important in hedging process. The greater the difference between the put and call strike prices, the wider the buying price range.

Next variant of Short Combo was created with the strike prices \$6.2 per bushel and \$6.6 per bushel. Also, the combination of these strike prices was selected without any initial cost (initial profit is \$0.117 per bushel), which causes the higher maximum buying price at \$6.483 per bushel. Comparison of these two hedging variants is illustrated in *Figure 4*. In the case of decreasing wheat price, the strategy B hedged the higher price floor, i.e., it was better than the strategy A.

Figure 4. Comparison of hedged positions by Short Combo strategy A and B



Source: Authors' calculations

Vertical Ratio Call Back Spread strategy (referred as VRCBS) is spread option strategy created by selling a lower number of call options n_1 with a lower strike price X_1, maturity date TR and option premium c_{S1} and at the same time by buying a higher number of call option n_2 on the same wheat futures contract with a strike price X_2, maturity date T and option premium c_{L2} (see *Table 8*). If the following condition is satisfied $n_1c_{S1} - n_2c_{L2} > 0$, then no additional costs are needed for the formation of Vertical Ratio Call Back Spread strategy, i.e., it is a zero-cost strategy.

Table 8. Hedged wheat buying price by Vertical Ratio Call Back Spread strategy

Commodity price range	Unhedged price	Payoff from strategy	Hedged price
$S_T<X_1$	$-S_T$	$n_1*c_{S1}-n_2*c_{L2}$	$-n*S_T+n_1*c_{S1}-n_2*c_{L2}$
$X_1<S_T\leq X_2$	$-S_T$	$-n_1*S_T+n_1*X_1+n_1*c_{S1}-n_2*c_{L2}$	$-n*S_T+n_1*S_T+n_1*X_1+n_1*c_{S1}-n_2*c_{L2}$
$S_T\geq X_2$	$-S_T$	$(n_2-n_1)*S_T+n_1*X_1-n_2*X_2+n_1*c_{S1}-n_2*c_{L2}$	$n_1*X_1-n_2*X_2+n_1*c_{S1}-n_2*c_{L2}$

Source: Authors' summary

It was expected the producer sell 1 May Wheat call option at the strike price $5.90 per bushel for the option premium $0.643 per bushel and at the same time buy 2 May Wheat call options at the strike price $6.20 per bushel for the option premium $0.495 per bushel. Based on the data, the following parameters in *Table 9* were calculated.

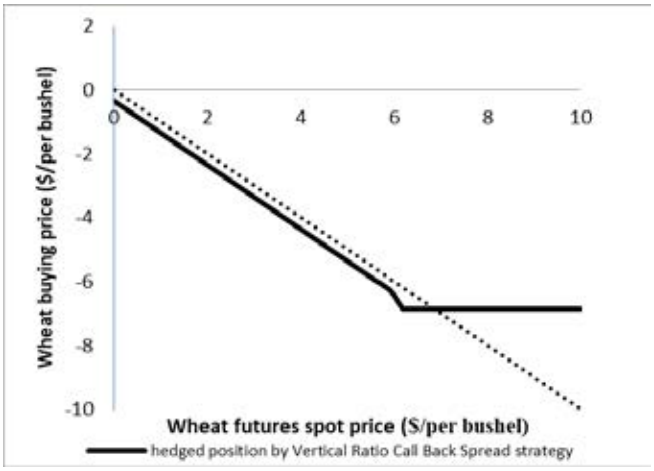
Table 9. Hedged wheat buying price by Vertical Ratio Call Back Spread strategy

Commodity price range	Hedged price	Profit of hedging		Loss of hedging	
		Min	Max	Min	Max
$S_T<5.9$	$-S_T-0.347$	–	–	0.347	0.347
$5.9\leq S_T<6.2$	$-2S_T+5.553$	–	–	0.347	0.647
$6.2\leq S_T<6.847$	-6.847	–	–	0	0.647
$6.847\leq S_T$	-6.847	0	∞	–	–

Source: Authors' calculation

In *Figure 5* are shown the unhedged position and hedged wheat buying price level by Vertical Ratio Call Back Spread strategy. It is illustrative that hedged position ensured the same buying price ceiling.

Figure 5. Hedged and unhedged wheat buying price by Vertical Ratio Call Back Spread strategy



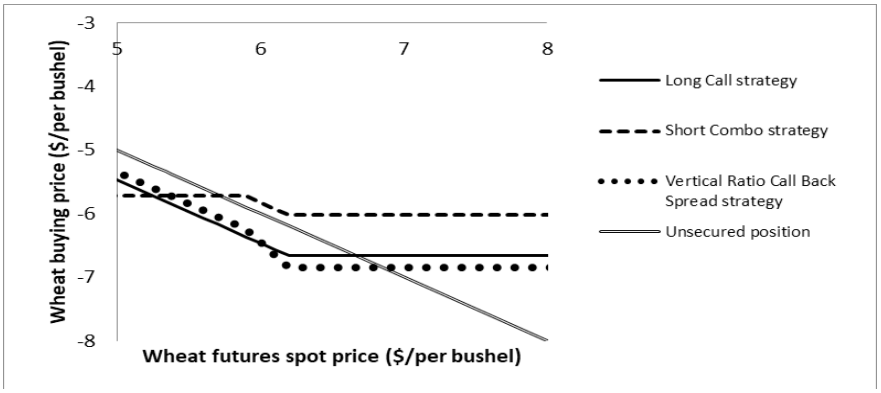
Source: Authors' calculations

Discussions

There do not exist the effective hedging strategy for all market participants and their individual expectations about price moves. Every hedger in the market should understand how to evaluate and compare option hedging strategies with the respect to their advantages and disadvantages.

Figure 6 compares alternatives A and presents the wheat buying prices for potential wheat spot prices in the future.

Figure 6. Comparison of A hedged alternatives



Source: Authors' calculations

The comparison of wheat hedging alternatives A is presented in *Table 10*. In summary, the conclusions are:

- Hedging variant formed by Short Combo strategy secures the lowest wheat buying price if the wheat futures spot price is higher than $5.377 per bushel but this strategy limits to profit in the wheat price decrease.
- Hedging variant formed by Vertical Ratio Call Back Spread strategy establishes the lowest wheat selling price if the wheat future spot price is lower than $5.377 per bushel but the highest wheat buying price if the wheat futures price is higher than $6.138 per bushel.
- Long Call strategy hedged the wheat buying price in the middle.
- The unsecured position offers better wheat buying price as others variants if the wheat futures price is lower than $5.724 per bushel but does not secure the buying price level ceiling.

In summary, Short Combo strategy hedges the lowest buying price compared to others strategies. On the other hand, this strategy does not allow to participate in the price drop. The benefit is also the possibility of formation without any initial costs. Vertical Ratio Call Back Spread strategy establishes the buyer the highest wheat buying price in the case of price increase. If the wheat spot price decreases in the future than the Vertical Ratio Call Back Spread strategy participates proportionally with the unhedged variant. The loss is limited in the amount of negative difference from option premiums.

Table 10. Comparison of wheat buying prices of A hedged alternatives

Wheat future spot range	LC		SC		VRCBS		UP	
	Min	Max	Min	Max	Min	Max	Min	Max
$0 \leq S_T < 5.257$	0.467	5.724	5.724	5.724	**0.347**	**5.604**	0	5.257
$5.257 \leq S_T < 5.339$	5.724	5.806	5.724	5.724	**5.604**	**5.686**	2.257	5.339
$5.339 \leq S_T < 5.377$	5.806	5.844	5.724	5.724	**5.686**	**5.724**	5.339	5.377
$5.377 \leq S_T < 5.724$	5.844	6.191	5.724	5.724	**5.724**	**6.071**	5.377	5.724
$5.724 \leq S_T < 5.9$	6.191	6.367	**5.724**	**5.724**	6.071	6.247	5.724	5.9
$5.9 \leq S_T < 6.0$	6.367	6.467	**5.724**	**5.824**	6.247	6.447	5.9	6.0
$6.0 \leq S_T < 6.02$	6.467	6.487	**5.824**	**5.844**	6.447	6.487	6.0	6.02
$6.02 \leq S_T < 6.138$	6.487	6.605	**5.844**	**5.926**	6.487	6.723	6.02	6.138
$6.138 \leq S_T < 6.2$	6.605	6.667	**5.926**	**6.024**	6.723	6.847	6.138	6.2
$6.2 \leq S_T < \infty$	6.667	6.667	**6.024**	**6.024**	6.847	6.847	6.2	∞

Source: Authors' calculation

Based on our methodology, the final *Table 11* summarizes fundamental attributes of analyzed option hedging strategies. Potential hedgers should have knowledge about them considering their future expectations.

Table 11. Attributes of option hedging strategies

Option hedging strategy	Minimum price	Maximum price	Profit of hedging	Loss of hedging	Zero-cost
Long Call	unlimited	limited	unlimited	limited	no
Short Combo	limited	limited	unlimited	unlimited	yes
Vertical Ratio Call Back Spread	unlimited	limited	unlimited	limited	yes

Source: Authors' summary

All presented strategies provide the ceiling price level and can help to protect buyers from unreasonable losses. From the analyzed hedging strategies only the Short Combo strategy does not alove to participate in the price decrease. Short Combo strategy and Vertical Ratio Call Back Spread strategy can be formed as the strategies zero-cost. The conclusion is that using short options in combination with long options can protect against anticipated price movement without initial financial resources. Long Call strategy and Vertical Ratio Call Back Spread strategy hedge a price growth and speculate on a price decrease. It is valid that hedging does not guarantee that the profit or loss in the futures market will fully offset the loss or profit in the spot market. The choice of the strike prices is significant step of the hedging process. In addition, there exist other option strategies that can be used by hedgers in the price risk management against the price increase.

Conclusions

Every wheat buyer tries to make purchase at the lowest price. The issue is that futures prices cannot be predicted. Option strategies is often considered as an appropriate hedging strategy. Actually, there are not many agricultural buyers who use options in their business. For those who understand the mechanism of the options they can provide a flexible and effective instrument of price risk management. Options offer many possibilities of hedging the price risk.

The paper presented wheat risk management using option strategies. The aim was to analyze and compare option hedging strategies Long Call, Short Combo and Vertical Ratio Call Back Spread strategy. These strategies were applied in hedging of wheat, where was demonstrated the usage of hedging against increasing price in selected model variants. Fundamental characteristic of these strategies has been provided. Every strategy was described and profit/loss payoffs was designed. Our results showed that all presented strategies hedge the wheat buying maximum price level. The Long Call strategy establishes a maximum buying price for an option premium and simultaneously allow to participate in the price decrease. The zero-cost Short Combo strategy hedges the lowest ceiling price level but the possibility to participate in the price drop by establishing a floor price level. The ceiling-floor price spread is determined by the strike prices selection. The greater the difference between strike prices, the wider the ceiling-floor price spread. The Vertical Ratio Call Back Spread strategy eliminates price risk if the markets move upside with the possibility to participate in the price decrease. The buying price spread by the Vertical Ratio Call Back Spread strategy is not only defined by the strike prices but also by the numbers of options.

Presented option strategies illustrate the possibilities of agricultural commodity hedging. The performed analysis and comparison have shown more remarkable findings which can be used in practical investment. Successful risk management with options is based on the ability of buyer to match an appropriate strategy to a particular price expectation in accordance with hedging objectives. This paper extends the previous research focused on hedging framework and it may be widened in further analysis.

Conflict of interests

The authors declare no conflict of interest.

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AGRICULTURE IN THE FUNCTION OF RURAL DEVELOPMENT – CASE STUDY FROM REPUBLIC OF SERBIA AND REPUBLIC OF SRPSKA

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ABSTRACT

Rural areas in Republic of Serbia and Republic of Srpska, but also in the surrounding countries, are rich in natural resources suitable for agricultural and rural development. The authors of the paper performed a comparative analysis of agricultural development and the possibility of influencing rural development in Serbia and Republic of Srpska. In addition to the available secondary documentation, they used data from FAOSTAT (Food and Agriculture Organization of the United Nations). The authors conducted a survey in the rural areas of the two countries during 2019, on a total sample of 215 respondents, farm owners. The obtained data were analyzed in the SPSS software, version 23.00. The descriptive statistical analysis gave an insight into the shortcomings of agricultural development, while the paired samples t-test confirmed the hypothesis of the existence of a statistically significant difference in certain categories.

Introduction

The modern definition of the term rural development implies integral and multisectoral and sustainable development. The integral development of rural areas is important due to the diversification of the rural economy, which in the time of modern structural processes and events faces numerous problems such as depopulation, population aging,

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landscape fossilization, and generally deteriorating socio-economic indicators that make this area passive and undesirable (Stewart et al., 2006; Boyd, 2008; Andrei et al., 2017). Traditionally, rural areas are associated with the use of natural resources and the economic branches of agriculture and forestry. However, in the development of rural areas in modern times, the importance of education, economic development and infrastructure development has been recognized. There are 6,158 settlements on the territory of Republic of Serbia, of which 193 belong to urban (3.1%), and 5,965 are other settlements, which are automatically considered rural (Cvijanović et al., 2020a; 2020b). In the period 2002-2011. year, the total number of inhabitants decreased by 4.15%, which is primarily a consequence of the negative natural increase and going abroad (Cvijanović et al., 2012; Gajić et al., 2020). In this period, the rural population decreased by 311,139 inhabitants (10.9%), ie it dropped to a level below three million, and today it makes up 40.6% of the total population of Republic of Serbia. In Serbia today, agriculture provides about 12% of the gross value added of the economy, and the agricultural population, according to the 2002 census, makes up about 11% of the total population (Njegovan et al., 2009).

Agricultural land in Republic of Srpska covers about 5.3 million hectares. The area of used agricultural land is about 3.4 million hectares, with arable land and gardens dominating with 76%, permanent grasslands occupying 18%, and permanent plantations about 6% (Cvijanović et al., 2012; 2020a). Agricultural production, as a basic feature of rural development, in relation to its contribution to GDP, is a very important branch of production for the Republic of Srpska. Of all the manufacturing sectors, agriculture has the largest share in the structure of GDP (larger than the manufacturing industry). However, the gross value added of agriculture is declining both in absolute and relative terms, mainly due to the faster development of other sectors of the economy. Agriculture sector in the period 2007-2013 participated in the total GDP of Republic of Srpska with 9-11%. In the period 2007-2013 year, a total of about 550 million KM (KM1 = €0.5118) was allocated from the agrarian budget, ie about 78 million KM, on an annual level. In the Republic of Srpska, 45.48% of the total arable land is not cultivated. According to the results of the 2013 census, there are 131,586 agricultural farms in Republic of Srpska (Gajic et al., 2018). In the register of agricultural holdings of the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska, there were 65,458 registered holdings (about 50% of the total number of agricultural holdings), among which the vast majority of farms produced exclusively for their own needs (Parausić et al. 2007; Bogdanov, 2007; Bakić, 2020).

At the beginning of the observed period, rural development policy was more significantly represented in the total budget expenditures for agricultural support (Anriquez et al., 2007; Jasur et al., 2016). The largest share in the support of rural development has funds intended for incentives for capital investments on agricultural holdings. Investments on the agricultural farm were encouraged by non-refundable funds for the renovation and construction of facilities, procurement of equipment and machinery, renovation and expansion of perennial plantations. The European policy for the development of

rural areas is based on the principle of decentralization of responsibilities, whereby it is necessary to strengthen partnerships and the inflow of investments into the poor parts of the member states (De Haan et al, 2005; Varin et al., 2016; Done et al, 2012). The prime reason that underlay the establishing and strengthening of the European Union (EU) was to provide the requisite framework for the permanent improvement of the living standard of its citizens (Chivu et al,2015; Nica et al., 2018). The European Commission has prescribed 22 measures that must be fulfilled and which are obligatory for all member states. Current rural development policy for the period 2014-2020 it has retained many previous policy measures with an emphasis on long-term strategic goals, while fostering competitiveness in agriculture, emphasizing the fight against climate change with nature protection, and improving rural areas through strategies to increase employment (Arce, 2003; Cvijanović et al., 2020b). Activities related to increasing the volume of agricultural production of a country are usually expressed through rural development programs and projects. However, although agriculture is rightly the most important goal in rural development, rural development should also include non-agricultural aspects of rural life (Jasur et al., 2015; Varun et al., 2016). The concept of rural development must be considered with special reference to agriculture, because agriculture is the basis for the life of most families in rural areas. In the last two decades, there has been an increasing emphasis on rural development programs and projects and the recognition that the development of rural areas is just as important as the construction of urban, industrial complexes. Development must have two pillars: urban industrialization and the improvement of rural areas (Arce, 2003; Smith, 2006; Shiru, 2008).

Labor has wider social, economic and economic significance. There is still an insufficient amount of research on this issue. The research came to certain conclusions related to the current state of agricultural and rural development of the given countries and countries in the region. The research included 215 respondents from farm owners, and based on their answers, key problems that slow down agricultural and rural development can be identified, and based on that, key strategic measures for improving production and the entire economy can be adopted. The authors of the paper in the software SPSS 23.00, showed a descriptive statistical analysis of the situation, ie the attitude of respondents on the main shortcomings of agricultural and rural development. While using the paired sample t-test, it was found that there is a statistically significant difference between certain categories between the two observed states.

Literature review

Diversification of the rural economy is crucial because it is a prerequisite for demographic stabilization, which is the basis for the sustainability of all components of development. Rural development is the process of improving the quality of life and economic well-being of people living in rural areas (Pradhan, 2015; Gajić et al., 2017). Rural development activities aim at the socio-economic development of rural areas, with the direct participation of the rural population in order to meet the needs specific to the area and to provide a socio-economic and cultural framework. Unlike urban areas, rural

areas are extremely different from each other in terms of natural and cultural heritage, so it is necessary to develop local, regional and national rural development programs that are tailored to the area (Atanassoaie, 2011; Varin et al., 2016; Gajić et al., 2020). When thinking about rural development, one must take into account the whole range of problems that the farmer faces on a daily basis. Some of these problems will be physical or tangible and relatively easy to recognize. Many of these problems stem from the place of farmers in the social and political structure in rural areas. Farmers and their families are involved in a complex network of relationships with other farmers in the area and often these relationships bring problems (Wetterstrand, 2019). Farmers may also have little access to the resources necessary for development. Finally, they may have had very little contact with rural development programs or other state and local co-financing of this branch of the economy and may not have known how to take advantage of such activities (Broad, 2006; Ogifeda, 2010). There are very strong reasons why resources should now be invested in rural development. More than half of the world's people and the vast majority of people in developing countries (Asia, Africa and Latin America) live in rural areas and earn part or all of their income from some form of agriculture (Pillay et al., 2013). Most of these people are still very poor and dependent on agricultural practices that have made little use of modern technology. They live in isolated and often inhospitable places, with little access to the resources they need to improve agriculture. Only in terms of the number of people, there is a very strong argument for giving high priority to rural development (Hecht et al., 2019; Scott, 2020).

The specifics of agricultural production are: that it significantly depends on natural soil conditions, relief, soil configuration, climate, new technologies, etc., which leads to greater or lesser fluctuations in annual production, greater business risk and income instability of agricultural producers; agriculture participates in the formation of national income and is the main source of accumulation for the development of industry (Pender, 2004). With the beginning of industrialization, agriculture was neglected, that its share decreases along with the development of non-agricultural activities, especially industry. The importance of agriculture is a strategic determinant of the EU economy (Baguedano et al., 2011). Food and beverage production in the EU generates 14.9% of the total revenue of the processing industry, and employs 4.5 million employees (Cvijanović et al., 2020a). Agriculture as an activity is an extremely important economic and social dimension of the economy of the surrounding countries (Gajić et al., 2017). In Croatia and Serbia, agricultural production, the state of rural development and demographic trends record the same heritage, similar negative macroeconomic development trends, and negative demographic trends in rural areas *(Folke, 2002).*

Table 1. Basic production indicators (analysis of areas under crops in thousands of hectares).

	Bosnia and Hercegovina			Serbia			Croatia			Slovenia		
	2005.	**2012.**	**2019.**	**2005.**	**2012.**	**2019.**	**2005.**	**2012.**	**2019.**	**2005.**	**2012.**	**2019.**
Apple	14.309	15.027	30.934	24.000	24.400	26.089	5.625	5.980	4.950	3.099	2.702	.2270
Barley	19.644	20.453	20.908	93.520	80.803	100.118	50.341	56.905	53.660	1.5451	17.967	21.140
Beans	9.499	8.955	6.991	22.678	12.906	9.091	6.477	788	-	451	289	-
Grapes	5.200	5.600	4.353	62.151	36.020	20.501	29.670	29.237	19.820	16.428	16.351	15.570
Maize	196.372	196.504	191.540	1.169. 976	976.020	962.083	318.973	299.161	255.890	42.369	39.166	38.880
Oats	16.830	10.280	10.208	42.530	34.554	22.669	21.185	28.514	18.500	2.731	1.369	1.210
Potatoes	41.352	36.787	34.239	84.434	52.035	34.110	18.903	10.232	9.390	6.306	3.386	2..800
Rye	3.265	3.456	.3561	6.855	4.375	5.046	1.848	846	1.580	1.320	902	1.180
Soya	5.510	5.325	9.026	156.680	162.714	229.372	48.211	54.109	78.330	172	140	1.430
Tomatoes	4.048	3.714	3.464	2.0947	9.158	7.888	659	448	320	164	221	220
Wheat	81.239	60.713	68.965	53.9813	603.275	2.399.225	146.253	186.949	143.150	30.059	34.586	26.730

Source: FAOSTAT (Food and Agriculture Organization of the United Nations), 2018.

Table 2. Basic production indicators (crops in tons)

	Bosnia and Hercegovina			Serbia			Croatia			Slovenia		
	2005.	**2012.**	**2019.**	**2005.**	**2012.**	**2019.**	**2005.**	**2012.**	**2019.**	**2005.**	**2012.**	**2019.**
Apple	52.181	50.023	98.265	240.320	243.987	499.578	57.298	3.7414	68.350	106190	55360	54270
Barley	51.879	65.337	7.4462	275.640	278.367	373.340	162.530	235.778	278.660	61.239	84727	102480
Beans	13.461	9.395	11.114	44.338	10.428	.9027	6.041	472	-	959	380	-
Grapes	23.273	2.5931	32.289	359.454	263.419	163.516	181.021	187.550	108.300	120868	92324	105200
Maize	1.004.099	539.432	1.235.596	6016765	3532602	7344542	2206729	1297590	2298320	351168	277358	360360
Oats	37.946	26.816	27.231	84.439	77.262	56.242	49.470	94.542	58.250	7.629	4.351	4.030
Potatoes	458.615	299.935	381.308	930.305	577.966	702.086	273.409	151.278	173.150	144714	79.253	65.960
Rye	7.516	10.748	10.449	15.417	10.640	12.963	4.737	2.426	6.990	4.092	3.422	4.480
Soya	12.482	6.708	23.753	429.639	280.638	700.502	119.602	96.718	244.280	333	343	4.240
Tomatoes	30.738	44.029	43.700	189.222	155.663	111.639	18.731	22.020	146.253	6.629	7.313	9.010
Wheat	248.332	225.137	264.769	1875335	2399225	2534643	601.748	999.681	803.270	141293	188065	139810

Source: FAOSTAT (Food and Agriculture Organization of the United Nations), 2018.

According to the statistical data of FAOSTAT (Food and Agriculture Organization of the United Nations, 2018), there are a total of 2,210 thousand hectares of agricultural land in Bosnia and Herzegovina.About 1,484 thousand hectares in Croatia, 3,464 thousand hectares in Serbia, and 612 thousand hectares of agricultural land in Slovenia. Agriculture, measured by its contribution to the creation of gross domestic product (GDP), is very important for Serbia and Republika Srpska. In the European Union, the common market includes both agricultural production and trade in agricultural products (Cvijanović et al., 2012). Agricultural trade represents in the functional and highly competitive contemporary economies a viable tool in the process of valuing the national agricultural potential (Andrei et al, 2020). The objectives of the EU's common agricultural policy are: to increase agricultural productivity by advancing technical development; rationalization of agricultural production and optimal use of factors of production, especially labor; ensuring in this way an adequate standard of living for the

agricultural population, in particular by increasing the wages of agricultural employees; market stabilization, guaranteeing supply, ensuring supply of consumers at reasonable prices (Lemos, 2007; Winder, 2019). The importance and role of agriculture came to the fore especially during the sanctions of the 1990s, when agriculture proved to be the most vital economic sector. Today's state of agriculture in the Republic of Serbia, its potentials and limitations, still show the same trend - to invest less in agriculture than it needs and, accordingly, to get less from it than possible (Gajić et al., 2017; Domanović et al., 2018). While in the last decade of the last century and the first half of the first decade of the XXI century, a constant foreign trade deficit was recorded (except for the symbolic surplus in 2000), and in recent years a significant surplus has been recorded (Bogdanov, 2007; Triveli et al., 2019). But despite that, production and processing, viewed as a whole, are still at a very low level of profitability and the necessary standards in the field of food safety, for its products to be sufficiently competitive and sought after in demanding markets, primarily the European Union market (Robert, 2001). Since the mid-1990s, the predominant source of investment in agriculture has been the agrarian budget, which in the period from 2001 to 2012 recorded significant oscillations, with a tendency to decrease, in recent years (Gajić et al., 2017). Short-term and long-term measures and actions are needed in order to stop the negative trends and activate the potentials of this strategic economic branch of the Republic of Serbia (Gajić et al., 2017). Production volume: Problems inherited from the previous period, as well as new challenges, problems and omissions in the transition process, have made agriculture achieve a much slower growth of production compared to the possibilities for many years (Scoones, 2007; Quevedo-Leon et al., 2019).

Methodlogy

In accordance with the defined problem area of work, and in order to test the initial hypothesis, qualitative and quantitative research methodology was used to present the key indicators of agricultural development. The authors processed the obtained results in the software SPSS 23.00, and based on descriptive statistical analysis obtained average estimates and values of standard deviation for the examined variables. The total sample consisted of 215 respondents, of which 107 respondents from Republic of Srpska and 108 from Republic of Serbia, and all are from the category of owners of agricultural holdings or registered agricultural producers. Only those questionnaires that provided complete answers to all questions were considered. A t-test for dependent samples was used to compare the mean values of the results and determine the statistical significance of their differences. The main goal is to determine whether there is a statistically significant difference between the average values of the determined variables for both countries. The term "statistically significant differences" has a very definite and defined meaning in statistics. If we claim that a difference is statistically significant, then we have determined that this difference, regardless of size, is not accidental, but that it very likely exists. When applying statistical tests, a significance level of 0.05 is generally used, that is, the probability that the hypothesis is set is wrong is less than 5%. The purpose of the application of secondary documentation is to determine the factors that influenced the development of agriculture in the earlier

development phases, because it is important for determining their future directions of development. The initial research hypotheses were also determined:

H1: there is no statistically significant difference between certain categories of agricultural development between Republic of Serbia and Republic of Srpska.

H1a: there is a statistically significant difference between certain categories of agricultural development between Republic of Serbia and Republic of Srpska.

H2: Agricultural production is a key factor in rural development

Results and Discussions

Categorical variables (features) are shown by relative (%) frequency. The central tendency of numerical variables (features) is shown by the arithmetic mean (m), and the scattering by the standard deviation (sd). The frequency distribution of numerical features was examined by indicators of skewness and kurtosis. Since all variables are normally distributed, parametric statistics methods were used. The t - pair test was used to examine the differences, and the Pearson correlation coefficient (r) was also shown. The selected significance level is $p < 0.05$. The results are shown in a tables. Generally speaking, the instrument shows satisfactory measuring characteristics. Reliability was determined by the Crombach alpha coefficient. The internal reliability of the questionnaire used is over 0.80 (Krombach's alpha coefficient $\alpha = 0.867$, with standardization $\alpha = 0.863$).

Table 3. Descriptive item analysis for Republic of Serbia and Republic of Srpska (average grades and standard deviation)

Datas for Republic of Serbia	m	sd
1. Lack of advisory bodies	1,89	0,868
2. Salles and collection of products	1,75	0,810
3. Administrative barriers and efficiency of local public administration	1,60	0,791
4. Underdeveloped rural infrastructure	1,60	0,795
5. Creating a brand of agricultural products	1,53	0,784
6. Provision of quality standards	1,79	0,902
7. Knowledge transfer	1,51	0,790
8. Developing cooperatives and associations	1,70	0,835
9. Improving competitiveness with sustainable development investments	1,62	0,804
10. Supports for youth	1,53	0,689
Datas for Republic of Srpska m sd		
1. Lack of advisory bodies	1,55	0,645
2. Sales and collection of products	1,59	0,780
3. Administrative barriers and efficiency of local public administration	1,48	0,748
4. Underdeveloped rural infrastructure	1,33	0,681
5. Creating a brand of agricultural products	1,53	0,796
6. Provision of quality standards	1,53	0,784
7. Knowledge transfer	1,79	0,902
8. Developing cooperatives and associations	1,51	0,790
9. Improving competitiveness with sustainable development investments	1,70	0,835
10. Supports for youth	1,62	0,804

*arithmetic means, sd = standard deviation

Table 3. provides insight into the descriptive values of the issues for both countries. The lack of advisory bodies in Serbia was assessed with an average score of m = 1.89 (sd = 0.868). When observing the value of the same item for the Republic of Srpska, the average score is approximately m = 1.55. Which indicates a lower level of activity of advisory bodies in the development of agricultural production, as well as the overall rural development. Various associations and organizations of agricultural producers are a basic component of this way of organizing agricultural advice. In Great Britain, Australia and other countries around the world, where there is a way of organizing agricultural advice, research institutions and experimental stations are under the jurisdiction of the state (Hecht et a., 2019). The arithmetic value for the issue of *sales and collection of products*, but also services for Republic of Serbia is m = 1.75, while for the Republic of Srpska m = 1.599. Which indicates that the respondents in Serbia are more satisfied with the sale and collection of agricultural products and in general the foreign trade exchange of the mentioned products. That there are administrative barriers is shown by the research data in both countries: the score for this item in Serbia is m = 1.60 (sds = 0.791), while for Republic of Srpska m = 1.48 (sd = 0.748). The adoption of the new Ordinance, which refers to the sale of small quantities of agricultural products, made it possible for products to be sold to end consumers without special procedures (Cvijanović et al., 2020). These are traditional products that, while respecting the principles of food safety, can be sold on markets, retail outlets, but also on the farm itself. The Ordinance stipulates that raw milk, eggs, cheese, fish and game may be sold in this way, but only in the quantities provided for in the Ordinance. Wholesale of agricultural products could, with the help of legal regulations, be brought to a higher level, engaging local producers in both countries (Scott, 2020). Respondents claim that rural infrastructure is underdeveloped (m = 1.60, sd = 0.791). The values of the arithmetic mean for the same question in the Republic of Srpska are m = 1.33. Some authors emphasize that overcoming the relative backwardness of the agrarian areas of the Republic of Serbia can be achieved by proactively acting on internal and external challenges (Gajić et al., 2020). Namely, in order to achieve adequate valorization of territorial capital of agricultural areas, and increase their attractiveness, it is necessary to identify key development models, and designed and cost-effective development projects such as equipping villages with modern infrastructure and increasing profitability of agriculture and other rural activities.

Economic development and production dynamics depend on the introduction and dissemination of innovations and knowledge, which encourage the transformation and renewal of the local production system, and the creation of a recognizable brand (Quevedo-Leon et al., 2020). Creating a brand with agricultural products is of great importance, but in both countries it is rather poorly quoted, and in both countries the value of the average rating is m = 1.53. Modern technology and new trends require a change in the position of domestic agricultural producers in the market, which implies changes, ie the acceptance of modern concepts and content of quality in the formulation of business portfolios of these manufacturers Product quality standards

were rated slightly better in Republic of Serbia m = 1.79, while in Republic of Srpska m = 1.53). The importance of education and knowledge transfer, as well as awareness development plays a key role in the development of rural areas. The average score for this item in Serbia is m = 1.51, while in Republic of Srpska it is m = 1.79. Education and knowledge transfer to farmers is the only possible way to develop their farms and improve production, and most of the responsibility for knowledge transfer lies with advisory services whose experts have a mission to reach every farmer who needs their help. Great importance in rural development would be contributed by more significant development of cooperatives and associations, which is shown by data whose grades are close to grade 2. The association of farmers as a model of sustainable rural development is a significant factor in the accelerated development of agriculture and improving the position of agricultural producers. The advantages of the association are numerous, and among them are the facilitated procurement of raw materials and safer distribution of end products to consumers. Also, investments are significant, which shows the average grades: Republic of Serbia m = 1.62, Republic of Srpska m = 1, 70. Numerous authors list the advantages of the association as the facilitation of the development of brands, the standardization of production, the facilitation of obtaining certificates confirming the quality of a product, and access to more favorable sources of credit. Retaining youth in rural areas would contribute to further development. Young people are an important generator of change and initiator of development, they represent a resource with many possibilities and potential that brings social change Respondents claim that it is of great importance to take all measures to stimulate youth and return to rural areas. Each of the respondents had the same answer that agriculture is crucial for the development of rural areas, which confirmed hypothesis H2.

Starting from the fact that the pairs have a normal distribution, testing the values of the arithmetic means of two large samples and testing the hypotheses, the t- test of paired samples was applied.

Table 4. T - test of statistical significance of differences in arithmetic mean of pairs (df=214)

Pairs	r	m_p	t	p	CI = 95%	
					Lower	Upper
Pair 1	0,136	0,335	4,866	0,000	0,199	0,471
Pair 2	0,222	0,279	4,422	0,000	0,155	0,403
Pair 3	0,301	0,251	4,422	0,000	0,117	0,386
Pair 4	0,082	0,274	3,500	0,001	0,429	0,120
Pair 5	0,475	0,088	1,680	0,094	0,192	0,015
Pair 6	0,136	0,355	4,866	0,000	0,199	0,471
Pair 7	0,222	0,279	4,422	0,000	0,155	0,403
Pair 8	0,301	0,251	3,679	0,000	0,117	0,386
Pair 9	0,082	0,274	3,500	O,001	0,429	0,120
Pair 10	0,475	0,088	1,680	0,094	0,192	0,015

* r = Pearson correlation, mp = arithmetic means of pairs, p= statistical significance, CI= Confidence Interval of the Difference

Based on the results from Table 4, it is concluded that there is a statistically significant correlation of the variables that make up pair 1. The value of p = 0.000, while the correlation coefficient is 0.136, which is a very weak correlation, but positive. The average score of this pair is mp = 0.33, and with a 95% confidence ratio, the following t-test results were obtained (t = 4.866; p = 0.000; CI 95% (L = 0.199, U = 0.471)). In pair two, a statistically significant difference in the values of arithmetic means p = 0.000 is also observed, the values of the dimension move in the same direction, because the correlation is positive, but weak. The average score of this pair is mp = 0.279. Value t = 4,422, with df = 214; Cl = 95% (L = 0.155, U = 0.403). Pair 3 also has a statistically significant difference in arithmetic means, with a weak positive correlation. Value mp = 0.251. With a 95% confidence factor, the value of t is 0.117 (L = 0.117, U = 0.386). Pair 4 has the following values mp = 0.274, p = 0.001, r = 0.08, the correlation is so low that it is neglected. The T-test showed the following values of statistical significance of differences in arithmetic means: t = 3,500; CI = 95%, L = 0.429, U = 0.120. The variables of pair 5 correlate weakly, but in the same direction, with p = 0.09, which is not a significant value of the statistically significant difference of the variables that make up pair 5 (mp = 0.088; t = 1.680; CI = 95%, L = 0.192, U = O, 15). Other pairs show statistically significant differences in arithmetic values, but a weak correlation. Par 6 shows statistical significance p = 0.000, with an average score mp = 0.335 (t = 4.866; CI = 95%; l = 0.199, U = 0.471). Pair 7 carries the average value of the arithmetic mean mp = 0.279 (p = 0.000; t = 4.422; CI = 95%; L = 0.155, U = 0.403). Pair 8 has the following values: mp = 0.251, p = 0.000, r = 0.3, which is still a weak correlation. The value of t is 3,679 (CI = 95%, L = 0.117, U = 0.386). Pair 9 also shows statistical significance p = 0.001, with an average score of mp = 0.274. With a 95% confidence factor, the value of t is 3,500 (L = 0.429, U = 0.120). A pair of ten carries an average score of mp = 0.088, and no statistics on the significance of arithmetic means and a value of t = 1.680. The obtained data indicate the confirmation of the alternative hypothesis that there is a statistically significant difference between certain categories of agricultural development between Serbia and Republika Srpska.

Conclusions

Based on the research to determine whether there is a statistically significant difference between certain categories of agricultural development between the Republic of Serbia and the Republic of Srpska, in the function of rural development, average grades and standard deviations for given variables were established, and the hypothesis that agriculture is crucial for rural development was confirmed analyzed areas. With the help of t-test for paired samples, it was determined that there is a statistically significant difference in the arithmetic values of the given dimensions of the research. An alternative hypothesis was confirmed. The weakest marks were the dimensions of product collection, followed by providing quality standards, rural infrastructure, as well as brand development and support for young people to return or stay in rural areas where their primary activity would be agricultural production.

The results indicate a lower level of activity of advisory bodies in the development of agricultural production, as well as the overall rural development in the Republic of Srpska in relation to the Republic of Serbia. Respondents in Serbia are more satisfied with the sale and collection of agricultural products and in general the foreign trade exchange of the mentioned products. Creating a brand of agricultural products in both countries is at a pretty bad level. Product quality standards are rated slightly better in Serbia than in the Republic of Srpska. However, the importance of education and knowledge transfer is better assessed in Republic of Srpska compared to Serbia. The results show that more significant development of cooperatives and associations would contribute to more successful development of rural areas. The analysis also shows that investments are significant in both countries.

Local communities certainly have a role to play, but the question remains whether local community support can be greater for the sector, as well as whether solutions may be in attracting more investors or joint action in terms of public-private partnership in agricultural production. The issue of rural economic development and a more holistic approach to its organization is essential for countries such as Republic of Srpska and Serbia. First of all, because it can be a significant source of competitiveness of the national economy, and we can argue that this area deserves additional attention, additional investment, as well as additional research.

Conflict of interests

The authors declare no conflict of interest.

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AGRICULTURAL ADVISORS` ROLE IN THE USE OF ICTs AS A TOOL FOR A MORE SUSTAINABLE SERBIAN AGRICULTURE

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ABSTRACT

The aim of this paper was to show the role and importance of agricultural advisers in the development and implementation of information and communication technologies (ICTs) in a path to the more sustainable agriculture, and achieving the SDG2 Zero Hunger of the UN 2030 Agenda. There are a lot of challenges in the efforts to develop so-called ``hi-tech agriculture`` and smart farming in the Republic of Serbia. This research is conducted on the territory of the Nisava district in three municipalities: Merošina, Gadžin Han and Niš. The obtained data were statistically processed and presented through tables and charts. Agricultural advisors play an important role in the digital literacy of agricultural producers on their pace to implement in practice principles of hi-tech agriculture. The most important is the funding of permanent education of advisers, as well agricultural producers to acquire the state of art knowledge and experience needed to become more competitive in the EU and global market.

Introduction

The United Nations Agenda, Transforming Our World: the 2030 Agenda for Sustainable Development is seen as a plan of action for people, the planet, and prosperity. 17

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sustainable goals (SDGs) which are declared in the Agenda 2030 are not easy to achieve (Al Zubi, Radovic, 2019). The SDG2 (Zero Hunger) aims to end all forms of hunger and malnutrition by 2030, making sure all people especially children have sufficient and nutritious food all year. This involves promoting sustainable agriculture, supporting small-scale farmers, and equal access to land, technology, and markets (United Nations, 2015; Popescu et al, 2017).

The Food and Agriculture Organization of the United Nations (FAO) has identified five key principles that balance the social, economic and environmental sustainability, and provide a basis for developing adapted policies, strategies, regulations and incentives. Five key principles are:

1. Increase productivity, employment and value addition in food systems;
2. Protect and enhance natural resources;
3. Improve livelihoods and foster inclusive economic growth;
4. Enhance the resilience of people, communities and ecosystems
5. Adopt governance to new challenges (FAO, 2018).

Agriculture is the fourth largest sector in the Republic of Serbia, accounting for 17.4 percent of employment and 5.4 percent of total exports. In 2019, the total budget for agriculture and rural development is US$348 million, of which 12 percent (or US$ 43 million) comes from EU resources). The remainder of the budget is covered by national program resources, of which US$44.6 million is allocated to rural development (World Bank, 2019). Serbian agriculture despite numerous efforts of policy-makers in the last decades still lacks consistent agricultural policy and strategy, which would lead to changes and compliance with the European Union Common Agricultural Policy (EU CAP) (Djurić et al., 2019). Achieving more sustainable agriculture in the Republic of Serbia is a particularly complex issue in the rural region (Todorović, Drobnjaković, 2010; Radović, Cvijanović, 2018; Dimitrovski et al., 2019).

Innovation is a main driver of sustainable agriculture. Therefore, in the global digitalized world there are many facts which addressed that the digitalization of agriculture has to be a number one priority on the agenda of all interested parties.

Information and communication technologies (ICTs) are the basis of economic development because they significantly affect the development of the economy and society (Spasić, Georgijevski, 2013). The fourth industrial revolution brings important opportunities for future agricultural development, particularly in less-advanced developing countries. Furthermore, a significant increase in ICTs application in developing countries, like Serbia represents a unique opportunity to pass on valuable information to different locations and to different people who were previously unable to access such information, and markedly reduce the cost of deploying the new services.

In the Serbian scientific community, there is some organization which is working in the area of providing ``tech solutions for sustainable agriculture``. The BioSense Centre at the University of Novi Sad Serbia has partnered with the Foundation for Agricultural Research DLO at the University of Wageningen in the Netherlands to increase food security in Serbia through the integration of advanced IT solutions into agricultural practice. They create Wireless Sensor Networks (WSN) and Remote Sensing to acquire detailed crop data for analysis. The sensors provide data about humidity, soil temperature, illumination, plant diameter, and growth rate. Biosense has pioneered a new trend in sustainable agriculture in Serbia called ***precision agriculture***, and more details are available on the platform (*agrosens.rs/#/app-h/about*). It brings the benefits of ICTs to the end-users, providing free tools for record-keeping and for better decision making based on remote sensing.

Precision agriculture is given as one example of the many ways to support agricultural production through high technology, with the aim of reducing energy use, monitoring soil conditions, and enhancing yields, and also focus on socio-economic aspects. Government, industry, academics, civil society, and agricultural producers need to collaborate to ensure that all of society is able to benefit from rapid advances in technology and precision agriculture.

Progress in agriculture and rural development cannot be imagined without consulting the public service, which is organized in a modern way. The primary function of such an organized public service in agriculture is to enable easier transfer of knowledge (Simonović, 2016). The tasks of the agricultural advisory service are activities that achieve the set goals. These activities are focused on jobs that improve agricultural production by branches of production, in crop production, livestock production, fruit growing, and viticulture, improving plant protection, mechanization and quality of agricultural land, and more. The Law on the provision of advisory and professional activities in the field of agriculture regulates the conditions and methods for advisory and professional activities in the field of agriculture, the Register of agricultural advisors, training of agricultural activities and agricultural producers, development planning advisory services in agriculture, as well as other issues of importance for advisory work in agriculture (Official Gazette of RS no 30/10, 2010).

The author's core observation is that information and communication technologies (ICTs) have the potential to increase the rate of diffusion of a very wide range of technologies, applications, and platforms across agriculture. It is based on data that only 14 percent of farmers had adopted smart farming technology, and eighty-one percent cited equipment cost as the most important reason for not doing so (ITU, FAO, 2020).

The aim of this article is to highlight the use of ICTs in the achievement of SDG2, as well all other SDGs, and creating more sustainable agriculture in the Republic of Serbia based on the emphasis on the role of agricultural advisors to encourage the agricultural producers to use ICTs, and so far become more involved in the process of developing sustainable agriculture. Therefore, the conducted research consider

the previous researchers related to the ways how agricultural producers obtain useful information, through which communication channels they try to achieve additional knowledge needed for their future work and etc. All data are provided based on work of eleven agricultural advisers in charge for those actions in the territory of Nišava district in 2019 (psss.rs/nis.html).

Obtained results confirmed a new paradigm for agricultural research which reflects farmer first, embraced participatory approaches, provided to farmers market information, weather warnings, mobile payments, connecting with customers of goods, and acknowledging the challenges of increasing complexity and uncertainty of situations.

Advisers have three major tasks to performed in future activities to engage agricultural producers to be more devoted to sustainable agricultural practice: make new things visible, respect the traditional knowledge and the third, emphasize the use of ICTs, facilitate learning, and help producers overcome major hurdles in adapting their farms to the age of the fourth industrial revolution.

Literature review

In less developed countries there are high transaction costs and restrictions on accessing information, which limits the optimal production of farmers. Rapid technological change, linked to climate change, requires farmers to have accurate and reliable information in order to make effective decisions. The information needs at each stage of the agricultural cycle must be met if an adequate response to each challenge is desired. As mobile phones have become the basis for providing advisory assistance to farmers, a number of researchers have begun to consider their impact on agricultural and rural development (Aker, 2008; Fu, Akter, 2012).

In addition, Srinivasan and Burrell point out that mobile phones are important for improving connections between different actors in the fish market and simplifying coordination in case of adverse events (Srinivasan, Burrell, 2013). The geographical location of the coastal area, as well as the very large lending opportunities, allow fishermen to optimize profits by selling catches in different markets. A study by Islam and Grönlund (2013) presented the application of the Agricultural Management System (AMIS) based on mobile telephony, which was locally promoted under the name Pallinet, in remote villages of Natore District in Bangladesh.

The study (Ruiz-Garcia et al. (2009) discuss the impact of information and communication technologies in poor communities in rural Lesotho. It points out that although information and communication technologies have the potential to improve the socio-economic aspects of small farmers, are: costs, illiteracy, infrastructure, access, and lack of necessary skills reduce the positive effect and potential for improving living conditions in agricultural communities

Since Serbian rural areas are usually poorly informed, so the provision of information has become a major goal of most development initiatives (Chapman, Slaymaker, 2002).

As a result, the largest information and communication services are based on the ability of farmers to access information that is relevant to life and livelihoods.

Several studies have analyzed farmers' information needs, based on which possible applications of information and communication technologies can be identified. For example, a national survey of farmers in India) identified three categories of information necessary for farmers: (1) information that helps farmers what to plant and which varieties to choose, (2) market information that includes prices and indicators price, (3) contextual information that includes weather conditions and best practices (Mitrović et al., 2009). These categories of information are needed at different stages of the agricultural life cycle, which includes: crop planning, purchase of seeds and raw materials, planting, growth, harvesting and sales (Filipović et al., 2017). The most critical information farmers need is: weather conditions, pest and disease control, information on seeds and market prices.

Although the most representative applications of information and communication technologies in agriculture are based on the use of mobile phones to transmit information, there are also examples of projects based on participatory approaches. These approaches include the integration of the Internet, mobile devices such as portable projectors, TV sets, and devices for the production and delivery of agricultural content (Janković et al., 2015). Among them is a representative example of Digital Green, which uses short videos with instructions, in which local farmers cooperate with agricultural experts. Videos are recorded with pocket video cameras and displayed locally using a pico projector. Farmer feedback is provided through Interactive Voice Response (IVR).

Farmers who receive timely information about the market situation can look for the cheapest possible market entry. Up-to-date information can be obtained from various persons who trade in goods in the form of SMS messages, e-mails, telephone calls, which is done almost immediately using mobile telephony services. In some situations, access to mobile phones leads to increased revenue. An analysis conducted by the World Bank in the Philippines confirms that mobile phone purchases are associated with higher revenues, ranging from 11% to 17%, (Labonne, Chase 2009).

Rađenović with colleagues (2020) examined key indicators that are necessary for the implementation and development of smart farming concepts in the agricultural industry, especially from the applied mobile technology point of view. They proved that those countries that invest the most in the ICTs in the agricultural sector can achieve a significant increase in value-added in the production process and ultimately to an increase in the percentage share of the agricultural sector in GDP.

The most valuable literature source for authors was the review which provides the results of a one-year study jointly conducted by ITU and FAO, addressing a broad range of issues related to contemporary policy and practices across Europe and the Commonwealth of Independent States (CIS) in e-agriculture. It features the experiences of countries in their ongoing efforts to develop and implement digital agriculture strategies (ITU, FAO, 2020).

The theoretical; background is also based on analyses of sustainable development literature (Antholt, 1994; Radovic et al., 2015), ICTs scientific researches related to agriculture (Pedersen et al., 2006), principles of stakeholders `participation in policy-making and implementation processes (Emerson, 2015), and social partnership and inter-organizational collaboration ideas were taken into consideration (Seitanidi et al., 2010), and many other available sources.

Materials and methods

With the aim to substantiate a research construct which would enable to present the importance of the use of ICTs in agriculture on the territory of the Nisava district in three local communities: Merošina, Gadžin Han, and Niš. The authors used few various methods: scientific discourse analysis, a survey of respondents, statistical data analysis, and systematization and synthesis of scientific insight. The research was conducted on 90 respondents, a sample of occasions, and 30 from each mentioned municipality. The research was done through a non-experimental method, through a questionnaire containing 20 items. The first part of the questionnaire refers to socio-demographic data, while the second part of the questionnaire refers to data on the use and utilization of new information technologies and data distribution via electronic devices. The obtained data were statistically processed and presented through tables and graphs.

Results and Discussions

Research dedicated to considering the possibility of implementing advisory agricultural services using ICTs analyzed information and communication systems and their use in the Nisava district as well as mechanisms for implementing advisory assistance and their primary purpose through services for voice, radio broadcasting, and calls, auxiliary services realized through SMS messages through the portal of advisory services and e-learning programs through printed publications. The obtained results are shown in Table 1.

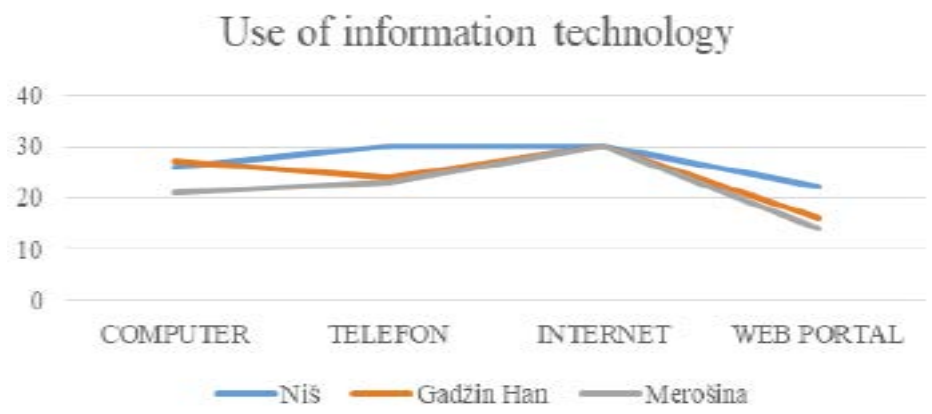
Table 1. Use of different types of ICTs

MUNICIPALITIES OF NISAVA DISTRICT	Used service							
	Computer		Mobile phone		Internet		Website	
	no	%	no	%	no	%	no	%
Niš	26	86.6	30	100.0	30	100.0	22	73.3
Gadžin Han	27	90.0	24	80.0	30	100.0	16	53.3
Merošina	21	70.0	23	76.6	30	100.0	14	46.6

Source: Author's calculations

The presented results indicate that the use of mobile phones and the use of the Internet by agricultural producers is very represented as much as 100% of the total number of respondents, while the use of computers is represented by 86.6%, and the use of information from web portals is the smallest, only 73. 3%. The results are presented in Figure 1.

Figure 1. Use of ICTs



Source: Author's calculations

By analyzing the initial and current efforts to develop information and communication technologies, we found a significant shift from the application of centralized approaches, such as the use of televentory (http://televenta.pro.talkiewalkie.org/), to the application of decentralized approaches, such as mobile systems and direct transmission of information "in hand" to users via mobile phones. This result is similar to those proved by Ceranić et al. (2011). Their prevalence and potential benefits, potential uses, can significantly improve the transfer of knowledge and information as well as improve the application of technologies and facilitate agricultural sustainable development.

The use of computers and the Internet is leading to improvements in all sectors. In the agricultural sector, computers are used to accomplish a number of tasks. Computers are much more common in the agriculture of developed countries, while very few farmers use computers in developing countries. However, the number of users is increasing every day (Ceranić et al., 2015), and the possibilities of application are increasing.

Taking care of finances in agriculture is a very important task in larger agricultural activities. That's why a computer is a necessary tool for recording records. Keeping notes with paper and pen is very time consuming and not secure enough, and computers make the job much simpler and less time consuming, while all calculations are done almost instantly. Rađenović with his colleagues concluded the same in one of his recent research and stated ''that farmers which understand the importance of using ICTs in agriculture are more likely to adopt a mobile technology perspective as a part of smart farming concept'' (Rađenović et al., 2020). The information provided to agricultural producers is crucial in making important decisions that can be useful to them in agricultural production and the manifestation of economic effect and profit.

The results shown in Table 2 show that farmers receive the largest amount of data through contact of consultants with farmers through the media, web portals of advisory services, direct visits to farmers, while the smallest percentage was the use of various

sort of printed materials. Advisers provided to them different printed materials like bulletins, as well as one specific journal named ‘’Berićet’’.

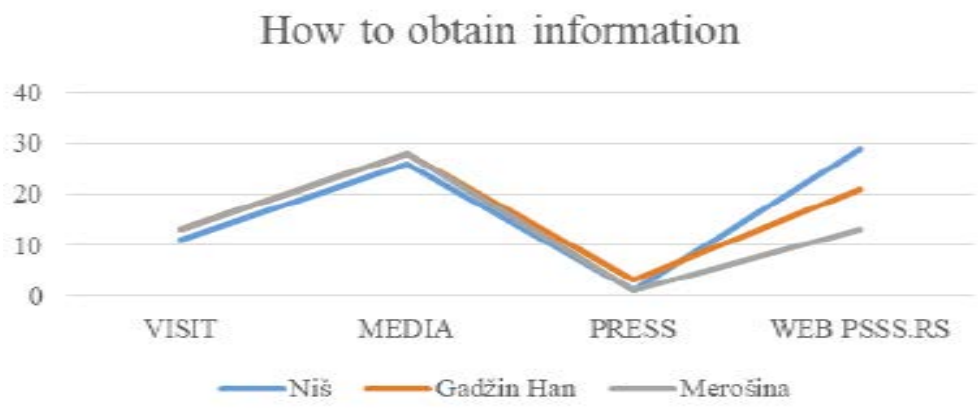
Table 2. Communication channels (obtaining useful information related to agriculture)

MUNICIPALITIES OF NISAVA DISTRICT	Communication channels							
	Site visit		TV, e-media		Printed material		website httpspsss.rs	
	no	%	no	%	no	%	no	%
Niš	11	36.6	26	86.6	1	3.33	29	96.6
Gadžin Han	13	43.3	28	93.3	3	10.0	21	70.0
Merošina	13	43.3	28	93.3	1	3.33	13	43.3

Source: Author's calculations

A graphical presentation of the results was performed in Figure 2.

Figure 2. How to get useful information about agriculture



Source: Author's calculations

The third part of this field research was related to the specific role of agricultural advisory services in this region, focused on providing adequate skills and knowledge. The research question was devoted to the ways how additional knowledge is obtained in this region. The knowledge system in agriculture is based on the functions that the system should fulfill and operationalized on a total of six basic functions: identification of (cognitive) needs, creation of innovative knowledge, operationalization of knowledge, dissemination of knowledge, application of knowledge, and evaluation of experiences.

And futurist Daniel Burns, author of TechnoTrends -24 Technologies That Will Revolutionize Our Lives, emphasizes, ‘’the future belongs to those who are capable of being retrained again and again’’ (Rose, Malcolm, 1997). The primary function of agriculture advisory services is to enable easier transfer of knowledge. Some scientists consider that they have also one more task: connecting agricultural producers with educational and scientific institutions (Vujičić, Ristić, 2006, p.69).

Therefore in practice, the role of the counselor in working with the target group is at least twofold: he is, on the one hand, an expert who has the necessary knowledge and information that can help farmers solve a problem, but also an educator whose task is to provide a situation that will stimulate learning (adoption of new knowledge), and thus motivates the farmer to change his opinions, attitudes, and behavior in order to improve his farm (Janković et al., 2003). From the point of view of improving domestic agriculture, the main target group of advisory work is farmers/farmers and their farms. The way in which advisors transfer their knowledge and transfer information is shown in Table 3.

Table 3. The role of the advisor in the transfer of expert advice

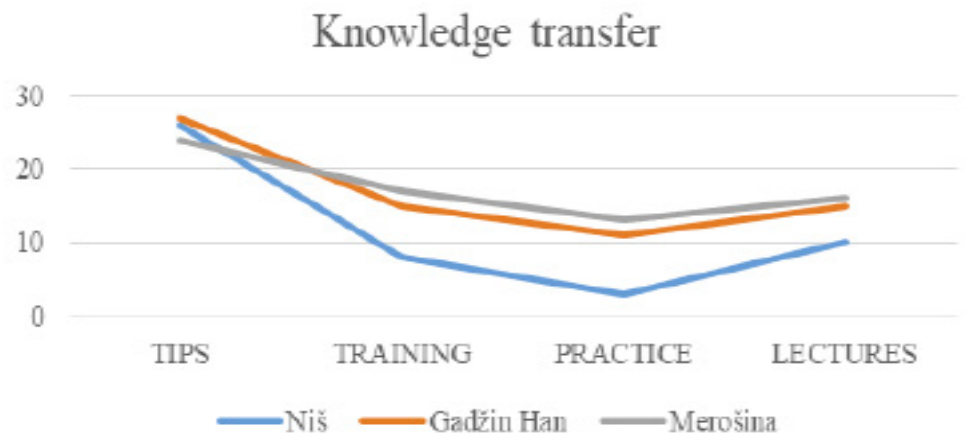
MUNICIPALITIES OF NISAVA DISTRICT	Knowledge transfer							
	tips		training		practice		lectures	
	No	%	no	%	no	%	No	%
Niš	26	86.6	8	26.6	3	10.0	30	100.0
Gadžin Han	27	90.0	15	50.0	11	36.6	15	50.0
Merošina	24	80.0	17	56.6	13	43.3	16	53.3

Source: Author's calculations

The presented results indicate that the activity of advisors is most pronounced through the provision of advice through direct contact with farmers, lecturing, while the provision of practical training in the field and training of farmers is less represented. All actions performed by advisors were performed in accordance with the Rulebook on the manner of performing advisory work in agriculture (Official Gazette of the RS, 2014 no 65/14).

The obtained results are graphically presented in Figure 3.

Figure 3. The role of advisors in the transfer of professional knowledge



Source: Author's calculations

The most important precondition for the successful work of agricultural advisors is the establishment of a system of permanent links between advisors and agricultural producers, based on mutual trust.

In order to engage scientific knowledge related to the ICTs in creating conditions for more sustainable agriculture, policy-makers will need to reconcile traditional knowledge as a guide for bridging a gap. Both kinds are based on human observation and experiences and are tested, replicated, and transmitted within the respective community through social institutions, and mechanisms put in place for that purpose (Ammann et al. 2007).

Despite ICTs provides standardization and regulation of agricultural processes while reducing the large gap between researchers in the field of agriculture and farmers, its integration is faced with additional challenges in Serbian societies like lack of data, inadequate skills, inadequate state of physical-digital infrastructure, and limited connectivity particularly in rural areas.

For successful planning and implementation of advisory work in the Nisava district, future activities must be carried out related to the development of advisory modules, training of advisors, and promotion of a more efficient system of work. Few recommendations based on the gained experiences are:

- The special importance in the work of advisors is emphasized through direct communication with farmers, touring farms, and providing new information through lectures, and other forms of informal education.
- Educational centers (PSSS) for counseling and information and communication systems (mobile telephony, computers, internet, and web portals) have to play a more significant role.
- The importance and role of agricultural advisory life in the life of the village and the rural community are extremely important, especially in the new environment and increasingly fierce competition in the market.
- The agricultural advisory service should be able to provide advisory services to farms that are commodity producers and to a larger number of small farms which could be interested in more innovative products.

Conclusions

The Republic of Serbia is a country devoted to achieving the goals and targets set out in the 2030 Agenda for Sustainable Development Agenda, and so SDG2 is one of the priorities. Serbia`s Smart Specialization Strategy is in relation to other public policy documents in the Republic of Serbia (Serbian Government, 2020), and one of them is the Agriculture and Rural Development Strategy 2014-2024 (Serbian Government, 2014). It is coherent with development activities within the FOOD FOR THE FUTURE priority area. Although, many actions were performed after all the fact is that the low adaptation rate of advanced technologies is recorded. The majority of agricultural producers addressed that they need subsidies for the adoption of hi-tech

technologies. The application of ICTs in agriculture requires new skills that cannot be created overnight and require changes in education and vocational training. Advisors in the Nisava district moved beyond rhetoric of participatory approaches to extension, towards a greater understanding of how ICTs need to be transformed into practice with a clear acknowledgement of potential constraints. Therefore, the vital role of the advisers in the process of achieving more sustainable agriculture also needs to be more clearly determined and acknowledged in the future.

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Conflict of interests

The authors declare no conflict of interest.

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INTERACTION OF THE EURASIAN ECONOMIC UNION AND ITS MEMBER STATES IN THE SPHERE OF AGRICULTURE

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ABSTRACT

The aim of the paper is to consider the international experience of delineating spheres of responsibility of national and supranational regulators in the sphere of agriculture on the example of the Eurasian Economic Union. Used philosophical, general scientific and special methods helped to provide an assessment of the process, which shows that, due to the incompleteness of the process of economic integration, the existing institutional structure of the Union cannot be considered as finalized, and therefore the assignment of certain powers to the Union's bodies is situational, which prevents the formulation of final conclusions on the specifics of delimiting the spheres of responsibility of national and supranational regulators and the boundaries of powers of national regulators in the agricultural sector. The authors concluded that Eurasian Economic Commission's powers and competence in the sphere of agriculture should be expanded in order to achieve aims of the integration entity.

Introduction

Integration of the Eurasian economic space is one of the key factors that will influence the long-term socio-economic development of the Russian Federation. And the topic of delimiting the spheres of responsibility of national and supranational regulators is one of the key topics for any integration entity, including the Eurasian Economic Union (hereinafter - EAEU). At present, there continues to be observed both duplication of functions of government agencies and services at the national level, and duplication of functions transferred to the supranational bodies at the level of national governments, which retained the relevant structural units. Duplicating functions are usually redundant.

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Their identification and exclusion from the integration development makes it possible to increase the efficiency of such processes.

The status, place and role of any body of the Eurasian Economic Union is determined by the volume of powers that it is endowed with and actually exercises. The Eurasian Economic Commission (hereinafter referred to as the EEC) plays an important role in the system of the EAEU bodies as a permanent regulatory body of the Union. The composition, functions, powers and procedure for its work are defined in a separate document — «Regulation on the Eurasian Economic Commission» (Regulation, 2014), in accordance with which, the main functions of the Commission are to ensure the conditions for the functioning and development of the Union, as well as the development of proposals in the field of economic integration within the framework of this integration entity (Lapenko, 2017).

Materials and methods

In order to obtain the most reliable scientific results of the study, philosophical, general scientific and special methods were used to ensure the unity of epistemological, socio-philosophical and legal analysis of the functioning of the Eurasian Economic Union and its interaction with the member states in the sphere of agriculture. The scientific and heuristic potential of such philosophical and general scientific research methods as analysis, synthesis, deduction, induction, abstraction, etc., generalization, modeling, etc. were also used. Thus, the use of methods of analysis and synthesis made it possible to analyze the essence of the Eurasian Economic Commission as the main regulatory body of the Union. On the basis of the system analysis the EAEU measures on regulation of the agricultural sector as well as integrity in unity of its basic components, and also system quality of such measures as an indicator of their efficiency were investigated. Comparative legal and system-structural methods allowed studying correlation between the powers of the EEC and the authorized bodies of the member states. Special methods — legal, classification and grouping — helped to clarify the features and legal mechanisms of such correlation. The dialectical method was used to draw conclusions from the study. The paper's materials were both supranational and national legal acts that define and regulate powers of relevant institutions in the agricultural sector.

Results

The spheres to which the EEC extends its competence, as a EAEU regulatory body, are very multifaceted. At the same time, this competence is implemented within the «limits of the powers provided for by the Treaty and international treaties within the Union». The existing breadth of the EEC powers, including agriculture, raises the issue of increasing the efficiency of delimiting their spheres of responsibility. When examining the EEC status and powers, it is necessary to keep in mind the existence of an unwritten principle that provides for the EEC's participation in the implementation of many managerial and regulatory functions and decision-making in the form of its own legal acts.

The Treaty on the Eurasian Economic Union (Treaty, 2014) recognizes the Union as an international organization for regional economic integration with international legal personality (paragraph 2 of Article 1), while securing in the Treaty the EAEU autonomous legal and institutional system (Articles 6, 8) (Chaika, 2020). In the Advisory Opinion of December 20, 2018, at the EEC's request, the EAEU Court stated the supranational nature of the activities of the Union's bodies and the limitation of the sovereign powers of the member states in the relevant areas (EAEU Court, 2018).

The EEC acts, by analogy with law of the European Union, were rightly characterized as acts of a secondary order, and the system of integration law of the Eurasian Economic Union, possessing a number of characteristic features, begins to act as an independent legal order, which is formed according to its own qualifying characteristics and patterns based on generally recognized principles and norms of international law and is different from other systems of law (Iskakova, 2016). The position and status of the EEC as a regulatory body makes it possible to adopt its own regulatory documents and decisions that are of a regulatory nature and binding on the member states. These decisions are included in law of the Union and are subject to direct application on the territory of the member states (p. 13 of the Regulation), which contributes to the effective implementation of the decisions taken (Lukyanova, Plyugina, 2016). The EEC has rather broad powers, but this competence is exercised within the «limits of the powers provided for by the Treaty and international treaties within the Union» (Boklan, Lifshits, 2016), and the decisions taken can significantly affect the economic processes taking place in the EAEU member states. Playing the key role in the EAEU institutional mechanism, the EEC exercises the powers necessary to ensure the coherent operation of the Union's institutional mechanism. Thus, it actively cooperates both with all other EAEU bodies and fruitfully interacts with the relevant competent authorities of the member states. The set of powers granted to the Commission, as well as its role as the main regulatory body of the Union, indicate that in fact this body is the main link, thanks to which the coordination and effective functioning of both legal and institutional is ensured (Sokolova, 2017).

The formation of a common market for goods and services throughout the EAEU is one of the main goals of the EAEU member states. To achieve this goal, a gradual liberalization of certain sectors of the economy, the creation of favorable conditions for the functioning of freedom of trade, which is ensured by reducing and not applying unnecessary requirements, conditions, exemptions and restrictions on the part of the member states, expanding the sectors (subsectors) of the common market for goods and services, as well as harmonization of laws of the member states and the integration entity, are necessary (e.g. Ćemalović, 2016). All these processes are at the stage of development and require analysis to establish a specific approach to the regulation of the agro-industrial complex by the national authorities of member states, in particular Russia, and the EEC, including defining directions for further effective mutual cooperation in the regulation of agriculture as one of the «sensitive» sectors to any integration entity (e.g. Puzić, Klevernić, Pavlović, 2014), as well as to identify main

problems and challenges for the development of the Eurasian agro-industrial integration (Kiselev, Romashkin, 2020).

The Treaty on the EAEU establishes the following main sectors for the implementation of an agreed (coordinated) agro-industrial policy:

1. Forecasting in the agro-industrial complex.

The EEC Collegium approved the new Methodology for forecasting the development of the agro-industrial complex of the countries of the Eurasian Economic Union in June 2020 (EEC Collegium, No70, 2020). According to the new rules the methodology was expanded with forecasting horizons to 5-10 years for medium-term and long-term forecasts with the adjustment of indicators every two years, allowing states and businesses to more fully assess the all-Union trends in the agricultural market and create joint projects.

2) State support for agriculture.

Obligations were taken on the permitted level of measures of state support for the industry, and prohibited measures of subsidizing the agro-industrial complex were determined along with the methodology for calculating the permitted level of state support measures. According to the EEC Department of Agroindustrial Policy, in general, the countries do not violate agreements on measures of state support for the agro-industrial complex.

3) Regulation of the common agricultural market.

At present, the draft Treaty on harmonized rules for the issue, circulation and redemption of warehouse certificates for agricultural products (EEC Collegium, No145, 2020) is under domestic approval. The implementation of its provisions will help to increase the profitability of the EAEU agricultural sector by expanding access to credit resources secured by warehouse receipts, transparency of the turnover and storage of agricultural products, as well as the development of agricultural production and trade. The document will supplement the EEC Board's Recommendation on a coordinated policy in the field of development of exchange trade in agricultural goods (EEC Collegium, 2016).

4) Uniform requirements for the production and circulation of products.

Within the framework of the relevant sectoral agreements, approaches have been determined to unify the requirements for the circulation of seeds of agricultural plants (Agreement, 2017) and the conduct of selection and breeding work within the EAEU (Agreement, 2019).

5) Development of exports of agricultural products and food.

Regarding this issue, we should note the EEC's list of certain types of agricultural products and food for export to third countries (EEC Collegium, No. 25, 2017). While, the EEC powers are limited in this regard to the preparation of analytical and informational materials.

6) Scientific and innovative development of the agro-industrial complex.

In this direction, within the Union, a proper regulatory framework was created for the effective implementation of advanced and innovative technologies and techniques in the field of agriculture.

7) Integrated information support of the agro-industrial complex.

In addition to the above directions, the Agreement provides that the Parties will exchange plans (programs) for the development of production of sensitive agricultural products, as well as hold annual consultations on them.

Despite the coincidence of the priorities for the agricultural sector's development, the national regulatory legal acts of the member states in the relevant field do not sufficiently reflect the development of intercountry cooperation in the Union.

In general, the issues of integration of the EAEU countries in the field of the agro-industrial complex are developed by Member of the Collegium (Minister) for Industry and Agroindustrial Complex; EAEU Council for Agroindustrial Policy (includes competent ministers of the member states); Advisory Committee on Agroindustrial Complex (at the level of deputy heads of the authorized bodies of the member states); Working groups under the Advisory Committee on Agroindustrial Complex (with the participation of representatives of the member states); EEC Department of Agroindustrial Policy. The authorized agencies of the member states take part in the EEC advisory bodies in order to determine the priorities for the development of integration and coordinate positions. A big step towards increasing the effectiveness of cooperation was the creation in 2018 of the EAEU Agroindustrial Policy Council, the importance of which as a platform for operational negotiations also manifested itself in a COVID-19 pandemic.

An analysis of the above-mentioned relevant regulatory framework of the agreed agro-industrial policy (in particular, Treaty, 2014; Regulation, 2014; Decision No35, 2013; Decision No94, 2014) makes it possible to form the table below (Table 1), which presents the relationship between the obligations and powers of the EEC and the member states.

Table 1. The relationship between the obligations and powers of the EEC and the member states in the sphere of agriculture.

Eurasian Economic Commission	Authorized bodies of the member states
Sensitive agricultural products	
Assessment of production indicators, provision with means of production, customs, tariff and technical regulation, mutual trade and meeting the needs of the domestic market, import substitution, integration potential and export development. Development of proposals for the sustainable development of production and increasing the competitiveness of sensitive goods. Coordination of development and approval of joint measures.	Submission of plans (programs) for the development of production of sensitive agricultural products and coordination of actions to the EEC.
Forecasting in the agro-industrial complex	
Generalization of national data of the member states and balancing of foreign and mutual trade.	Calculation of supply and demand forecasts for the list of agricultural products, raw materials and food, as well as the calculation of forecast values and submission of data to the Commission.

Eurasian Economic Commission	Authorized bodies of the member states
State support for agriculture	
Sending a request to the executive authorities of the member states to provide information necessary for monitoring and comparative legal analysis.	Preparation and sending to the Commission and other member states of a notification on the provided state support for agriculture for the reporting period and a notification on planned state support for agriculture in the current year in accordance with the forms approved by the Decision of the Council of the Commission dated October 18, 2016 No. 163.
Regulation of the common agricultural market	
The supranational competence within the framework of the Agreement on the Rules for the Issue, Circulation and Redemption within the Eurasian Economic Union of warehouse receipts for agricultural products consists in setting the requirements: - to the list of information included in the storage agreement; - to the functioning in the member state of the system of guaranteeing the fulfillment of obligations under warehouse receipts.	National competences under the Agreement on the Rules for the Issue, Circulation and Redemption within the Eurasian Economic Union of warehouse receipts for agricultural products are to establish the requirements: - to the rules of storage and maintenance of quantitative and qualitative accounting agricultural products; - to the form of the warehouse receipt, the procedure for its manufacture, acquisition, storage and destruction, types and degrees its protection (in the case of a documentary form); - to the formation and maintenance of the state register of warehouses in the public domain and registry warehouse certificates.
Development of a unified policy in the field of circulation of seeds of agricultural plants and pedigree products.	Taking measures aimed at unification of legislation. Mutual recognition of documents.
Development of agricultural exports	
Preparation, together with the member states, of recommendations for the implementation of concerted actions aimed at developing of export potential.	Informing the Commission about: - the state of international and domestic markets for exported agricultural products; - the requirements of foreign countries for the import of agricultural products; - applied measures and support mechanisms of export.
Functions within the framework of the Procedure for organizing joint research and development work in the agro-industrial complex of the countries of Union: - approval of the list of topics for joint research and development works for 5 years; - sending a request for participation to the government / authorized body.	Functions within the framework of the Procedure for organizing joint R&D in the agro-industrial complex of the countries of the Union: - formation of an answer (yes / no), determination of the customer and the contractor; - development and direction of a feasibility study to the EEC.

Source: compiled by the authors on EAEU law, EEC materials and national legislation

Based on the distribution of powers indicated in the above-mentioned table, it can be concluded that the effectiveness of the implementation of the agreed agro-industrial policy depends on two factors:

- completeness of implementation of norms adopted at the supranational level at the state level;

- completeness and quality of information provided by national authorized bodies to the EEC on time.

Discussions

An important area of increasing the efficiency of interaction between the national authorized bodies and the EEC is to improve the quality of information interaction, including on the provision of state support and regulatory ensuring. As part of the regulatory mechanism of the common agricultural market, further work will be focused on the implementation of the adopted agreements in the field of circulation of seeds of agricultural plants and breeding products and their further development. An important task remains the adoption at the state level of the Agreement on the rules for the issue, circulation and redemption of warehouse receipts within the EAEU, which will also allow to streamline the regulation of the common market and the distribution of powers between the EEC and national authorized bodies. The agrarian policy of the EAEU countries should also be harmonized. In particular, it is necessary to agree on the application of the same basic support measures for the agro-industrial complex, which distort the market in the least possible way. Otherwise, agricultural producers from different EAEU countries will be in unequal conditions.

The draft Strategic Directions for the Development of Eurasian Economic Integration until 2025 set tasks for the development of integration processes in the agro-industrial sector in order to increase the production of agricultural products and ensure food security. As the basis for a comprehensive document that will determine the general principles and approaches to ensuring food security, the relevant act of the EAEU bodies will be adopted. The Regulation on the development of common principles and approaches to ensuring food security in the Union based on the UN FAO methodology has been supported by all Union countries within the framework of the draft Strategic Directions for the Development of Eurasian Economic Integration until 2025 and should be adopted.

In connection with the completion of the formation in all states of the Union of the regulatory legal framework governing the production and sale of organic products, the EAEU is working to form a supranational regulatory legal regulation in the field of organic agriculture in order to ensure the free circulation of organic products within the Union and the development of exports. Despite the novelty of the legislation in the countries, there are differences in the labeling of organic products, approaches to the regulation of production, certification and standardization, accreditation of conformity assessment bodies. In order to deepen integration, Russia is in favor of developing an international treaty on the creation of a common market for organic agricultural products in the EAEU.

Conclusions

As a result of the conducted research, we can conclude that it is expedient to expand the EEC's powers and, accordingly, increase the level of its responsibility. At the same time, there are certain frictions in the EAEU governing system, which are caused by difficulties in coordinating and implementing of the EEC's decisions, because the EEC, as a supranational body, does not have the authority to control the activities of national regulators, and national regulators can influence the EEC only via national governments. Despite the fact that the institutional structure of the integration entity at the initial stage of the EAEU's functioning demonstrates its sufficient efficiency and operability, to ensure the development of integration, it is necessary to add some improvements, in particular, by giving the EEC's Collegium additional powers in agriculture to coordinate the development and implementation of interstate documents in the field of the agro-industrial complex by the allied countries. Moreover, expansion of the EEC relevant powers will contribute to the development of harmonizing and unifying approaches to the regulation and functioning of the agro-industrial complex in all member states of the Union.

Conflict of interests

The authors declare no conflict of interest.

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DEMOGRAPHICS CHARACTERISTICS OF CONSUMERS AS FACTORS IN THE PURCHASE OF CEREAL PRODUCTS IN THE REPUBLIC OF SERBIA

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ABSTRACT

Today, there is a trend towards a healthy lifestyle and a healthy diet. Cereals are considered the healthiest food because of their properties. They contain a good ratio of carbohydrates, unsaturated fatty acids, vitamins, proteins, minerals and plant fibers that are necessary for human nutrition. Therefore, the production and trade of cereals in the world tend to grow significantly. The aim of the paper is to identify the demographic characteristics of consumers that influence consumer decision when buying cereal products. The empirical research was conducted on a sample of 201 respondents from the territory of the Republic of Serbia through a questionnaire, which was made for research purposes. Through the discovery of consumer preferences, there is an opportunity to help producers of cereal products in Serbia to offer products that will meet the requirements of consumers.

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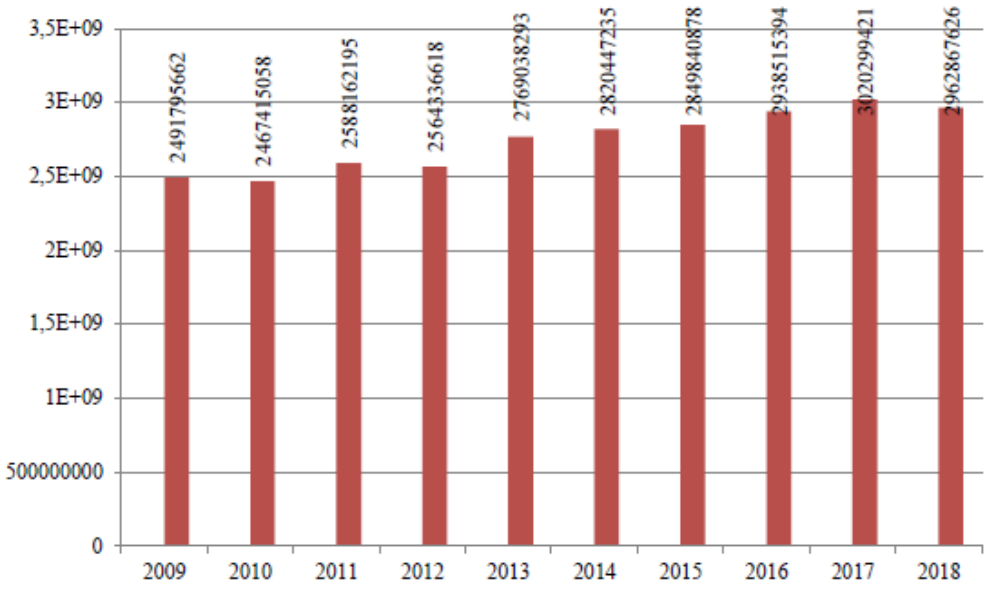
Introduction

Today's trends in food demand are shaped, among other things, by demographic changes and the modern lifestyle of consumers (Raletić, Sudarević, Katić, Kalinić, & Kalinić, 2016; Raletić, 2017). The most important demographic changes are the aging of the population, urbanization, larger number of smaller households, an increase in the number of working women and a decline in the birth rate. At the same time, there is a trend of a healthy lifestyle and a healthy diet as a consequence of the modern lifestyle of consumers (Mitić & Gligorijević, 2015: 336). Due to the epidemic of chronic diseases caused by bad eating habits, interest in the effects of nutrients on health has increased in recent years (Sevak et al., 2004: 160). Food insecurity/security is closely linked to the number of undernourishment. Undernourishment is the result of the absence of one or more factors contributing to good nutrition (Kovljenić & Raletić-Jotanović, 2020). One of the priorities of each country is to improve food production, ensure food security and high quality, as well as draw attention to the importance of a healthy diet, which is an integral part of preserving and improving health and disease prevention (Radosavljević, 2010: 131).

With the development of consumer awareness, there is an increasing demand for the consumption of healthier products, which are of better quality. Cereals are considered the healthiest food due to their properties. They have a good ratio of carbohydrates, unsaturated fatty acids, vitamins, proteins, minerals and plant fibers, all according to natural human needs (Vlahović, 2015: 37-38). Production and trade of cereals in the world they tend to grow significantly. Cereals in the diet should make up about 30% of the daily energy intake. Worldwide: rice, wheat, corn and millet are important ingredients in the human diet and are responsible the daily subsistence of a billion people. More than 50% of the world's daily calorie intake is obtained directly from cereals (Sarwar et al., 2013: 34). Cereal production is growing, primarily in order to meet the growing needs of people. The level of consumption is conditioned by the level of production, ie growing conditions, as well as the consumption habits of individual countries. Failure of grain production due to adverse weather conditions, pathogens or human actions has contributed to increasing grain production in many countries be a key national and international goal (Lafiandra, Riccardi & Shewry, 2014: 312).

Figure 1. Overview of global cereal production (tons)



Source: Authors' calculation, based on FAOSTAT data, 2020

Figure 1 shows the global production of cereals from the year 2009 to 2018. Over the years, the production of cereals has more or less oscillated. The lowest production was realized in 2010, while the highest production was recorded in 2017. After 2012, in 2013/2014, 2014/2015, 2015/2016, 2016/2017 the global production of cereals increased significantly (FAOSTAT, 2020). In the world, cereals are grown in over 73% of the world's total harvested area and contribute with over 60% of world food production by providing dietary fiber, protein, energy, minerals and vitamins necessary for human health (Charalampopoulos, Wang, Pandiella & Webb, 2002: 132). Their contribution to the daily diet varies significantly between developing and developed countries. In developing countries, such as Africa and parts of Asia, cereals provide as much as 70% of the energy value, while in developed countries, such as the United Kingdom, cereals provide about 30% of energy intake and 50% of available carbohydrates (Alexandratos, 2006).

In the Republic of Serbia, the largest area of agricultural land belongs to the production of cereals. In the total value of agricultural production in 2019, plant production participated with 66.0%, and livestock with 34.0%. Compared to 2018, the net index of physical volume of agricultural production decreased by 1.2%. Crop production was 1.9% higher than in the previous year. Realized production in 2019 year, compared to 2018, was lower in wheat by 13.8%, sunflower by 0.6%, and sugar beet by 0.9%, and higher in corn by 5.5% (Statistical Office of the Republic of Serbia, 2020). Cereal production in Serbia is one of the largest components of agricultural production. Agricultural production in Serbia can have greater economic effects than now, which is why the factors and demographic characteristics that increase the purchase of cereals should be investigated, which is the

goal of the paper. Consumer choice of products is influenced by many related factors. Demand for consumer goods is conditioned by economic, demographic, socio-cultural, geographical, sociological and psychological factors (Mayer, 1978). Bearing in mind the importance of cereals in human nutrition, identifying factors that influence the purchase of cereal products is essential in maintaining food security.

The aim of this paper is to identify the key demographic characteristics of consumers that influence their decision when buying cereal products. The analyzed demographic characteristics of consumers are: gender, level of education, financial situation and monthly income, which will be explained in more detail below.

By revealing the demographic characteristics of consumers, there is an opportunity to help producers of cereal products in Serbia to offer products that will meet consumer demands, increase the competitiveness of the Serbian economy and maintaining food security, since the world grain production and trade tend to grow significantly.

Demographic characteristics of consumers as factors of purchase of cereal products

Individual consumption of food and cereals and purchasing decisions are explained by various factors. The factors include the characteristics of individuals and households, information processing capacities and attitudes towards health (EUFIC, 2005).

The demand for consumer goods according to Mayer is conditioned by (Mayer, 1978: 151-167):

1) demographic factors, age, health, household size, their structure;

2) economic factors which include income, price and creditworthiness of the household;

3) socio-cultural factors (level of education of household members);

4) geographical factors that come to the fore through the characteristics of the region where the households are located;

5) sociological and psychological factors (individual differences in taste, attitude towards shopping, etc.);

6) the influence of complementary or substitution products.

Sanlier and Karakus indicated two groups of factors that influence the consumer's choice of food and cereals (Sanlier & Karakus, 2010: 141):

1) factors related to consumers, which include: attitude towards health and healthy lifestyle, sensory variables, social relations, knowledge of food and eating habits, lifestyle, age, gender, education; and

2) marketing factors that include primarily the price, distribution and marketing communications of food products.

One of the approaches in studying food choices comes from socio-psychological research of behavior. In this approach, it is assumed that many influences on food choices come from the beliefs and attitudes of the individual. Beliefs about nutritional quality and the effects of food on health may be more important than the actual nutritional qualities and health consequences when choosing an individual. Also as stated by Shepherd (Shepherd, 1999: 808):

1) demographic,
2) marketing,
3) economic,
4) social,
5) cultural or
6) religious factors can affect the attitudes and beliefs of an individual.

Empirical studies have shown that demographic factors such as gender, age, education, and individual income play an important role in determining food consumption patterns worldwide (Roux et al., 2000; Roslow et al., 2000; Ali, Kapoor & Moorthy, 2010).

Certain studies have shown that women have a greater tendency to buy products with health declarations (De Jong, Ocke, Branderhorst & Friele, 2003: 275), while other studies have found no evidence of gender differences (Urala & Lahteenmaki, 2007: 1).

Other studies have found that with increasing age, health concerns increase, as does the preference for products with health declarations (Ares, Gimenez, & Gambaro, 2008; Simon and Manohar, 2012). However, there is evidence to support the idea that the younger population also prefers products with health declarations as well as older age groups (Lahteenmaki, 2013: 198).

There is a positive relationship between income and food choices. The amount of income also affects the purchase of cereal products. The more affordable cereal products become, the more households will buy them (Simon & Manohar, 2012: 1-3). Kaur and Singh investigated the factors that lead to the purchase of cereal products and their research results showed that external influences, health, brand awareness and quality are the main factors influencing the purchase of cereal products (Kaur & Singh, 2014: 47). The results of research by Kamalaveni and Nirmala (2000) showed that age, occupation, education, family size and annual income have a proportional impact on per capita food costs (Kamalaveni & Nirmala, 2000: 12-18). The results of a study conducted by Worsely (2003) showed that consumers who consume white bread are younger, less educated, have children or are smokers (Worsely, 2003: 695). Research conducted by Binkley and Eales has shown grain prices, demographic variables, and the knowledge about the health elements of cereals positively affect the consumer's choice (Binkley & Eales, 2000). Ares and Gambaro indicated that demographic characteristics such as age and gender are key determinants that influence the acceptance of functional food by consumers (Ares & Gambaro, 2007).

Income growth leads to a change in consumption, primarily to a more varied diet that includes a higher proportion of animal proteins, fats and oils (Valin et al., 2014: 52). While on the other hand with income growth, there is a decrease in demand for cereals, fruits and vegetables (Herforth & Ahmed, 2015: 505–520).

Due to all the above, we start from the assumptions:

(H1): The gender of consumers affects the purchase of cereal products in the Republic of Serbia.

(H2): The level of consumer education affects the purchase of cereal products in the Republic of Serbia.

(H3): The financial situation of consumers affects the purchase of cereal products in the Republic of Serbia.

(H4): Monthly incomes of consumers affect the purchase of cereal products in the Republic of Serbia.

Research methodology

Sample

The research was conducted on the territory of the Republic of Serbia in 2020, and 201 respondents participated in it. The sample is considered representative considering: the size of the sample in relation to the basic set, the nature of the research, the number of variables to be researched and the desired level of belief.

Table 1. Sample characteristics

Gender of respondents	Number of respondents
Male	98
Female	103
Age of respondents	Number of respondents
up to 20 years	14
od 21-30	98
od 31-40	49
od 41-50	16
over 50 years	24
Place of residence	Number of respondents
urban settlement	112
suburb	58
rural area	31
Degree of education	Number of respondents
completed primary school	8
completed high school	72
completed college	99
master or doctor of science	22
Financial situation	Number of respondents
without income (pupil, student, unemployed)	61

with income (employee, pensioner)	140
Income	Number of respondents
less than 25. 000 RSD	22
od 25. 001 do 50. 000 RSD	61
od 50. 001 do 80.000 RSD	36
more than 80. 000 RSD	21

Source: Author

The analyzed demographic characteristics of the sample are gender, level of education, financial situation and monthly income of individuals. The study involved 98 males and 103 females. Regarding the level of education of respondents, 8 respondents have completed primary school, 72 respondents have completed high school 99 respondents have completed college or university and 22 respondents have a master's or doctor degree. In the sample, 61 respondents was without income (pupil, student, unemployed) and 140 respondents had income (employed, retired). In the income group, 22 respondents had incomes less than 25.000 RSD, the largest number of respondents have incomes from 25.001 to 50.000 RSD, 61 respondents had 61.000 dinars, from 50.001 to 80.000 RSD have 36 respondents, while the least number of respondents, 21 of them have incomes higher than 80.000 RSD.

Research instrument

The research instrument used in the paper was a questionnaire, made for research purposes. The questionnaire was made on the basis of the used literature, previous research and author's assumptions that were reformulated into questions.

The first part of the questionnaire refers to identification questions (gender, age, level of education, place of residence, financial situation and income).

The second part of the questionnaire contains statements regarding the frequency of purchases of cereal products, and the impact of health and nutritional properties on their purchase. Consumers responded to these statements with numbers from 1 to 5, which expressed the extent to which consumers agree with each statement. The numbers had the following meanings:

1 – I do not agree at all; 2 – I mostly disagree; 3 – unspecified; 4 – I mostly agree; 5-I totally agree

Data processing

For collecting the primary data, descriptive, ie quantitative method was used. Descriptive statistics and regression analysis were used in the paper. The obtained data were analyzed in the GRETL program for Windows OS.

Research results

In Table 2, descriptive indicators of the scale items for testing the purchase of cereal products are shown.

Table 2. Descriptive indicators of the scale for testing the purchase of cereal products (min.1, max.5)

Item	M	SD
1. I often buy cereals and cereal products.	3.36	1.18
2. I buy white bread and pastries.	3.39	1.29
3. I buy wholemeal bread and pastries.	3.30	1.33
4. I buy white rice.	3.39	1.37
5. I buy wholemeal rice.	2.61	1.43
6. I buy confectionery products (biscuits, waffles)	3.36	1.33
7. I buy confectionery products of a well-known brand.	2.83	1.36
8. When choosing confectionery products, I buy those products that are healthier.	3.24	1.23

Source: Author

In Table 2, the results of descriptive statistics are shown. Approximately the same number of respondents buy white bread and pastries and wholemeal bread and pastries. It can be noticed that the respondents are less focused on the more frequent purchase of these cereal products, while among them the purchase of integral rice (item 5) and the purchase of food products of well-known brands (item 7) stand out.

The results of the regression analysis will be presented in the next part. The dependent variable was the purchase of cereal products, which is expressed in terms of value. The impact of independent variable demographic characteristics (gender, level of education, financial situation and monthly income of individuals) on the dependent variable (purchase of cereal products) is shown in Model 1.

Model 1: Purchase of cereal products

Model 1: OLS, using observations 1-206 (n = 156)

Missing or incomplete observations dropped: 50

Dependent variable: PurchaseCereal

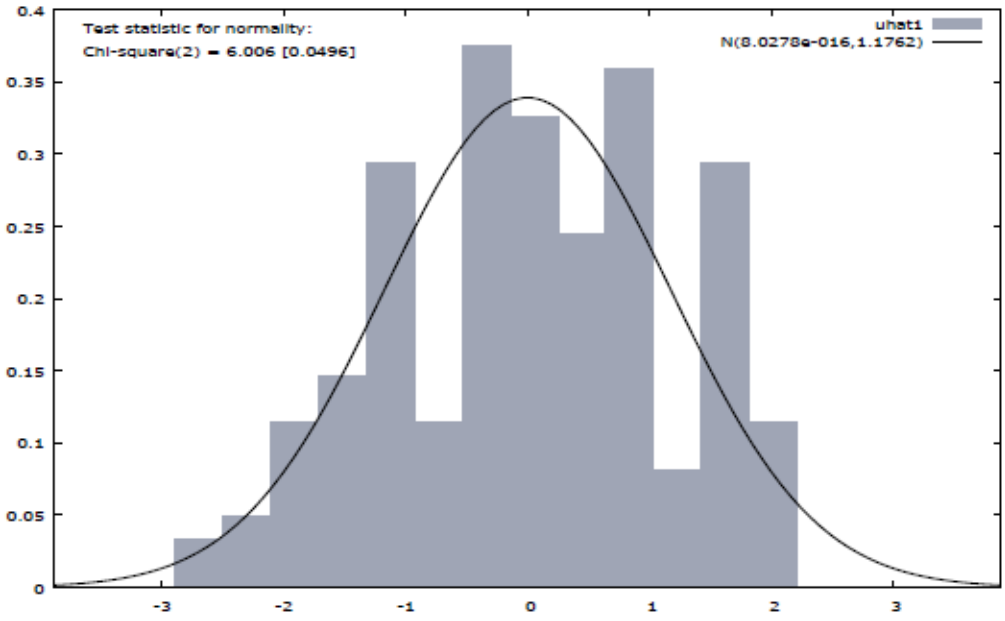
	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	4.34517	0.768449	5.6545	<0.0001	***
LevelEdu	0.104021	0.158243	0.6573	0.5120	
Gender	−0.342154	0.198232	−1.7260	0.0864	*
FinSit	−0.528131	0.307994	−1.7147	0.0884	*
Income	0.0846164	0.121849	0.6944	0.4885	

^PurchaseCereal = 4.35 - 0.342* Gender + 0.104* LevelEdu - 0.528*FinSit + 0.0846*Income

(0.768) (0.198) (0.158) (0.308) (0.122)

Based on the results of regression analysis (Model 1), it can be concluded that gender and financial situation, as demographic characteristics, represent significant factors influencing the purchase of cereal products.

Figure 2. Normal distribution



Source: Author

Figure 2 shows the residual normality test which shows that there is a normal distribution of data. Normal distribution means that the values are evenly distributed, ie this type of distribution shows that the mean values are the most frequent and as we move towards the ends the frequency of margins is lower.

Discussion of results

Descriptive statistics showed that approximately the same number of respondents buy white bread and pastries and wholemeal bread and pastries. Cereals and cereal products are bought to a lesser extent. They often buy white rice, while to a much lesser extent they buy integral rice. Respondents often buy confectionery products, for which the brand of the product is less important to them. This indicates that consumers in Serbia still do not take into account the health dimension of the product, because cereals and healthier cereal products (integral rice) are bought to a lesser extent.

The results of regression analysis (Model 1) showed that gender, as a demographic variable, is a significant factor influencing the purchase of cereal products, as shown by these studies (Mayer, 1978; Shepherd, 1999; De Jong, Ocke, Branderhorst & Friele, 2003; Ares & Gambaro, 2007; Sanlier & Karakus, 2010). The financial situation (with/without income) is also a significant factor influencing the purchase of cereal products.

Consumers with income are more likely to buy cereal products. The more people receive a steady income and expect to continue to receive income, the more there are those who are in a position to make purchasing costs (Mayer, 1978, Simon & Manohar, 2012; Herforth & Ahmed, 2015). On the other hand results of regression showed that there is no statistically significant relationship between the level of education and the purchase of cereal products and between monthly income and the purchase of cereal products. There are no significant oscillations between respondents with different levels of education and the decision to buy cereal products, because all respondents more or less equally decide to buy them, since cereals and cereal products are necessary in the daily diet. Most of the respondents have lower incomes, so they are expected to consume cereal products, because they cannot afford a more varied diet. With the growth of income there is a change in consumption, primarily to a more varied diet that includes a higher proportion of animal proteins, fats and oils, while at the same time there is a decrease in demand for cereals, fruits and vegetables (Valin et al., 2014; Herforth & Ahmed, 2015).

Conclusion

The research results show that:

- Hypothesis (H1) was confirmed because gender is a significant factor in the purchase of cereal products in the Republic of Serbia;
- Hypothesis (H2) is refuted because the level of education of consumers does not affect the purchase of cereal products in the Republic of Serbia;
- Hypothesis (H3) is confirmed because the financial situation of consumers affects the purchase of cereal products in the Republic of Serbia;
- Hypothesis (H4) is refuted because monthly receipts do not affect the purchase of cereal products in the Republic of Serbia.

The theoretical application of the results is reflected in the creation of profiles of consumers who buy cereal products in the Republic of Serbia and in other developing countries. Also, the theoretical application of the results is that the results can be the basis for a theoretical framework, ie. setting hypotheses in other studies.

The practical application of the results is reflected in the results that allow to effectively plan, implement and evaluate marketing strategies aimed at increasing use of cereal products in the Republic of Serbia, in the sense that it is based on gender and financial situation of consumers given that these demographic characteristics influence the purchasing decision when it comes to cereal products, that is, that the marketing strategy does not spend resources on consumer segmentation and everything that accompanies it according to monthly income and level of education.

The conducted research had certain limitations. The research was conducted through only one measurement, the obtained results were not confirmed as such once again, which affects the relevance of the obtained results. There are no data with which the

obtained results could be compared, whether they confirm already existing results or can be considered as results indicating an exception.

The conducted research opens space for future research of the cereals market, which would include a number of factors (attitude towards health and healthy lifestyle, knowledge of food and eating habits, sociological and psychological factors, the influence of marketing factors before the promotion of cereals) then possible longitudinal and comparative research between cities, states. Research of this type would be of great importance for producers of cereal products, since the production and trade of cereals in the world tend to grow significantly, and cereals provide more than half of the total daily energy value of meals in the world. Therefore, ensuring an adequate supply of cereals is key to maintaining the food security of each country. Also, it is necessary to make certain efforts in educating consumers about the benefits of healthier products, and cereals are considered the healthiest food due to their properties.

Conflict of interests

The authors declare no conflict of interest.

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LEGAL PROTECTION OF ENVIRONMENTS IN THE REPUBLIC OF SERBIA

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ABSTRACT

Forms of environmental protection in the Republic of Serbia, as a rule, include administrative, misdemeanor and criminal law protection. This paper deals with general considerations of criminal law protection of the environment, its significance and position in the criminal legislation of the Republic of Serbia, and the effects of the competent judicial and other bodies on its suppression. The research includes basic national legal standards in the field of criminal law protection of the environment and their chronological correlation. The paper contains an empirical research of statistical indicators within which the correlation of reported, accused and convicted persons (outcome of criminal proceedings) for crimes against the environment during the time period from 2006 to 2017 in the Republic of Serbia was investigated.

Introduction

The genesis development of environmental protection can be observed from two aspects. The first refers to the theoretical aspect, which includes theoretical research and contemplation of the environment, and the second includes legal protection, ie normative regulation of this area. If we look globally at therepresentation of enviromental problems (ecology) in theory (*International Webster New EncyclopedicDictionary of English*

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Language, 1973), the initial records theorists usually link to the period of the second half of the nineteenth century, ie to the publication of German biologist Ernest Haeckel entitled "History of Nature" from 1866 (Lilić, Drenovak, 2010). It is an indisputable fact that during the period of industrialization, environmental protection was moved to the second plan, whereby the primary goal of global society being focused on industrial development and economic progress. In such concept, the balance within the so-called "magic triangle", which includes three basic elements: ecological balance, economic security and social justice, was obviously disturbed. The development of the theoretical framework of environmental protection has contributed to the creation of environmental law as a new autonomous legal branch, and on the other hand, environmental safety occupies an important place in this new normative concept and is directly determined by criminal law protection (Brock, 1991) Criminal law norms of ecological character find their *ratio legis* in the fact that criminal sanctions suppress illegal actions of individuals and legal entities in the field of environmental law (Ćemalović, Jović, 2015). In addition to the fact that at the end of the last and the beginning of this century, environmental law recorded sudden tendencies of development, some regulations indicate that elements of this branch of law existed in the initial phase of development of legal science in general. The first significant document from this area that directly prescribed a certain type of environmental protection is the Budva Statute, from the ninth century, whose original provision translated from Italian language is: "I order that no one may throw garbage from the hallway or from the terrace or throw it on the road in any street in the city, under threat of a fine of 12 dinars, thereof half of it belongs to the court and half to the municipality" (Luketić, Bujuklić, Vučković, 1988 & Lukinović et al., 2020).

The subject of research in this paper includes the protection of basic natural values, ie protection of air, water (Petrović, Jović, Manojlović, 2015), land (Petrović, Jović, Manojlović, 2014) as well as flora and fauna. The main goal is to make a finding within the scientific description of legal provisions and empirical research of statistical indicators on the degree and scope of criminal law regulation of environmental protection and the efficiency of judicial and other bodies in the field of environmental protection. The research was conducted on the basis of available theoretical material, adopted legal regulations and published statistical bulletins.

Methodology and material

The methodological-theoretical framework in this paper is based on the application of scientific methods of historical, statistical, quantitative, qualitative, scientific description, correlation and methods of content analysis, which explore available sources in existing theory and empiricism on criminal environmental protection and what are the scope of that protection in the Republic of Serbia. Beside to the scientific goal the scope of legal protection which has to be explore, there is a social one, which could be called a strategic or broader reform goal, because it indicates the need for changes in scientific and professional understanding as well necessary changes in pre-investigation and criminal proceedings in Serbia, from this areas. Indicators from the

research are: scientific and professional legal literature, the number of filed criminal charges by the competent authorities for the commission of criminal offenses against the environment; the number of indictments filed by the prosecution; and the number of convictions handed down by the competent courts (Republic Institute for statistics Bulletins "Adult perpetrators of criminal offenses - reports, charges, convictions: Bulletin No. 490/2006; Bulletin No. 502/2007; Bulletin No. 514/2008; Bulletin No. 529/2009; Bulletin No. 546/2010; Bulletin No. 558/2011,; Bulletin No. 576/2012; Bulletin No. 588/2013; Bulletin No. 603/2014; Bulletin No. 617/2015; Bulletin No. 629/2016; and Bulletin No. 643/2017.). From the structure of work, sources and indicators, subjects and goals of the research, a theoretical-hypothetical framework is imposed, that the professional practice of criminal protection with its products of investigation procedure-criminal reports and criminal procedure-indictments and verdicts does not provide adequate environmental protection in the Republic of Serbia.

Results of theoretical research and discussions

Chronology of normative regulation of environmental protection

The criminal legislation of medieval Serbia did not issued legal protection of the environment, while the provisions of *Dušan's Legal Code* (Radojčić, 1960), as a rule, represented a private reaction to a crime, and the framework of legal protection of the so-called "common good" was quite restrictive. Until the codification of national criminal legislation and the enactment of the "Criminal Penal Code" of 1860, and the enactment of the first modern Criminal Code from year 1947 ("Official Gazette of the FPRY", No. 106/1947), the field of environmental protection remained outside the scope criminal law regulations. By the provisions of the Criminal Code from year 1951 ("Official Gazette of the FPRY", No. 13/1951) refers to nine criminal offenses by which environment was protected (criminal offenses against the *national economy*), according to the object of protection known to today's criminal legislation These criminal offenses were issued according to the following legal qualification: neglect of land cultivation and raising cattle; pests in agriculture; production of harmful means for the treatment of livestock; negligent provision of veterinary assistance; transmission of infectious diseases in animals, plants and trees; contamination of animal feed or water; devastation of forests; illegal hunting and illegal fishing. Furthermore, the provisions of the Law on Amendments to the Criminal Code from year 1959 ("Official Gazette of the FPRY", No. 30/1959) introduce certain changes for existing criminal offenses and the framework of environmental protection is expanded with new incriminations, issueded within two criminal offenses (criminal offense of destruction of orchards using harmful substances and criminal offense of forest theft). According to further chronology, we find out that until 1977, this area remained unchanged.

In the Criminal Code of 1977 ("Official Gazette of the SRS", No. 26/1977), criminal offenses against the environment were issued within two legal chapters, ie two groups of criminal offenses, as follows: 1) within framework of criminal offenses *against*

human health and the human environment and 2) in the framework of crimes *against the economy*. In comparison with the Criminal Code from 1951 and 1959, we notice that the number of criminal offenses in this area has increased by one criminal offense, and that the names and legal characteristics of certain offenses have been changed. As for the penal policy, in the law from 1977, it was mitigated for some criminal acts and aggravated for some. Finally, the amendments to the Criminal Legal Code from 2003 ("Official Gazette of RS", No. 39/2003) new incriminations were introduced, ie two new criminal offenses within the group of criminal offenses against the economy, namely: *destruction and damage to specially protected natural goods and the* criminal offense *of taking abroad, without a permit*, a *specially protected plant or animal species.*

New legal solutions in the field of criminal law of the environment protection

With the adoption of the now valid Criminal Code from 2005 ("Official Gazette of RS", No. 85/2005), for the first time, all criminal offenses against the environment were unified and classified within a separate legal chapter. Compared to previous legal solutions, now, the framework of criminal law protection has been significantly expanded and penal policy has been tightened. With new legal solutions, environmental protection has, formally speaking, gained importance (Salzman, Thompson, 2003), creating preconditions for achieving the concept of stable environmental safety (Jović, et.al., 2019), which confirms the justification of the initiative of the eighties of the last century, in orderto integrate environmental factors into the concept of global security (Dimitrijević, 2010).

Crimes against the environment belong to the group of crimes that occupy the sixth place (out of a total of 23 groups) according to the number of issued acts in the Criminal Code, so they are characterized by their number and diversity, and criminal law theory classifies this type of crime into four categories (Čejović, 2006). The first category includes seven criminal offenses (*general criminal offenses against the environment*), which, as a rule, endanger the environment to the greatest extent. The following criminal offenses are classified in this category: *environmental pollution; failure to take measures for eniveronmetal protection; illegal construction and commissioning of facilities and plants that pollute the environment; damage to facilities and devices for environmental protection; environmental damage; destruction, damage, taking abroad and bringing into Serbia a protected natural good and the criminal offense of violation of the right to information about the state of the environment.* The second category (*criminal offenses related to hazardous substances)* includes two criminal offenses, namely: *introduction of hazardous substances into Serbia and illicit processing, disposal and storage of hazardous substances* and the criminal offense of illicit c*onstruction of nuclear facilities,* while the third category *(criminal offenses* against flora and fauna), also includes the following seven criminal offenses: *killing and abusing animals; transmission of infectious diseases in animals and plants; negligent provision of veterinary assistance; production of harmful agents for the treatment of animals; contamination of food and water for feeding, ie feeding animals; devastation of forests* and the crime of forest

theft. The fourth category includes two criminal offenses (criminal offenses of illegal hunting and fishing), which include *illegal hunting* and *illegal fishing.*

Within the amendments to the now valid Criminal Code, the first of which was in 2009, and the last in 2019 ("Official Gazette of RS" No. 72/2009), " Official Gazette of RS ", No. 111/2009); 2012, ("Official Gazette of RS", No. 112/2012); year 2013, ("Official Gazette of RS ", No. 104/2013); year 2014, " Official Gazette of RS ", No. 108/2014); year 2016, " Official Gazette of RS ", No. 94/2016); year 2019, and " Official Gazette of RS", No. 35/2019), for certain criminal offenses, certain changes and additions have been made in terms of penal policy. The Law on Amendments to the Criminal Code of 2009 ("Official Gazette of the RS", No. 72/2009) for criminal offenses of *environmental pollution, failure to take environmental protection measures, ingest of dangerous substances into Serbia and illicit processing, disposal and storage of dangerous substances, killing and abuse of animals, and the crime of contamination of food and water for food, ie watering animals,* penal policy has been tightened. As for the amendments to the Criminal Code that followed in 2019, it referred only to the crime of *killing and abusing animals,* in terms of tightening the penal policy, within which the basic form of the crime was the previous prison sentence of up to one year, increased to imprisonment for up to two years, and for the second more serious form of crime the previous lower limit of imprisonment of three months was increased to imprisonment of six months, while the upper limit of up to three years for this form remained unchanged

Crimes against the environment are among the offenses for which, for all acts, prosecution is *undertaken* ex officio, and imprisonment is determined in the range of up to one to ten years. It is also significant the legal provision according to which the court may, in cases where pronounces a suspended sentence, impose an obligation on the convicted person to take the determined measures for the protection and preservation of the environment, ie measures to eliminate harmful consequences for the environment, which have occurred by committing a crime (Stojanović, Perić, 2002).

Findings of empirical research and discussion

Empirical research includes scientific statistical, quantitative, qualitative analysis and scientific correlation of findings from available databases / indicators expressed in the number of reported, accused and convicted adults for the period from 2006 to 2017, in the area of the Republic of Serbia.

In *(Table 1.)* shows the result of the findings from the correlation of the total number of reported, accused and convicted adults for all crimes, in relation to the total number of reported, accused and convicted persons for crimes against the environment. From this research, we find that the number of reported persons for crimes against the environment has a share in the total number of reported persons for all crimes, of only 1.90%, with the number of accused having a share of 2.58% and the number of convicted 2.44%. Investigating criminal offenses against the environment, we find that

of the total number of reported persons, 71.18% were indicted and 50.22% convicted, while 70.56% of the total number of accused persons were convicted.

Table 1. Number of reported, accused and convicted adults for all criminal offenses and for criminal offenses against the environment on the territory of the Republic of Serbia

Year	*Reported persons*	*Accused persons*	*Convicted persons*
2006	105.701 - **2.009**	55.369 – **1.430**	41.422 – **1.009**
2007	98.702 – **1.831**	48.903 – **1.203**	38.694 - **917**
2008	101.723 – **1.895**	53.035 - **858**	42.138 - **633**
2009	100.026 – **2.081**	50.404 – **1.068**	40.880 - **619**
2010	74.279 – **1.568**	27.860 - **917**	21.681 - **333**
2011	88.207 – **1.809**	39.439 - **635**	30.807 - **449**
2012	92.879 – **1.841**	41.621 - **632**	31.322 - **430**
2013	91.411 – **1.996**	45.704 – **1.039**	32.241 - **508**
2014	92.600 – **2.148**	48.425 - **895**	35.376 - **589**
2015	108.759 – **2.205**	42.030 - **780**	33.189 - **549**
2016	96.237 – **2.507**	39.610 - **631**	32.525 - **472**
2017	90.348 – **2.187**	37.752 - **610**	31.759 - **512**
In total	1.140.872 - **24.077**	530.152 - **10.698**	413.034 - **7.020**

Source: Republički zavod za statistiku

The (*Table 2.*) shows the statistical indicators of the total number of reported, accused and convicted adults for crimes against the environment, expressed cumulatively, according to the structure of all crimes. This research shows that the largest number of persons were reported, accused and convicted for criminal offenses from the group of offenses against flora and fauna, namely: *forest theft,* with a share of 74.39%; *killing and abuse of animals*, with a share of 7.43%; *illegal hunting*, with a share of 6.48%, *devastation of forests*, with a share of 5.71% and *illegal fishing*, with a share of 3.10%. The share of the number of persons reported for these criminal offenses comparing to all other criminal offenses against the environment is 97.11%, while the share of the accused is 43.51%, ie the share of convicted 28.56%. Furthermore, the research shows that the highest percentage of lost crimes in the correlation of reported, accused and convicted persons, refers to the crime of *killing and abusing animals*, which indicates that animal's welfare is greatly endangered (Petrović, Jović, Manojlović, 2018). Namely, out of the total number of reported persons for this crime, only 19.46% were charged and 13.76% were convicted. The share of convicts in relation to the accused for this crime is 70.69%, which indicates that the crime is mostly lost in the phase of pre-investigation procedure (rejected criminal report), ie investigation procedure (suspended investigation) and accusation (indictment not filed).

Table 2. Number of reported, accused and convicted persons according to the structure of criminal offenses

Type of criminal offense	*Reported persons*	*Accused persons*	*Convicted persons*
Environmental pollution	154	32	8
Non-taking measures for environmental protection	80	32	15
Illegal construction and commissioning of facilities and plants that pollute the environment	8	1	3
Damage of buildings and devices for environmental protection	14	2	2
Environmental damage	96	40	25
Destruction, damage, taking abroad and bringing into Serbia a protected natural asset	166	61	54
Importation of dangerous substances into Serbia and illegal processing, disposal and storage of dangerous substances	20	6	6
Illegal construction of nuclear plants	2	1	1
Violation of the right to information on the state of the environment	11	0	0
Killing and abusing animals	1788	348	246
Transmission of infectious diseases in animals and plants	28	18	13
Unconscientious provision of veterinary assistance	32	5	0
Production of harmful agents for the treatment of animals	14	12	11
Contamination of food and water for food, ie feeding animals	70	13	6
Forest devastation	1376	640	498
Forest theft	17911	8401	5344
Illegal hunting	1561	598	347
Illegal fishing	746	488	441
In total	24.077	10.698	7.020

*Source:*Republički zavod za statistiku

According to the findings from the research in (*Table 3.*), which refer to the type of decision in the pre-investigation (Jović, 2014) procedure and the investigation procedure for reported persons, according to the structure of all criminal offenses against the environment, we find that in many cases application is rejected. As a percentage, the number of reported persons against whom criminal charges for all crimes against the environment were rejected is 36.01%, while the investigation was terminated in only four cases, and the suspension of the investigation followed in slightly less than 1%. Dismissal in the criminal offenses for which the largest number of persons is reported varies, and those for the offense of *forest theft* are in amount of 34.48%, for the offense of *illegal hunting* 45.93%, then for the offense of *killing and abusing animals* is 35.63%, and for the offense *illegal fishing* is 30.97%. The findings from the research indicate that the number of rejected criminal charges for criminal offenses belonging to the group of

general criminal offenses against the environment is the largest, and it is in amounts of 61.06%. These findings, on the one hand, confirm the complexity of proving criminal offenses from this group (Busarčević, et. al., 2001), and on the other hand indicate the need to increase the efficiency of the evidentiary procedure (Lazarević, 2006).

Table 3. Number of registered adults according to the type of decision

Type of criminal offense	*Application rejected*	*Terminated investigation*	*Suspended Investigation*
Environmental pollution	90	0	2
Non-taking measures for environmental protection	54	0	6
Illegal construction and commissioning of facilities and plants that pollute the environment	6	0	0
Damage of buildings and devices for environmental protection	6	0	1
Environmental damage	41	0	1
Destruction, damage, taking abroad and bringing into Serbia a protected natural asset	116	0	0
Importation of dangerous substances into Serbia and illegal processing, disposal and storage of dangerous substances	1	0	0
Illegal construction of nuclear plants	1	0	0
Violation of the right to information on the state of the environment	10	0	0
Killing and abusing animals	637	0	12
Transmission of infectious diseases in animals and plants	19	0	0
Unconscientious provision of veterinary assistance	15	0	0
Production of harmful agents for the treatment of animals	2	0	0
Contamination of food and water for food, ie feeding animals	17	0	0
Forest devastation	532	1	14
Forest theft	6176	3	136
Illegal hunting	717	0	24
Illegal fishing	231	0	1
In total	8.671	4	197

Source: Republički zavod za statistiku

Quantitative qualitative analysis of the findings from (*Table 4.*), which refers to the type of decision for the accused, finding is that in most of the cases, the accused were found guilty, which makes a total of 69. 07%. The number of accused persons against whom the proceedings were suspended is the lowest and it amounts to 8.13%, with the number of accused persons acquitted of the charge being 10.21%, and the number of accused against whom the charge was rejected being 13.68%. Observed by the structure of

criminal offenses, the number of accused found guilty of the most numerous criminal offenses also varies, and its share for the criminal offense of *forest theft* is 68.37%, then for the criminal offense of *forest devastation* 73.59%, for the criminal offense of *killing* and *abusing animals* 70.69% , then the crime of *illegal hunting* 59.25%, or for the crime of *illegal fishing* 88.73%. Regarding the investigation by groups of criminal offenses, as was the case with the reported persons, the smallest number of accused found guilty relates to general criminal offenses against the environment, and it is 63.69%, which also indicates the need to increase the efficiency of the judiciary procedure and procedure for legal remedies.

Table 4. Number of accused adults by type of decision

Type of criminal offense	*Procedure suspended*	*Acquitted from charge*	*The charge was denied*	*Found guilty*
Environmental pollution	0	16	3	8
Failure to take environmental protection measures	7	7	4	15
Illegal construction and commissioning of facilities and plants that pollute the environment	0	0	0	1
Damage to buildings and devices for environmental protection	0	0	0	2
Environmental damage	4	5	4	27
Destruction, damage, taking abroad and bringing into Serbia a protected natural asset	6	2	3	54
Importation of dangerous substances into Serbia and illegal processing, disposal and storage of dangerous substances	0	0	0	6
Illegal construction of nuclear plants	0	0	0	0
Violation of the right to information on the state of the environment	0	0	0	0
Killing and abusing animals	23	46	27	246
Transmission of infectious diseases in animals and plants	2	3	3	12
Unconscientious provision of veterinary assistance	0	1	4	0
Production of harmful agents for the treatment of animals	1	0	0	5
Contamination of food and water for food, ie feeding animals	2	3	3	6
Forest devastation	43	53	62	471
Forest theft	690	789	1265	5744
Illegal hunting	69	131	58	349
Illegal fishing	23	36	27	443
In total	870	1092	1463	7389

Source: Republički zavod za statistiku

Examining the data from (*Table 5.*), which refer to the imposed criminal sanctions, we find that in most cases, a suspended sentence was imposed against convicted persons, which makes a total of 57.21%. The court reprimand was issued in the smallest number of cases, with a share of 1.45%, while the fine is the second in the number of imposed criminal sanctions and it is 26.35%. Imprisonment was imposed in a small number of cases and it is only 12.83%. From the research related to the structure of imprisonment, we find that in most cases this sentence was imposed for a period of 3 to 6 months, a total of 27.75%, and imprisonment for a term of 2 to 3 months, which is 25.75%. The most severe imprisonment sentence for crimes against the environment is 2 to 3 years, this sentence was imposed in only eleven cases during the investigation period, in seven cases for the crime of *forest theft*, and in one case for crimes of *forest devastation*, *environmental damage* and *illegal*.

Table 5. Number of convicted adults according to the imposed criminal sanctions

Type of criminal offense	*Prison sentence*	*Amercement (fine)*	*Probation*	*Court reprimand*
Environmental pollution	1	1	7	0
Failure to take environmental protection measures	6	2	8	0
Illegal construction and commissioning of facilities and plants that pollute the environment	1	0	0	0
Damage to buildings and devices for environmental protection	2	0	1	0
Environmental damage	7	3	14	0
Destruction, damage, taking abroad and bringing into Serbia a protected natural asset	9	5	40	0
Importation of dangerous substances into Serbia and illegal processing, disposal and storage of dangerous substances	2	1	3	0
Illegal construction of nuclear plants	1	0	0	0
Violation of the right to information on the state of the environment	0	0	0	0
Killing and abusing animals	22	83	126	10
Transmission of infectious diseases in animals and plants	4	3	0	0
Unconscientious provision of veterinary assistance	0	0	0	0
Production of harmful agents for the treatment of animals	0	1	10	0
Contamination of food and water for food, ie feeding animals	1	1	4	0
Forest devastation	37	170	276	7

Type of criminal offense	*Prison sentence*	*Amercement (fine)*	*Probation*	*Court reprimand*
Forest theft	732	1372	3069	77
Illegal hunting	28	106	197	4
Illegal fishing	48	102	261	4
In total	901	1850	4016	102

Source: Republički zavod za statistiku

Conclusion

The level of criminal protection of the environment during the past years, as the findings from the research indicate, as very low level. Despite the fact that Serbia has adopted a wide range of legal regulations in the field of environmental protection in a relatively short period, it can be noticed that the prosecution has problems with filed criminal charges, which are especially negatively correlated between reported and accused, ie convicted persons.

The findings from the research indicate that judicial and other state bodies are reluctant to engage in proving those criminal offenses thus procedure of proving is complex in nature and requires a higher level of expertise and persistence. The fact that general crimes that endanger the environment the most and whose proof is the most complex, represented only 1.99% in the total number of crimes in this area, indicates disrespect for the basic constitutional principle relating to the *right of everyone to a healthy environment and to timely and complete be informed of her condition*.

The competent state authorities obviously deal only with criminal offenses for which they can easily collect material evidence *(forest theft, forest devastation, killing and abuse of animals, illegal hunting, illegal fishing),* hence these offenses are the most numerous (but with a very mild criminal record policy), while for general criminal offenses against the environment, the proof of which is based on expert findings or other documents, and for which a higher level of expertise and knowledge is necessary, in addition to being insignificant in terms of the number of detected, criminal proceedings are generally not ending with a conviction.

In order to improve the situation in the field of detection and proof of criminal offenses against the environment, it is necessary to apply adequate criminal and penal policy, primarily in the field of recognizing and timely responding to incriminations that endanger the environment, professional training and technical training of bodies and institutions which are involved in the procedure of proving these criminal offenses, especially if we keep in mind the fact that the greatest loss of crime occurs in the phase of pre-investigation procedure, ie the procedure of investigation and accusation.

Conflict of interests

The authors declare no conflict of interest.

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AGRICULTURE 4.0 AND IMPROVING COMPETITIVENESS OF THE DOMESTIC AGRO-FOOD SECTOR

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ABSTRACT

The domestic agro-food sector has an important role in economic development and in overall GDP growth. The concept of Agriculture 4.0 that integrates the use of information-communication technologies presents a direction in which the domestic agriculture sector should focus. Additionally, besides conducting business within the frameworks of Agriculture 4.0, the standardization of processes in the agro-food sector can also contribute to achieving competitiveness on the globalized market. In this paper the importance and number of ISO standards are investigated. In addition, factors and indicators that characterize Agriculture 4.0 are analysed. Based on the collected and analysed data, a unified competitiveness factor (UCF) is calculated for the period from 2017 to 2020. The UCF provides and overview on the potential competitiveness of the domestic agro-food sector. The paper contributes to the existing body of literature as it managed to provide a strong basis for future research in this domain.

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Introduction

In this research the digitalization of agriculture - Agriculture 4.0, the necessity of standardization, the importance of highly finalized and processed agricultural products are analysed. Data from FAO, ISO and other organizations was collected and analysed in order to derive significant insight into the competitiveness of the domestic agro-food sector. Additionally, potential future trends are discussed, which are accompanied by suggestions and guidelines for improving the Serbian agricultural sector in accordance with the concepts that are part of Agriculture 4.0. This explorative research is significant as it addresses crucial competitiveness factors in the domestic agro-food sector in the context of Agriculture 4.0, which can be viewed as a concept within framework of Industry 4.0. In addition, it takes into consideration recent studies and the newest available data, thus it contributes to the existing body of literature.

This paper consists of four sections (excluding the Introduction and Conclusion sections). The first section provides details on the materials and methods. More precisely, the data sources and the approach to data analysis are described. In the second section the importance of ISO standards and ICTs are noted and additional data on ISO standards is provided. In the third section the concept of agriculture 4.0 is highlighted and the crucial role of highly processed, finalized products in competitiveness is highlighted. Additionally, a unified competitiveness factor (UCF) is calculated with the goal to identify the future potential competitiveness of the domestic agro-food sector. From here, graphs for predicting future trends are presented. In the fourth section the results are briefly discussed, suggestions and guidelines for improving competitiveness of the domestic agro-food sector are proposed.

Competitiveness, ICT and the importance of standardization

Traditional approaches to agriculture and the overall food industry are no longer viable due to increasing food demands. More precisely, by 2050 the demand for food will rise by up to 70% (De Clercq et al., 2018). This increase in demand further increases production. However, this production has to be improved and revolutionized in order to reduce water and energy consumption, and to achieve higher quality foods, higher yields with less pesticides and fertilizers. Further, the concept of the fourth evolution in farming technology - Agriculture 4.0 arises and it aims at increasing productivity, adapting to climate change laws and requirements, avoiding waste and effectively allocating resources (Zhai, et al., 2020). It can be argued that Agriculture 4.0 includes modern information-communication technologies (ICTs), which are the cornerstone of the fourth industrial revolution - Industry 4.0. Next, in order to achieve the aims and strategic goals that are outlined in the Agriculture 4.0 approach, it is necessary to digitalize farming procedures and supply chains in order to reduce the consumption of water, fertilizers, and pesticides.

The digitalization of the agro-food sector includes the implementation and application of robots, moisture sensors, temperature sensors, GPS technology, and aerial images

(De Clercq et al., 2018). Furthermore, the domestic agro-food sector is characterized with the process of standardization of agro-products with the goal to increase regional competitiveness (Ikram et al., 2020). However, the majority of standards that are applied in the Balkans, more precisely in Serbia, are mainly mandatory standards, which don't contribute significantly to the competitiveness of the domestic agro-foods sector (Ćoćkalo et al., 2019). The lack of national competitiveness additionally affects the competitiveness of the domestic agro-food sector. Low productivity, minimal standardization, and old farming equipment significantly contribute to the inadequate competitive ability of the Serbian agricultural sector (Bešić et al., 2014).

Furthermore, the modern business environment is characterized by constant changes on the globalized market. These changes are increasing and intensifying over time and present a challenges for enterprises in all industrial sectors (Đorđević, et al., 2016). In order to stay relevant on the market, enterprises have to meet customers' demands and expectations, and to provide high, consistent levels of product and service quality in order to increase customer satisfaction (Popović, & Miletić, 2016; Milojević et al., 2020). When it comes to overall competitiveness of the domestic economy, according to the latest rankings noted in the Global Competitiveness Report 2019 (WEF, 2019), Serbia is ranked 72nd (out of 141). In the same report, neighbouring countries and countries in the region are ranked as follows: Albania 81st; Austria 21st; Bosnia and Herzegovina 92nd; Bulgaria 49th; Croatia 63rd; Greece 59th; Hungary 47th; Montenegro 73rd; North Macedonia 82nd; and Slovenia 35th (WEF, 2019). It is evident that Serbia has room for improvement regarding its competitiveness ranking. ICT adoption, the financial system, and the institutions have to be improved in order to increase national competitiveness. Significant investments into to the ICT sector and the application of ICT in other sectors is crucial for economic growth (Domazet et al., 2018).

ICT adoption in the agriculture sector is a prerequisite for Agriculture 4.0, which brings improvements when it comes to agricultural development (Simonović, Ćurčić, 2018). Further, standardization of business operations can improve productivity, increase product and service quality, and increase the competitive advantage on the market (Miletić et al., 2020). The importance of standards is present in the agriculture sector, as the increase of ISO standards can improve product quality and increase competitiveness when it comes to export of agricultural goods (Aničić, Paraušić, 2020). Next, in Table 1., the number of ISO standards in all sectors for 2018 and 2019, for Serbia and neighbouring countries is presented.

Table 1. Number of ISO standards in Serbia and region (all sectors)

Country	ISO 9001		ISO 14001		ISO/IEC 27001		ISO 50001		ISO/IEC 20000	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Albania	214	363	144	151	19	33	4	8	3	1
Austria	3282	3325	1079	1052	157	81	237	236	9	/
Bosnia and Herzegovina	1346	935	291	742	24	31	12	11	/	/

Country	ISO 9001		ISO 14001		ISO/IEC 27001		ISO 50001		ISO/IEC 20000	
Bulgaria	5943	6278	1946	1993	339	367	181	252	92	95
Croatia	2343	2715	1027	1182	138	190	136	194	10	15
Greece	6165	6570	1415	1542	240	336	81	109	13	17
Hungary	6658	7107	2391	2547	484	554	613	472	30	26
Montenegro	137	163	63	91	11	11	/	/	/	/
North Macedonia	436	502	306	292	33	30	6	3	25	/
Romania	9299	9506	4553	4658	585	654	58	57	51	42
Serbia	2427	2707	1169	1275	223	258	73	87	22	10
Slovenia	1710	1761	432	468	80	31	30	27	/	/

Source: ISO, 2019

According to Table 1., there is an increase of ISO standards in Serbia from 2018 to 2019. The largest number of standards is noted in Romania, followed by Greece, and Bulgaria on the third place by the number of ISO standards.

Overall, the number of standards in Serbia is not adequate, improvement is necessary, however, there is a solid base when it comes to the current number of ISO certificates. Next, in Table 2. the number of ISO standards in the agriculture sector for 2018 and 2019, for Serbia and neighbouring countries is presented.

Table 2. Number of ISO standards in Serbia and region (agriculture sector)

Country	ISO 9001		ISO 14001		ISO/IEC 27001		ISO 50001		ISO/IEC 20000		SUM
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2019
Albania	2	2	1	2	/	/	/	/	/	/	7
Austria	2	2	/	1	/	/	/	/		/	4
Bosnia and Herzegovina	5	4	3	3	/	/	/	/	/	/	15
Bulgaria	236	315	42	38	11	9	/	/	/	/	631
Croatia	22	28	12	13	/	/	/	/	/	/	75
Greece	33	41	4	4	/	/	/	/	/	/	82
Hungary	35	56	5	10	/	/	1	/	/	/	106
Montenegro	1	1	1	1	/	/	/	/	/	/	4
North Macedonia	/	2	/	3	/	/	/	/	/	/	5
Romania	20	41	11	23	/	/	/	/	/	/	95
Serbia	19	18	6	4	/	/	1	1	/	/	49
Slovenia	3	3	/	/	/	/	/	/	/	/	6

Source: ISO, 2019

Based on the data in Table 2., Serbia has 49 ISO standards in the agriculture sector, and this number should be higher, considering the importance of the agriculture sector from the aspect of national economic growth (Tomić, Radanov, 2020). Therefore, it can be argued that this number is inadequate, and there should be an increase in number

of standards in the agriculture sector. Further, the ISO 22000:2018 standard for food and safety management systems that defines the requirements for any organization in the food chain, plays a significant role in the agriculture sector as well as sectors that are directly or indirectly connected to the agriculture sector. The ISO 22000 standard can implemented and used by every participant in food supply chains. Therefore, in the context of competitiveness of the domestic agro-food sector, ISO 22000 provides a cornerstone of food safety improvement, food quality improvement, reducing costs in supply chains, and increasing customer trust (Chen et al., 2019). In Table 3. the number of ISO standards for 2018 and 2019 (latest data) in Serbia and neighboring countries is presented.

Table 3. Number of ISO 22000 standards in Serbia and other countries

Country/year	AL	AU	BH	BU	CRO	GR	HU	MN	NM	RO	SRB	SLO
2018	29	72	30	324	59	1912	127	13	61	653	216	12
2019	12	82	20	310	58	2024	126	12	54	639	195	13
Legend: AL - Albania; AU - Austria; BH - Bosnia and Herzegovina; BU - Bulgaria; CRO - Croatia; GR - Greece; HU - Hungary; MN - Montenegro; NM - North Macedonia; RO - Romania; SRB - Serbia; SLO – Slovenia												

Source: ISO, 2019

The data in Table 3. indicates that. compared to neighbouring countries, Serbia has a moderate number of ISO 22000 standards, thus it can be argued that there is a basis for further development in the agro-food sector. In the next section, Agriculture 4.0, the necessity for highly processed agricultural products, and the potential competitiveness of the domestic agro-foods sector are addressed.

Data and methods

The globalization of markets and the changes that are brought on by the fourth industrial revolution - Industry 4.0 significantly affect the process of achieving and maintaining competitiveness on the market, regardless of industry (Bakator et al., 2019). This lack of competitiveness of domestic enterprises is evident in the agro-food sector as well.

The research was carried out for over a month where spreadsheets were collected, and data extracted, categorized for comparison and analysis. Data on the number of ISO standards was obtained via the ISO database with the latest data (ISO, 2019). Further, data regarding the agro-food sector was obtained from the Food and Agriculture Organization of the United Nations (FAO, 2021). Next, data on the implementation and application of information-communication technologies (ICT) in domestic enterprises was obtained from the Statistical Office of the Republic of Serbia (RSZ, 2021). Additionally, information and data was obtained and analysed from other studies in this domain.

Data analysis included data categorization, deduction, and qualitative correlation analysis. In addition, graphs presenting future potential trends are modelled. In addition,

several metrics in the agricultural sector (water consumption, production, industry valued GDP, agriculture valued GDP etc.). In addition, data regarding the digitalization of domestic enterprises was obtained and analysed. Through categorization and tabular comparison of data it was managed to develop comprehensive tables that present the competitiveness of the domestic agro-food sector. Further, graphs indicating trends are modelled in order to provide an overview on the strategic potential of the domestic agro-food sector in the future.

The obtained results, presented in these tables and graphs, are further examined in the discussion section. Here, suggestions and guidelines for improving the domestic agro-food sector within the frameworks of Agriculture 4.0 are proposed. The suggestions and guidelines are based on the obtained results. More precisely, the current situation regarding the competitiveness of the domestic agro-food sector, and future potential trends are the cornerstones of the noted suggestions and guidelines.

Agriculture 4.0 and the potential of the domestic agriculture sector

Digitalized agricultural production, and the effects of ICT application in farming are mainly positive as they contribute to productivity, water use efficiency, and less pesticide use (Klerkx et al., 2019). However, the use of advanced technologies such as artificial intelligence systems, robotics, Big Data Analytics, and Internet of Things should be strategically implemented, as these changes have societal effects besides economic effects (Rose, Chilvers, 2018). As agricultural production is faces challenges when it comes to yield, pesticide use, and sustainable development, the use of technologies that are within the framework of Agriculture 4.0 slowly becomes an imperative (Ozdogan et al., 2017). Besides the noted necessity for modern ICT use in the agro-food sector, it is necessary to process and finalize agricultural products to the highest degree, as such products bring the most value when exported (Đurić et al., 2017). This further indicates the necessity for higher number of standards (Wilcock, Boys, 2017).

Standards in the agro-food sector can be implemented from various aspects, including products, ICT, and environment sustainability. More precisely, the implementation of the ISO 14001 standard provides a solid basis for sustainable development in the agro-food sector, where the environment is not uncontrollably exploited, but rather strategic actions are introduced in in order to comply with the ISO 14001 standard, which further increases environmental protection and preservation (Carrillo-Labella et al., 2020; Zhao et al., 2020). Standardization of finalized products positively affects exports of agricultural products (Kim, 2021).

It can be argued that Agriculture 4.0 goes along and relies on modern ICT adoption, standardization, and highly finalized products that have higher value compared to raw or semi-processed products. In Table 4., the agriculture gross value added to GDP for the period of 2003 to 2017, for Serbia and neighbouring countries is presented.

Table 4. Agriculture value added to GDP in % (and in millions of US)

Country	2003-2007	2008-2012	2013-2017
Albania	17.15% (1.831)	18.77% (2.312)	19.01% (2.476)
Austria	1.42% (5.505)	1.35% (5.521)	1.20% (5.033)
Bosnia and Herzegovina	7.71% (1.215)	6.14% (1.057)	5.60% (1.012)
Bulgaria	4.65% (2.066)	4.41% (2.345)	4.04% (2.995)
Croatia	3.73% (2.242)	3.34% (1.886)	2.94% (1.624)
Greece	3.04% (9.673)	3.24% (7.954)	3.70% (7.540)
Hungary	3.49% (4.887)	3.91% (5.012)	3.80% (5.374)
Montenegro	7.23% (266)	7.45% (304)	6.85% (332)
North Macedonia	8.93% (744)	9.11% (887)	7.87% (890)
Romania	5.50% (9.605)	4.67% (8.002)	4.31% (9.131)
Serbia	8.28% (3.336)	7.53% (3.069)	6.02% (2.656)
Slovenia	2.05% (983)	1.96% (914)	1.85% (899)

Source: FAO, 2021

The Food and Agriculture Organization of the United Nations (FAO, 2021), only has data up to 2017. The Statistical Office of the Republic of Serbia has data from 2018 to 2020, where the agriculture gross added value to GDP in 2018 was 7%, in 2019 was 6.9%, and in 2020 was 7.5%. (RZS, 2018; RZS, 2019). It is also noted that the agriculture gross added value to GDP is an important factor that made the COVID-19 pandemic and economic crisis less impactful on the overall GDP loss in 2020 (Danas, 2020). The real growth of the agricultural sector in 2007, 2012, and 2017 was -11.4%, 15.1% and 1.6% respectively (FAO, 2021). The latest growth rate has to be improved as the agricultural sector is a strong cornerstone of the domestic economy (Gligorijević et al., 2020). Next, in Table 5 the percentage of agricultural water withdrawal from the total renewable water sources and irrigated agriculture water use efficiency in 2007, 2012, and 2017 for Serbia and neighbouring countries is presented.

Table 5. Agriculture water withdrawal as % of total renewable water sources (and Irrigated Agriculture Water Use Efficiency (US$/m^3)

Country	2003-2007	2008-2012	2013-2017
Albania	1.76 (0.708)	1.98 (1.444)	3.00 (1.220)
Austria	0.11 (3.148)	0.010 (3.484)	0.10 (3.365)
Bosnia and Herzegovina	/ /	/ /	/ /
Bulgaria	3.28 (0.116)	4.46 (0.081)	3.92 (0.092)
Croatia	0.003 (10.23)	0.034 (1.124)	0.072 (1.496)
Greece	12.37 (0.464)	12.11 (0.387)	13.22 (0.440)
Hungary	0.296 (0.431)	0.31 (0.651)	0.499 (0.332)
Montenegro	/ (/)	/ (3.66)	/ (45.85)
North Macedonia	1.96 (1.564)	21.14 (0.169)	5.14 (0.682)
Romania	0.518 (0.258)	0.515 (0.263)	0.703 (0.270)
Serbia	0.079 (/)	0.385 (0.149)	0.407 (0.122)
Slovenia	0.014 (/)	0.007 (6.651)	0.012 (4.117)

Source: FAO, 2021

Based on the data in Table 5. it can be seen that in Serbia agriculture water withdrawal as of total renewable water sources is 0.407%. This number is low compared to Greece (13.22%), North Macedonia (5.14%), Bulgaria (3.92%), and Albania (3%). In order to become competitive within the frameworks of Agriculture 4.0. it is necessary address this factor.

Next, in Table 6. the percentages of ICT application in domestic enterprises from all sectors are presented.

Table 6. Information-communication technology application in enterprises (all sectors)

	2017	2018	2019	2020
Internet connection in Serbian enterprises	99.7%	99.8%	99.8%	100%
Broadband, fast Internet connections in Serbian enterprises	98.6%	98.8%	97.1%	98.4%
Mobile Internet use in domestic enterprises	81.9%	75.4%	79.1%	77%
Domestic enterprises that have a website	82.6%	82.6%	83.6%	84.4%
Website has the function of online purchasing	18.7%	25.1%	28.9%	28.1%
E-commerce	23.8%	26.3%	27.5%	27.9%
Use of Cloud applications	15.5%	15.5%	21.9%	18.6%
Average %	60.11	60.5	62.56	62.06

Source: RZS, 2021

Based on the data presented in Table 6., there is an increase in ICT solution implementation and application across various sectors. The lowest percentages are noted in the E-commerce sector and in the application of cloud-based solutions.

Quantification and integration of values from Tables 2., 4., 5., and 6. is conducted in order to create a unified competitiveness indicator of the domestic agro-food sector. The unified competitiveness indicator takes into consideration:

- the number of ISO standards in the domestic agriculture sector (label: **ISODA**);
- the agriculture value added to GDP in % (label: **GDPA**);
- real growth in % of gross value added (GVA) of the agriculture, forestry and sighing sector (label: **GVAG**)
- agriculture water withdrawal as % of total renewable water sources (label: **AWW**);
- irrigated agriculture water use efficiency (US$/m3) (label: **AWUE**);
- and the average potential of information-communication technology (ICT) application in domestic enterprises (label: **ICTDE**).

The noted indicators are chosen as these encompass several key concepts that characterize Agriculture 4.0. These concepts are standardization as a mechanism to improve international presence (export potential) (Caetano, 2017); agriculture % of total GDP as an indicator of how agriculture affects the performance of the overall domestic economy (Aničić, et al., 2016); agriculture GVA real growth in % as this can show what trends are present in the agriculture sector when it comes to growth; agriculture water withdrawal % of total renewable water sources present a key indicator within Agriculture 4.0, as one of the goals are to increase the use of water from renewable resources (Velasco-Muñoz et al., 2018); water use efficiency from agriculture irrigation has the same impact and importance as using water from renewable sources and together are also important factors for sustainable development (Aznar-Sánchez et al., 2018); the potential of ICT implementation and application present a driving mechanism of agriculture development as it can increase productivity, yield, and contribute to the increase of production of highly processed agricultural products that have higher market value compared to raw or half-processed goods (Mikhailushkin, 2018; Saidu, 2017).

An equation for determining the unified competitiveness factor (**UCF**) is introduced:

UCF= $xisum_{2019}/xmaxsum_{2019}$*100 + 100*GDPA(%) + 100*GVAG(%) + 100*AWW (%) - (xmintabx*100/AWUE) + 100*ICTDE (avg%).

Overall, based on the equation the percentages are multiplied with 100, while for water efficiency use, the lowest value from the table is multiplied with 100 and divided with the domestic values). For the ISO standards the sum values for 2019 are used (this is the latest data). Further, for ICT, as there are several factors with percentages, the average percentage is used and it is multiplied with 100.

The UCF is calculated for 2017, 2018. 2019 and 2020. The newest available data is used. However, as for some factors there is no available data for example 2020. In those cases, the value from previous year used.

The noted equation for calculating the UCF presents an approach that can provide some insight into future trends when it comes to Agriculture 4.0 development and competitiveness of the domestic agro-food sector. The results of the calculation for the years 2017, 2018, 2019, and 2020 are presented in Table 7.

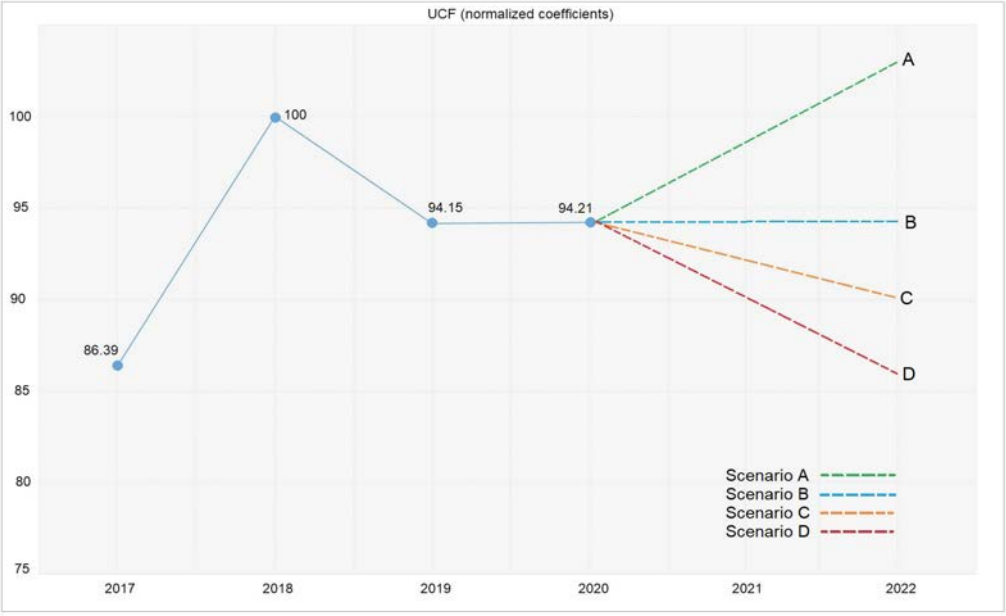
Table 7. Unified competitiveness factor (UCF) of the domestic agro-food sector

	2017	2018	2019	2020
UCF for the agro-food sector	170.57	197.45	185.91	186.01
UCF for the agro-food sector (normalized into scale of 1-100)	86.39	100	94.15	94.21

Source: Authors

The results in Table 7. indicate a gradual rise in competitiveness of the domestic agro-food sector. From here, the results are presented on a graph Figure 1. and future potential scenarios for the upcoming years are noted and discussed. The potential scenarios are based on the obtained and analysed data.

Figure 1. Potential competitiveness outcomes (scenarios) of the domestic agro-food sector



Source: Authors

Figure 1. depicts the UCF from 2017 to 2020. Additionally, four scenarios (A, B, C, and D) are noted. These scenarios represent the potential of the domestic agriculture sector in the next two years. The scenarios are derived from logical assumptions are by analysing previous trends.

Scenario A presents an outcome where there is an increased number of ISO standards in the agriculture sector; higher water use efficiency for irrigation; higher percentages of water use from renewable water resources; higher percentage of ICT implementation and application; and a significantly higher growth of gross added value to GDP and percentage of total GDP.

In **scenario B**, only mild increase of the noted factors would be sufficient to maintain the current competitiveness ability of the domestic agriculture sector. Mild increase is necessary, as the market is constantly changing and competition on the market is evolving and intensifying. Next, **scenario C** is the potential outcome if there is no change and a slight decrease in the noted factors and indicators.

Finally, the least favourable competitive strength of the domestic agriculture sector is presented as **scenario D**. This scenario would occur if there is a significant decrease in the number of ISO standards, decrease of water efficiency use, decrease of water use from renewable water sources, as well as decrease in ICT application percentages. Due to the COVID-19 pandemic, the current business environment is dynamic and enterprises face challenges in all sectors. Therefore, if scenario A has a low probability of occurring. Scenario B is a more likely outcome of the current economic climate.

Discussion

Increasing the competitiveness of the domestic agro-food sector requires significant and systematic engagement on various levels of government. The obtained and analysed data regarding ISO standards, agro-food indicators, and ICT application provided significant insight into the current state of competitive ability of the domestic agro-food sector. With the goal to provide a concise overview of current and future potential competitiveness of the domestic agro-food sector, a unified competitiveness factor (UCF) was calculated. From here, the graph (Figure 1.) was constructed with potential future competitiveness scenarios. Based on the analysed data, and on the obtained results of the analysis the following suggestions and guidelines for improving competitiveness of the domestic agro-food sector are proposed:

- Systematically increase the number of ISO standards in the agro-food sector, but also in other industrial sectors as well. Focus should be on standards that would result in improvement of quality, ICT adoption and sustainable development.
- Increase awareness among local communities on the importance and significance of the ISO 22000 when it comes to the competitiveness of the domestic agro-food sector.
- Increase the awareness of ICT application benefits in agriculture to farmers and local communities.
- Provide adequate infrastructure for ICT solutions across various agro-food sub-sectors. This should include farmlands, semi-processing, and finalized processing of products.

- Develop strategic plans for implementing ICTs in the agro-food sector, and provide support in the form of seminars and education of workers that would apply the ICT.
- Systematically increase the number and intensity of highly processed, finalized agricultural products. This involves creating value in products rather than exporting raw or semi-processed products.
- Develop short-term and long-term plans regarding national and local agricultural product processing with the goal to reduce the export of unprocessed (raw) products and increase the number finalized products.
- Focus on environment preservation through Agriculture 4.0 concepts, including the increase of irrigation water use efficiency, increase of water use from renewable water sources, and reduction of pesticide use.

Overall, when it comes to Agriculture 4.0 the domestic agro-food sectors requires a multi-solution approach where several mechanisms are introduced with the goal to strategically and organically increase the number of ISO standards in agriculture, increase water use efficiency, reduce pesticide use; increase the percentage of finalized products in export, and to overall increase productivity, and yield in agriculture production.

This current paper contributes to the existing body of literature as it integrates important data on the domestic agro-food sector, standardization, and ICT application. This data is categorized, analysed, and used to create a significant overview on the potential competitiveness of the domestic agro-food sector.

Conclusion

Competitiveness of the domestic agro-food sector is affected by numerous factors. In this paper data regarding ISO standards, agriculture, and ICT application in enterprises is analyzed. It can be concluded that the potential competitiveness of the domestic agro-food sector relies on several indicators in these three aspects (standards, agriculture, ICT). In addition, it was noted that in order to increase competitiveness in agriculture, it is necessary to address all the "weak points" regarding product-type exports (highly processed and finalized products, instead of raw and semi processed products); agriculture (water use efficiency, growth of gross added value, organic farming and/or reduced use of pesticides); and number of standards (primarily in the agro-food sector, but in other sectors as well).

The limitation of this paper is that the research is conceptualized around obtaining and analyzing data from external databases, as there were no surveys within this research. However, the goal of the paper was to provide an overview and solid basis for future research, thus the noted limitation is not severe. For future research empirical data from farms and other agriculture-based enterprises could be collected via survey or interview.

Conflict of interests

The authors declare no conflict of interest.

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BUSINESS OPERATIONS OF ENTREPRENEURIAL STORES IN THE FIELD OF AGRICULTURE IN THE REPUBLIC OF SERBIA IN THE PERIOD 2015-2019

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ABSTRACT

Entrepreneurship development represents one of the very important factors in the development of economies in transition. Bearing in mind that most of these economies still have a significant share of agricultural products in the structure of production and exports, special attention should be paid to the development of entrepreneurship in the field of agriculture. The research results in this paper indicate that the share of entrepreneurs in this business activity in the total number of entrepreneurs is extremely low, as well as that their share in employment in state subventions is also low, and it can be concluded that entrepreneurship in agriculture is still not sufficiently developed. By using PROMETHEE and the entropy method, a comparative analysis of the performance of entrepreneurs in this sector and entrepreneurs in other business activities within the real sector of the economy was performed and it was concluded that the key limitations in the business operations of these entrepreneurs are inefficient funds management and high indebtedness.

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Introduction

In modern business conditions, the trend of increase and change in the structure of demand for agricultural products is increasingly pronounced. Such a situation on the world market requires market orientation of business entities operating in this business activity, in order to better respond to new market requirements. In that sense, it is necessary to create conditions for improving the competitiveness of the agricultural sector, which cannot be based only on low input prices (land, labour), but on greater application of knowledge and innovation in business operations. The current application of information technologies in agriculture in Serbia is modest, compared to the EU countries, primarily due to the unfavourable educational structure of agricultural producers, as well as limited financial resources, which significantly complicates the process of applying IT.

The crisis in the agricultural sector in the Republic of Serbia has been going on for many years. Insufficient use of the potential for the development of agricultural production is the result of a wrong systemic attitude towards the agricultural sector. Instead of investing in the development of this economic area with numerous comparative advantages, the process of disinvestment has been happening for a long time, which further causes the process of deagrarization and demographic emptying of villages. In addition, this industry has been further depleted by years of economic recession.

Agricultural production is exposed to numerous risks, such as natural disasters, unpredictable weather conditions, yield and price uncertainty, and it is estimated that these risks will increase in the future, due to global warming, genetic engineering in agriculture and pandemics of livestock diseases. These limitations and risks have a particularly negative effect on the business of entrepreneurs, which greatly affects the sustainability of their business. Entrepreneurs in the field of agriculture have significantly higher costs and lower productivity, compared to large business entities, due to insufficient application of technics and technology in production. Insufficient volume of own funds, limited access to external sources of financing, high costs of obtaining capital, complicated administrative procedures, insufficiently transparently defined credit conditions and problems in securing loans are also mentioned as limitations in the business operations of this group of business entities. Therefore, the state and local governments should create a stimulating business environment for the development of entrepreneurship in the agricultural sector and rural development in general, especially in underdeveloped regions of the Republic of Serbia. Implementation of necessary incentive measures in agriculture, accompanied by reforms of the judiciary and education, can strengthen agricultural entrepreneurship in Serbia in the long run by completely replacing the anachronistic structure from the end of the last century and by taking the country into a new phase of expansionary agricultural development.

In this sense, the aim of this paper is to perform a comparative analysis of the business operations of agricultural entrepreneurs in relation to entrepreneurs operating in other business activities within the real sector in order to assess their position and the limitations they face in business operations and to define appropriate measures to improve their business operations. For this purpose, based on the ratio analysis of business operations of entrepreneurs in eight sectors that make up the real sector of the economy, which served as the basis for multicriteria analysis, conducted using the PROMETHEE method and entropy method.

Key trends in agriculture and its contribution to the economic development of the Republic of Serbia

Table 1 shows the movement of key indicators that indicate trends in the agricultural sector in the Republic of Serbia in the period 2015-2019.

Table 1. Key indicators of agricultural development in the Republic of Serbia in the period 2015-2019

Year	Real growth rates, previous year = 100 (in%)[1]	Growth rate of GVA per employee, previous year = 100 (u %)[2]	Share in employment (in%)[1]	Share in GDP (in%)[1]	Share in exports (in%)[1]
2015	2.2	3.40	1.94	6.7	7.06
2016	7.5	5.64	1.73	6.8	7.15
2017	-11.4	-6.99	1.67	6.0	5.93
2018	15.1	22.53	1.59	6.3	5.44
2019	-1.6	2.03	1.47	6.0	6.10

Source: Statistical Office of the Republic of Serbia, World Bank.

Based on the data in Table 1, it can be concluded that agricultural growth rates recorded significant variations during the observed five-year period, which was largely the result of the sensitivity of agricultural production to external factors and risks. A particularly pronounced decline in economic activity in this field was recorded in 2017. The reasons for such a low real growth rate in that year were multiple, and they related primarily to the drought that significantly threatened the production of corn and soybeans, frost that led to a drastic decline in plum production as one of the key export products and record low prices of raspberries in the world market. Significant growth was recorded the following year primarily on the basis of a low base in the previous year. At the end of the observed period, a decline in agricultural production of 1.6% was recorded for the reasons already mentioned. It is important to point out that the Corona virus pandemic did not leave significant consequences on the business operation of this sector in 2020. This business activity is one of the few that has shown significant resilience to the crisis, given that during the first three quarters of 2020, an average growth rate of 4.5% was achieved. A similar trend of movement was recorded in the case of the growth rate of GVA per employee, which indicates that the level of productivity of agricultural production recorded significant oscillations in the observed period. Here also came to

a break in productivity growth in 2017, after which a growth of 22.53% was recorded. At the end of the observed period, a slight productivity growth of 2.03% was recorded. Slightly higher growth rates of this indicator in relation to the real growth of economic activity are the result of a continuous decrease in the number of employees in this business activity, as evidenced by the continuous decrease in the share of this business activity in total employment. At the same time, the share in employment was very modest and averaged 1.68% in the observed period.

Agriculture traditionally has a relatively high share in GDP creation. The average share of this business activity in GDP in the observed period was 6.36%, although a slightly lower share was recorded during the last three observed years. The share in exports recorded a significant decrease in 2017 (which is certainly the result of reduced economic activity in that year) and by the end of the observed period it recorded a slightly lower share compared to the first two observed years. However, it is important to say that in 2019 there was recorded a slight increase in this indicator compared to the previous year, but also that during the Corona virus pandemic in 2020, this economic activity significantly contributed to exports, given that it had already achieved a share of 7.36% in the first three quarters of 2020. It is possible to achieve mitigation of the effects of the pandemic on the Serbian economy by making better use of the potential for agricultural development. Improvement of the situation in this sector can significantly contribute to the improvement of the foreign trade balance, the reduction of public debt, the reduction of unemployment and the increase in the living standards of the population.

Having in mind the strategic importance that agriculture has for the development of the economy of the Republic of Serbia, but also the limitations it faces, the question of providing adequate state support that will contribute to its more dynamic development in the future logically arises.

State support for the development of agriculture in the Republic of Serbia

The Republic of Serbia has made certain efforts to prevent further lagging behind of agriculture in relation to other economic areas in the country, but also in relation to the surrounding countries. This, of course, is not possible without modernizing the production process through the application of modern science and technology in business operations, which requires significant investments. The problems in financing the agricultural sector are multiple and are the result of decisions made in the 20th century. The policy of depressed prices in the SFRY, sanctions of the international community, the disintegration of the SFRY and other socio-political factors influenced the volume of agricultural production to decrease significantly. Permanent solution of the problem of financing agrarians requires the adoption of a long-term plan for the development of agriculture and its consistent and continuous implementation.

The Law on Agriculture and Rural Development adopted the obligation to adopt the National Program for Agriculture, within which the medium- and short-term goals of the

agricultural policy are defined. In that sense, in January 2018, the National Program for Agriculture for the period 2018-2020 was adopted, that represents a further elaboration of the Strategy of Agriculture and Rural Development of the Republic of Serbia for the period 2014-2024. This program, among other things, contains a financial plan by groups of measures for the development of agriculture by years. The plan does not include funds placed from the budget of the autonomous province or local self-government units. It should be noted that the planning of financial resources was carried out in accordance with the classification of the EU's Common Agricultural Policy (CAP). This way of defining the strategy is a necessary precondition for the continuation of the European integration process, because it shows the readiness of state bodies to consistently and gradually adopt the elements of the agricultural development model applied in the EU and it represents one of the most complex chapters in EU accession negotiations, so progress in this area would significantly contribute to progress in negotiations with the EU. This should provide conditions for more successful business operations of business entities in the field of agriculture, increase in the quality of agricultural products, stabilization of the markets for these products and generally more dynamic rural development in the long run. In order to see the role of the state in encouraging the development of agriculture according to the National Program for Agriculture for the period 2018-2020, Table 2 shows the scope and structure of state support to agriculture defined by the mentioned planning document.

Table 2. Amount of state support to agriculture by types of measures in the Republic of Serbia in 2018-2020 defined by the National Program for Agriculture for the period 2018-2020

Type of support	Amount of support in million RSD		
	2018	2019	2020
Direct payments	2,268	21,784	22,307
Market regulation measures	-	-	438
Special incentives	255	255	255
Credit support	800	800	800
In total	**22,324**	**22,839**	**23,800**

Source: National Program for Agriculture for the period 2018-2020

Based on the data from Table 2, it can be concluded that direct payments are the most important form of incentives in agriculture and rural development, given that on average almost 95% of funds are intended for this type of support. Direct payments are primarily aimed at stabilizing producers' incomes, but also at solving the problem of low productivity (due to mostly extensive agricultural production), poorly developed market and inefficient and inadequate use of natural resources. For other planned types of support, only 5.2% of the total planned funds in the observed three-year period were allocated. During the first two years, the use of measures related to market regulation was not planned, while in 2020, 438 million dinars were planned to be allocated for these purposes, that is, 1.84% of the allocated funds for that year. It was planned to allocate 225 million dinars evenly every year for special incentives, and 800 million dollars for credit support.

In addition to the structure of incentive measures provided by the National Program for Agriculture, it is very important to consider the level of subventions in agriculture, as well as their share in total expenses and budget expenditures. In that sense, Table 3 shows the movement of subventions in agriculture provided by the Law on Budget by years in the period 2015-2021.

Table 3. Trend of movement of subventions in agriculture in the Republic of Serbia in the period 2015-2021

Year	Total expenses and budget expenditures (in 000 RSD)	Subventions in agriculture (in 000 RSD)	Change in the value of subventions in agriculture compared to the previous year (in%)	Share	Change in share compared to the previous year (in%)
2015	1,115,731,682	28,063,951	-	2.52	-
2016	1,119,194,196	27,951,498	-0.40	2.50	-0.71
2017	1,161,983,504	31,600,710	13.06	2.72	8.89
2018	1,206,848,355	34,315,130	8.59	2.84	4.55
2019	1,269,091,337	41,580,757	21.17	3.28	15.23
2020	1,334,681,031	41,008,753	-1.38	3.07	-6.22
2021	1,514,823,614	41,865,313	2.09	2.76	-10.05

Source: Author's calculation based on data from the Law on Budget for the respective years, available at: https://www.mpravde.gov.rs/sr/tekst/11523/zakon-o-budzetu-republike-srbije-.php

The data in Table 3 indicate that the amount of subventions in agriculture was continuously increasing in the period 2016-2019, with the exception of 2020, when there was recorded a decline in allocated funds for subventions of 1.38%. For the current 2021, the budget has envisaged the allocation of a slightly higher amount of subventions (2.09%), in order to support the economic activity of business activity which managed to maintain a satisfactory level of production even in the conditions of the Corona virus pandemic. It is interesting to point out that in 2017, when this business activity recorded a significant decline due to unfavourable production conditions, the level of subventions to agriculture increased by as much as 13.06%. However, the largest increase in the amount of subventions was recorded in 2019 (21.17%), due to a change in the method of payment of subventions in livestock (which began to be paid per head from that year), a wider range of subjects of subventions (due to the inclusion of heads outside the productivity control programs), as well as greater allocation of funds intended to encourage the formation of producer organizations and marketing and promotion of agricultural products. This changed level and form of support was primarily supposed to contribute to a better appearance of producers on the market.

In addition to the growth of the level of subventions in absolute amount, there came to the largest increase in the share of subventions in this business activity in total expenses and budget expenditures (15.23%). However, it should be noted that this share did not change significantly and averaged 2.81% in the observed period. This is a relatively

low level of support for economic activity that has significant potential for growth and development and that greatly contributes to GDP creation and export. Encouraging the development of entrepreneurship in agriculture should contribute to better use of the potential in this field in the coming period.

Entrepreneurship in agriculture in the Republic of Serbia

The development of entrepreneurship in the field of agriculture in the Republic of Serbia has not been at a satisfactory level for many years and, therefore, does not contribute to the growth of economic activity and employment as much as it could thanks to the development potential that the Republic of Serbia has. In support of this claim, it can be stated the fact that for years about 80% of entrepreneurs operate in the so-called non-tradable sectors in which the largest number of workers are employed, as well as a small number of entrepreneurial stores that operate in this business activity. In this regard, Table 4 shows the movement of the number of entrepreneurial stores and their share in the total number of entrepreneurial stores published by the Business Registers Agency (APR) in the Annual Bulletin of Financial Statements.

Table 4. Movement trend of the number of entrepreneurial stores registered in the APR in the period 2015-2019

Years	Number of entrepreneurial stores	Number of entrepreneurial stores in agriculture	Index	Share
2015	17,286	116	90.6	0.67
2016	17,098	122	105.2	0.71
2017	17,592	130	106.6	0.74
2018	18,594	136	104.6	0.73
2019	108,557	827	608.1	0.76

Source: APR, Annual Bulletin of Financial Statements (relevant issues)

Although the data from Table 4 indicate that there was a significant increase in the number of entrepreneurs in 2019 compared to previous years, it came to such a drastic increase in the number of entrepreneurs due to changes in regulations. In particular, with the Law on Amendments to the Law on Personal Income Tax, most entrepreneurs have changed the way of keeping business books since 2019 (switched from simple to double-entry bookkeeping), as a result of which they started applying the Law on Accounting, so the number of entrepreneurs who report financial statements to APR has increased. Nevertheless, data on the share of entrepreneurial stores in the field of agriculture unequivocally indicate that these entrepreneurs participated in the total number of entrepreneurs with less than 1% (on average 0.72%) during the entire observed period.

As the number of entrepreneurial activities in the field of agriculture was very low during the observed period, these business entities could not significantly contribute to employment growth. In order to see the movement of the number of employees in entrepreneurial stores in the field of agriculture in the previous period, Table 5 shows the key indicators that indicate the situation in this field in the period 2015-2019.

Table 5. Movement of the number of employees in entrepreneurial stores registered in the APR in the period 2015-2019

Years	Number of employees in entrepreneurial stores	Number of employees in agricultural entrepreneurial stores	Index	Share
2015	46189	235	114.0	0.51
2016	47906	262	111.5	0.55
2017	51546	294	112.2	0.57
2018	57164	333	115.0	0.58
2019	210455	1138	341.7	0.54

Source: APR, Annual Bulletin of Financial Statements (relevant issues)

Based on the data presented in Table 5, it can be concluded that, in this case in 2019, there came to a significant change in the number of employees, but that it was the result of changes in legislation. The share of employees in agricultural entrepreneurial stores in the total number of employees in all entrepreneurial stores was even lower than it was the case with the number of entrepreneurial stores. This frequency also did not change significantly during the observed period and averaged 0.55%.

In order to gain insight into the support to agricultural entrepreneurs, Table 6 shows the movement of incomes from premiums, subventions, donations, etc. granted to entrepreneurs in this business activity in the period 2015-2019, which are stated in the income statements submitted to the APR.

As with the previous two indicators, in this case, due to the change in legislation, it is most reliable to monitor data on the share of incomes from premiums, subventions, donations, etc. granted to agricultural entrepreneurs in the total incomes acquired on this basis in all entrepreneurial stores shown in Table 6. The value of these incomes in agricultural entrepreneurial stores has varied significantly over the years, but if we look at the data on their share in the total incomes of this type, we can see that there have been relatively small changes. During the observed period, agricultural entrepreneurs on average participated in the income on that basis in the amount of 2.34% per year.

Table 6. Movement of incomes from premiums, subventions, donations, etc. granted to agricultural entrepreneurs registered in APR in the period 2015-2019

Years	Incomes from premiums, subventions, donations, etc. granted to entrepreneurs	Incomes from premiums, subventions, donations, etc. granted to agricultural entrepreneurs	Index	Share
2015	875,226	16,327	-	1.87
2016	722,660	21,077	129.1	2.92
2017	981,307	31,440	149.2	3.20
2018	1,160,426	26,155	83.2	2.25
2019	4,450,325	65,790	251.5	1.48

Source: APR, Annual Bulletin of Financial Statements (relevant issues)

Comparative analysis of business operations of agricultural entrepreneurial stores in relation to entrepreneurial stores in other economic fields within the real sector

In order to assess the financial position of agricultural entrepreneurs in relation to other entrepreneurs operating in the real sector, a ratio analysis of business operations of entrepreneurs in the following sectors was performed: Sector A - Agriculture, forestry and fisheries; Sector B - Mining; Sector C – Manufacturing industry; Sector D - Electricity, gas, steam and air conditioning supply; Sector E - Water supply; wastewater management, control of waste disposal processes and similar activities; Sector F - Construction; Sector G - Wholesale and retail trade; repair of motor vehicles and motorcycles and Sector H - Traffic and storage. The analysis includes three indicators from four key segments of the ratio analysis: liquidity indicators, funds management indicators, profitability indicators and debt management indicators. In this way, it was made possible for each of the segments to be equally included in the analysis. The results obtained on the basis of the ratio analysis are shown in Table 7.

By analyzing the liquidity ratio shown in Table 7, it can be concluded that entrepreneurs in the field of agriculture have a relatively low level of liquidity. The general liquidity ratio is less than 1, which is most often stated as the lower limit of this indicator. Although slightly lower than the reference value, this value of this indicator indicates insufficient liquidity of entrepreneurs in this business activity. Only sector D records a lower value of this indicator compared to agricultural entrepreneurs, while sector H does not record a slightly higher value of this indicator. It is often stated in the literature that the minimum value of the rigorous liquidity ratio is 1, so based on this indicator it can be concluded that agricultural entrepreneurs do not achieve satisfactory liquidity even according to this indicator, although in relation to entrepreneurs in other business activities the situation is somewhat more favorable than in the previous indicator. In particular, entrepreneurs in sectors D (which also have a lower level of liquidity

according to the general liquidity ratio) and G (which, due to the high value of stock, achieve significantly worse results in terms of liquidity, although they have a high value of the general liquidity ratio) have worse results according to this indicator. If we take into account the value of net working capital in relation to the value of business assets, it can be concluded that agricultural entrepreneurs have achieved the same results as entrepreneurs from sector H, while entrepreneurs in sector D have significantly worse results according to this indicator.

Table 7. Results of ratio analysis

Ratio analysis indicators	Companies by sectors of business activity							
	A	B	C	D	E	F	G	H
Liquidity indicators								
Current (general) liquidity ratio (CR)	0.98	1.07	1.25	0.44	1.12	1.13	1.46	0.99
Rigorous liquidity ratio (QR)	0.67	0.94	0.68	0.30	0.70	0.81	0.49	0.87
Net working capital in relation to total assets (NWC)	-0.01	0.03	0.13	-0.54	0.07	0.08	0.27	-0.01
Funds management indicators								
Customer turnover ratio (CTC)	5.26	3.81	7.55	3.91	10.78	6.04	20.89	4.60
Fixed assets turnover ratio (FAT)	4.78	1.78	4.80	0.45	6.94	6.01	18.60	4.34
Total asset turnover ratio (AT)	1.54	0.99	1.64	0.26	2.50	1.65	2.79	1.69
Profitability indicators								
Net profit margin (NPM)	4.21%	9.25%	3.65%	-4.51%	3.71%	5.65%	2.17%	4.05%
Return on total assets (ROA)	7.17%	9.10%	7.65%	-1.72%	12.58%	15.20%	7.52%	10.08%
Return on equity (ROE)	24.58%	18.44%	15.66%	-33.11%	28.33%	32.39%	16.81%	22.61%
Debt management indicators								
Debt ratio (DR)	73.61	49.97	61.58	53.22	67.29	70.31	63,84	69.36
Debt-to-Equity ratio (DER)	2.79	1.01	1.61	15.09	2.06	2.45	1.77	2.29
Share of long-term liabilities in total liabilities (LTD)	4.62	8.13	8.79	0.00	10.33	6.00	5.70	7.74

Source: Author's calculation based on data from the Annual Bulletin of Financial Statements 2019

The next group of indicators is the asset management ratios, where the situation is somewhat more favourable in relation to liquidity. Agricultural entrepreneurs have a higher customer turnover ratio and fixed assets turnover ratio in relation to entrepreneurs from sectors B, D and H, while according to the value of the total assets turnover ratio they are in a more favourable position only in relation to sectors B and D.

Profitability or profit earning of agricultural entrepreneurs is, according to the level

of profit rate and ROA, more favourable only in relation to entrepreneurs from sector D, who achieve the worst results according to all three indicators of profitability. As for the value of ROE, the situation is much more favourable, bearing in mind that only entrepreneurs from sectors E and F have a higher return on capital compared to agricultural entrepreneurs.

In order to complete the picture of the economy of business operations of entrepreneurs in the field of agriculture, but also of other considered sectors, it is necessary to consider the structure of funding sources. Taking into account the fact that a large number of authors point out that the upper limit of indebtedness is the ratio of capital and debt 1:1 (that is, in the percentage of 50:50), it can be concluded that entrepreneurs in the field of agriculture have the highest level of debt in relation to their own sources, which is indicated by the values of debt ratios and capital structure ratios (leverage). If, on the other hand, the value of the share of long-term debt in borrowed sources is taken into account, it can be concluded that the largest part of borrowed funds of agricultural entrepreneurs represent short-term liabilities. This indicates a serious problem faced by entrepreneurs in this business activity, and that is the inability to finance current business operations from their own sources.

Based on all the above-mentioned, it can be concluded that, taking into account the observed indicators separately, it is not possible to obtain a complete picture of the business operations of these business entities. Therefore, it is necessary to take into account all the observed indicators together for comparative analysis. For that reason, multicriteria analysis was used in this paper, by using the PROMETHEE method, which enables the synthesis of all analysed indicators into one, based on which it is possible to compare the business operations of entrepreneurs from the analysed fields.

PROMETHEE method

The PROMETHEE method represents a suitable method for solving multicriteria problems that are based on ranking the final set of alternatives based on a number of criteria that need to be maximized or minimized. This method is one of the most commonly used methods of multicriteria analysis, and was developed by Brans, Mareschal and Vincke during the last two decades of the 20th century (Brans, J. P., Mareschal, B.; Brans, J.P. Mareschal, B. Vincke, Ph., 1984; Brans, J.P., Vincke, Ph., 1985; Despotović & Durkalić, 2017; Durkalić et al., 2019; Đurić et al., 2020). There is almost no scientific field in which this method has not been applied.

This method is based on calculating the net flow of preferences, that is, the values of each alternative expressed in preferences. The net flow of preferences represents a value that synthesizes all indicators and on the basis of which the observed alternatives are ranked. The PROMETHEE method consists of several iterations and there are several versions of this method. In this paper, the PROMETHEE II method will be applied, which implies a complete ranking of alternatives.

In order for the observed alternatives to be ranked based on the observed criteria, the PROMETHEE method requires defining the appropriate parameters for each of them (Brans, J.P., Mareschal, B. Vincke, Ph., 1984; Brans, J.P., Vincke, Ph., 1985; Brans, J.P. Mareschal, B., 2005):

- Direction of preference - it determines whether a given criterion should be minimized or maximized;
- Weighting coefficients - they indicate the importance of a certain criterion for calculating the net flow of preferences. The higher the value of the weighting coefficient, the more important the criterion is for ranking. In doing so, it should be borne in mind that the sum of all weights should be equal to one;
- Preference threshold (p) - it shows the smallest difference between two alternatives according to a given criterion that the decision maker considers significant for decision making;
- Indifference threshold (q) - it shows the largest difference between the two alternatives according to the observed criterion that the decision maker considers irrelevant for decision making;
- Preference function - the selected function transfers the difference between two alternatives (e.g. alternative 1 and alternative 2) into a preference level ranging from 0 to 1, for each criterion separately. The closer the level of preference of alternative 1 is to 0 in relation to alternative 2, the better alternative 2 is in relation to alternative 1 according to the given criterion, and the closer to 1, the alternative 1 is better than alternative 2 according to the observed criterion.

After defining these parameters, it is possible to rank the alternatives by taking into account all the criteria. In order to get the value of the net flow of preferences, we first calculate the positive flow of preferences (which shows how much a certain alternative is better than the others) and the negative net flow of preferences (which shows how much a certain alternative is worse than the others). Subtracting these two values gives a net flow of preferences, ranging from 1 to -1. The higher the value of the net flow of preferences of a particular alternative, the better that alternative is compared to the others, and vice versa.

Entropy method

Bearing in mind that one of the parameters to be defined for the application of this method is the weighting coefficient for each criterion, the entropy method has been applied for this purpose in this paper. Objectively defined weighting coefficients are usually used when applying multicriteria analysis for conducting comparative analysis, while subjectively determined weighting coefficients are most often used in cases when ranking alternatives is done for decision making based on decision maker preferences. The application of the entropy method enables the objective defining of weight coefficients, and thus a more objective ranking of the observed alternatives. Determining the weight of the criteria based on this method is based on measuring the uncertainty of information in the decision matrix.

The application of this method is based on the calculations of the entropy value, on the basis of which the value of the weight coefficient for each criterion is later calculated. The criterion for which a lower value of entropy is obtained provides more information for decision making, and accordingly it has a greater significance for decision making, that is, the final ranking of alternatives. When determining the weight parameters, it is started from the defined decision matrix, on the basis of which the normalization of data is first performed. Then the entropy value is calculated for each criterion, in order to finally determine the weight of all criteria based on it.

Setting up a multicriteria analysis model

Before the application of the PROMETHEE method, it is necessary to define the already mentioned parameters of multicriteria analysis, on the basis of which the ranking of entrepreneurial stores from the observed sectors was performed. The values of weight coefficients were determined by using the entropy method, which together with other parameters of multicriteria analysis are shown in Table 8.

Table 8. Defined parameters of multicriteria analysis

	Liquidity indicators			Funds management indicators		
Parameters	CR	QR	NWC	CTC	FAT	AT
Direction of preference	Max	Max	Max	Max	Max	Max
Weighting coefficient	0.06	0.08	0.06	0.12	0.09	0.08
Preference function	Linear	Linear	Linear	Linear	Linear	Linear
Indifference threshold	0.26	0.17	0.24	5.65	5.41	0.64
Preference threshold	0.59	0.41	0.48	11.49	11.05	1.56
	Profitybility indicators			Indebtedness indicators		
Parameters	NPM	ROA	ROE	DR	DER	LTD
Direction of preference	Max	Max	Max	Min	Min	Min
Weighting coefficient	0.06	0.07	0.07	0.10	0.12	0.07
Preference function	Linear	Linear	Linear	Linear	Linear	Linear
Indifference threshold	3.57	4.33	21.44	6.44	5.38	2.62
Preference threshold	7.70	9.85	41.06	16.36	9.19	6.27

Based on Table 8, it can be concluded that the highest weighting coefficient has been obtained for CTC and DER (0.12), which indicates that the largest differences among entrepreneurs from different business activities exist in this indicator, while the smallest differences are present in the amount of CR, NWC and NPM (0.06). The preference function and the preference and indifference thresholds were determined with the help of the Visual PROMETHEE software package, which proposed the given parameters based on the characteristics of the entered data set.

Results and discussion

By applying the mentioned parameters, the ranking of entrepreneurs from selected sectors of business activity was performed, in order to gain insight into the differences in the efficiency of business operations of agricultural entrepreneurs and entrepreneurs from other considered business activities. Table 9 shows the movement of positive, negative and net flow of preferences and the ranking of entrepreneurs from selected business activities on the basis of all observed indicators together.

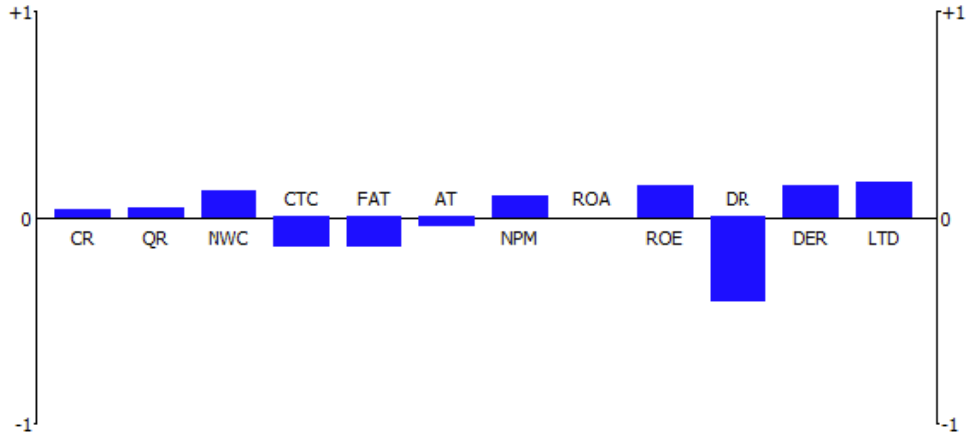
Table 9. Results of the PROM0ETHEE method

Rank	action	Phi+	Phi-	Phi
1	G	0.3575	0.0727	0.2847
2	B	0.1994	0.0777	0.1217
3	F	0.1209	0.0829	0.0380
4	E	0.1265	0.0917	0.0348
5	C	0.0978	0.0827	0.0152
6	H	0.0991	0.0939	0.0052
7	A	0.0965	0.1151	-0.0185
8	D	0.1269	0.6079	-0.4810

Source: Author's calculation.

Based on the results shown in Table 9, it can be concluded that the best ranked entrepreneurs are in sector G, while agricultural entrepreneurs are ranked in the penultimate place. Only entrepreneurs from sector D achieve worse results. It should be emphasized that only the two worst ranked sectors have a negative net flow of preferences, which indicates that the limitations in business operations of entrepreneurs from these business activities outweigh the advantages they have over entrepreneurs from other sectors. These ranking results indicate that entrepreneurs operating in the field of agriculture face numerous limitations in doing business, which slows down the development of entrepreneurship in this business activity. In order to see the advantages and limitations of business operations of entrepreneurs in this sector, Figure 1 shows the profile of this business activity obtained in the Visual PROMETHEE software package.

Figure 1. Advantages and limitations in the business operations of agricultural entrepreneurs in relation to entrepreneurs from other business activities



Source: Author's calculation.

Based on the results shown in Figure 1, it can be concluded that the key limitations in the business operations of these entrepreneurs relate to inefficient funds management, given that the chart shows all three pillars indicating the mentioned group of indicators facing down. In addition, indebtedness represents a significant limitation for these entrepreneurs. The biggest limitation in business operation represents the large share of borrowed capital in the structure of funding sources. It should be noted that although the column showing leverage is up, it is not a significant advantage of this sector, but such results were obtained due to significantly better results achieved compared to sector D, where leverage is extremely high, due to high losses above capital, despite the relatively low share of liabilities in total liabilities.

Conclusion

Numerous problems that exist in the agriculture of the Republic of Serbia impose as an imperative the adoption of a long-term development policy in the field of agriculture. Adoption of long-term development policy in agriculture implies certain changes, in terms of business conditions, pricing policy, credit and tax support mechanisms. The most important aspect of creating a long-term development policy in the field of agriculture should be a substantial change in the current attitude towards agriculture, in the sense that agricultural production with all its specifics is treated equally with other economic fields.

In addition, the slow turnover of capital invested in agriculture makes it necessary to have constant funding sources, due to the seasonal character of this production. The seasonal character of agricultural production requires the need for successive engagement of means for production and stocks. Precisely because of that, the request for additional (external) funding sources for this production is permanently present. In addition to this specificity, the necessity of state support arises from the fact that the

investment of funds is made successively, due to the existence of time inconsistency of costs invoiced in agriculture and the opportunities for agriculture to cover these costs through its implementation. A special problem represents the poor organization of business operations in this business activity. There is a small number of entrepreneurial stores. There is still a large share of natural production. Commodity production is growing, but at a slow pace. To this should be added the rather unregulated market of agricultural products. There is monopolistic behaviour and the absence of healthy competition. These are all weaknesses that agriculture as a whole is still facing, and which should be eliminated in the upcoming period. In addition, it is necessary to provide support to young agriculturists in order to prevent deagrarization and demographic depopulation of villages, and introduce quality standards for agricultural products and create conditions for sustainable agricultural production.

Conflict of interests

The authors declare no conflict of interest.

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2. Hjalager, A. M., & Richards, G. (Eds.). (2003). *Tourism and gastronomy*. Routledge, London.
3. Mićović, A. (2017). Tourism Development and Evolution of Tourism Related Rules, *2nd International Scientific Conference – Thematic Proceedings II*, Faculty of Hotel Management and Tourism, Vrnjačka Banja, 181-202. Retrieved from http://www.hit-vb.kg.ac.rs/conference/images/thematic_proceedings/2017_II.pdf
4. Stošić, L., & Stošić, I. (2013). Diffusion of innovation in modern school. *International Journal Of Cognitive Research In Science, Engineering And Education (IJCRSEE),* 1(1), 12-24.

5. Domanović, V., Vujičić, M., & Ristić, L. (2018), Profitability of food industry companies in the Republic of Serbia, *Economic of Agriculture*, 65(1), 11-32. doi:10.5937/ekoPolj1801011D
6. The Food and Agriculture Organization of the United Nations (FAO), Retrieved from http://www.fao.org (July 31, 2018)

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Example:

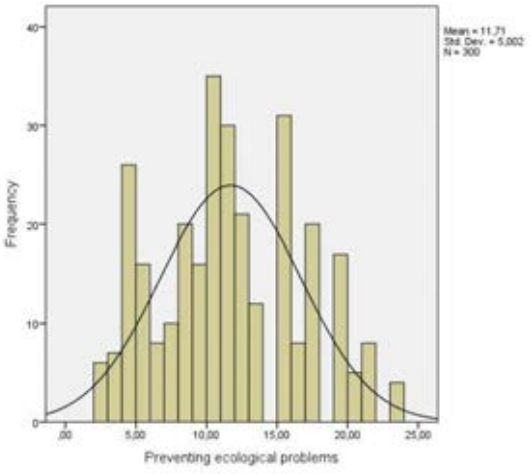
Table 1. The distribution cost of packaged goods from Subotica to retail-store objects

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

All illustrations whether diagrams, photographs or charts are referred to as Figures. The name and number of figures should be centered on the line above a figure.

Figure 1. Agriculture, value added (% of GDP)



Source: Authors' calculations

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