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CRITICAL ANALYSIS OF REALIBILITY OF THE MODEL OF INVESTMENT CREDIT APPROVAL IN AGRICULTURE AND FOOD PROCESSING INDUSTRY¹

Lidija Barjaktarovic², Renata Pindžo³, Azra Hanic⁴

Summary

Investments are funds which are invested in certain manufacturing goods, revenue on investments, the process of investment, subject in which it is invested, and which is obtained as a result of the assessment of investment. Every rational investor entering into an investment expects some benefits. Entry decision into a particular investment project carries a business risk, both for investors and for the bank as co-financier of the project. Accordingly, the subject of this paper-research is a critical analysis of the reliability of the model of investment credit approval in agriculture and food processing industry (MICA) used by local banks when considering whether to financially support investment needs of large corporate customers in the segment of secondary agriculture production and food processing industry. Applying the model of the correlation analysis, the degree of interconnectedness of indicators of the quality of assets and business performances of Serbian banking sector are quantified.

Key words: *investment, customer analysis, transaction analysis, cash flow, EBITDA.*

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Introduction

Investments in the broadest sense are a necessary condition to achieve progress and the realization of continuous human efforts to master the forces of nature and efficiently use them for its own needs. (Jovanović, 2000) According to Bodie et al. (2008) an investment is the current commitment of money or other resources in the expectation of reaping future benefits. Furthermore, it is in accordance with Brealey et al. (2007) that today's investments bring benefits in the future. Moreover, Palepu et al. (2007) stressed that expected earnings and Return on Equity (ROE) are crucial for investments. Finally, it is in relation with Đuričin, Lončar (2012) that future (forecasted) profitability is important for investment decisions. The four basic elements of investment are (Barać et al., 2004): an entity that invests (investor), the object in which it is invested (the investment proposal or project), the price of renouncing of expenditure (interest rate) and the price of "Hope" (discount rate).

Sources of investment funding can be owned and borrowed (the company's balance sheet liabilities). The decision on the mean of financing depends on the return on investment (owned and borrowed). Also, the investments present a new incentive for company's overall business activities. The primary source of repayment is the income from the basic business operations of the company. However, many companies simply do not want to take the risk themselves and do not want to invest their equity without adequate credit support of the banks (Hanić, Pindžo, 2008).

The subject of this paper-research is a critical analysis of the reliability of the model of investment credit approval in agriculture and food processing industry (MICA) used by local banks when considering to financially support investment needs of large corporate customers. The aim of this paper is to show the possibilities of improving the reliability of MICA from the standpoint of reliability for decision-making in this domain. The basic hypothesis (H0) is: There is a reasonable doubt about the reliability of MICA used by commercial banks in the Republic of Serbia.

The basis for proving the hypothesis are official annual reports of Serbian banking which are available on the website of the National Bank of Serbia (NBS) and in the World Bank (WB), for a period of 2009-2014. Indicators of the subject of analysis are credits in use, asset quality expressed through the level of non-performing loans (NPL), amount of equity, capital adequacy ratio (CAR), ROE and Return on Assets (ROA). Onwards, Pearson correlation coefficient will be applied, in order to determine the effect of the applied MICA on the business banks performances, i.e. the impact of NPLs on the financial result and the capital of a bank.

Accordingly, the paper is organized in four parts. In the introductory part, subject, aim and hypothesis will be defined. Methodology will be described in the second chapter. In the third chapter literature review will be presented. In the fourth part research results will be presented. In the last chapter, concluding remarks will be presented.

Literature Review

According to the data of the Business Registers Agency (APR), in the Republic of Serbia 120,614 business entities operate in 2015 (APR 2016). However, there is no publicly available information about their credit rating, made by independent external credit rating agencies.

In the following paragraphs, authors will present research results on the topic of quantitative factors in the client analysis - the objectivity of the financial statements, the instruments of financial analysis and opinion of an external auditor. In theoretical terms, Hopwood et. al., (2012), and, in our region, Belak (2011) are the authors who have worked extensively on the credibility of the financial statements as a basis for determining the creditworthiness of the client, i.e. on forensic accounting and auditing. The focus of their work was on the investigative actions about conducted fraud. In view of the fact that this is a current and interesting issue for the wider scientific and professional public, we have many studies, and articles on this subject, also, publicly published data of various relevant state institutions, which will be presented below.

According to CFE (2014), the third category of scams is false financial reporting (9% of the total number, but causes the greatest financial effects, on average, a loss of USD 1 million). According to data of this association, fraudulent schemes in financial statements may relate to: (1) overvalue of assets and income (premature revenue recognition, notional incomes, hidden liabilities and costs, inadequate property valuation - overvalue, inadequate disclosure), or (2) underestimation of assets and income (disposal of revenue recognition, underestimated income, overvalue of liabilities and costs, inadequate valuation of property - underestimation).

Recent empirical studies on the subject of the credibility of financial statements carried out in our country (in the period from 2009 to 2015) provide a basis for the hypothesis that the degree of reliability and credibility of financial statements is relatively low. The reasons for this, as one may assume, are commonly found in the system of rewarding of managers and a desire to reduce the tax base, i.e., tax evasion (Mirdala et. al., 2014). Furthermore, research conducted among accountants (2014) showed that there was no clear boundary between creative use of accounting techniques and their misuse. Also, Mirković (2014) using Beneish M-scoring model, partly pointed to manipulation of financial results in the company Jedinstvo a.d. Sevojno in 2012 and 2013. Then Barjaktarović et. al., (2014) applying Benford's law on a sample of 847 large companies, which operated in the Republic of Serbia in 2012, indicated that there were grounds for doubt on stated financial results due to the regularity of the appearance of numbers 1 and 9. Moreover, Čerović et. al., (2015) on a sample of 4029 large and medium-sized enterprises operating in the Republic of Serbia, in the period from 2009 to 2013, applying the application of Benford's law, indicated that there were reasonable grounds to doubt on reported amounts of net cash flow from operating activities, due to the higher incidence of numbers 1 and 3, and lower occurrence of number 4. The authors suggested that the reasons could be manipulative, but also ignorance of people that compose the cash flow statement. Next, Bugarčić (2015) pointed out to mistrust in the case of tax evasion and money laundering in the Republic of Serbia on the basis of cash payment transactions (owner's loan) and withdrawals from the

account on the basis of forged business documents. Based on the survey conducted among accountants in Serbia in major cities (2015), had found that a small number of enterprises correctly: (1) calculate depreciation of fixed assets (assets amounted to 60.36% of all economic entities that have submitted data for statistical purposes for 2014) (Stanišić et. al., 2015), (2) use prescribed regulations for the assessment of depreciation claims and has no real analysis of conducted calculation in order to improve their performance in the coming reporting periods (Vićentijević et. al., 2015). Stanišić et. al., (2015) stated that there was a practice of buying (external) auditor's opinion.

According to the analysis Knežević et. al., (2013) many limits of the application of financial analysis existed, and the most significant were the following: identification of industrial categories of companies and intercompany relationships (group of connected companies), seasonal influences on the obtained values of indicators, published averages of industries were of an approximate character and in many cases represented a target of companies, the financial statements had been prepared using the historical cost basis without considering the impact of inflation, the relevant data on the balance sheet, etc. Furthermore, all the tools for determining the creditworthiness of the legal entity are mainly used by external users of financial statements, rather than by the employees of the company (Todorović et. al., 2013).

Bearing in mind that researches indicates that there are doubts about the quantitative elements which are used to determine the creditworthiness of the legal entity, the authors of this paper reflected on performance of banks in accordance with the assumed credit risks, given that so far no research was published that indicates suspicion of publicly disclosed information on the NBS website.

Methodology

The authors used data from primary researches conducted from 2005 to 2014 (during their active work in a bank as a consultant of banks and borrowers), secondary data published by NBS (in the period since 2009 until 2014), expert opinions (6 interviews with risk managers of local banks, representatives of supervisory departments of NBS / directly involved in banks' control/ and clients - borrowers in the Republic of Serbia in 2015), as well as information available on the internet sites of relevant institutions and analysed borrowers' enterprises. In addition to the descriptive statistical method, they also used the method of correlation analysis and approach model for researching about the problem of the reliability MICA used by domestic banks.

At the beginning, the authors will focus to the standard model used by commercial banks to approve investment credit in agriculture and food processing industry (MICA), and which is subject of critical analysis. After that, they will propose a quantitative model which will determine the connections between MICA and asset quality and profitability of Serbian banking sector.

Standard Model of Investment Credit Approval in Agriculture and Food Processing Industry by Commercial Banks in Serbia

The research is based on existing procedures in Serbian banking sector. It includes official steps between departments and their responsibilities. Credit approval process consists of following steps: (1) credit request (prepared by the company), (2) credit application process (within the bank), (3) credit decision (yes or no), (4) credit contract conclusion (yes), (5) usage and (6) monitoring of the loan (yes). The first step is relevant for further research analysis.

Banks' model for determining the creditworthiness of the customer includes (Barjaktarović, 2013):

- (1) Clients' analysis – covers: soft (qualitative) and hard (quantitative) facts i.e. character and ability of client, which means the determination of net present value and cash flow from investment (primary source of repayment);
- (2) Transaction analysis – covers: purpose and amount of the loan, impact of transaction on the balance sheet and income statement of the company, repayment possibilities, structure of the loan and security structure (collateral is the secondary source of repayment).

This model should provide bank with healthy credit portfolio i.e. customers which will be capable to repay the loan in time. Out of scope of the research is credit collection model within the bank.

The client's creditworthiness presents possibility to service his debts in the future, and includes: (1) the **willingness (character) of customer**, (2) **the ability or solvency of client receivables** (cash, capital, market capacity or collateral) **to convert into money in the right time**. Area of the qualitative analysis of the company includes: ownership structure, management of the company, the business strategy, analysis of the industry in which the company conducts business activity, an analysis of the market position of the company, the business cycle in which there is a company and SWOT analysis. Area of quantitative analysis of the company includes: analysis of the financial operations of the client in the broadest sense and all changes in its size and power. Sources of information for quantitative analysis of the client are: annual reports of the company (balance sheet, income statement, cash flow statement, annex), quarterly reports of the company, cost accounting, the projections of the company, the consolidated statements of the entity, the audit report of the legal entity, unqualified or qualified opinion of the third parties, and the reputation of auditors. The most important characteristic of agriculture and food processing industry comparing to other industries is seasonality of production and consequently, collection of receivables. Furthermore, the largest challenge in performing business is to find relevant heading instrument, in order to protect business from external factors which have influence on production and sales as well as on trends on financial market in terms of market risk protection. Finally, the relevant feature/attitude of credit beneficiaries in this industry is that they belong to the group of connected companies where the main shareholder is investment fund/s (main aim of existence is maximizing EBITDA, such as Danube Foods Group, etc.) or successful player in some other field of industry (main aim of existence is maximizing net profit, such as Victoria group or MK Group, etc.) which is not connected to the core business of the borrower.

The cash flow statement gives information about the sources and using of cash (decrease). It is used to determine the funds available to the company that can be used in the process of repayment of overdue liabilities. Thereby, the creditor always determines cash flow projections more conservatively than the borrower (which includes the financial projections), in order to assess the worst-case scenario of the client's business and furthermore, the ability for servicing the debt on the basis of the approved loan in those circumstances. Furthermore, next essential element of quantitative analysis is ratio numbers that summarize the key relationships and results from the basic financial statements and indicate the financial performance of the enterprise.

Any rational investor entering into an investment expects concrete benefits and increase of present value of their investment. In order to make investment decision, investor and creditor, take in consideration the benefits and accepted risks (Barjaktarović, Ječmenica, 2011), i.e. make projections of income statement and cash flows. (Lončar et. al., 2015). In the conventional models of long-term financing, it is necessary in the first place to determine what are the additional (*incremental*) cash flows arising from the investment itself, i.e. which cannot resist without that and shall be calculated as:

Cash flows from investment - Cash flows without investment.

If the company already operates and wants to calculate net cash flows of the investment itself, the same can be done by creating a separate account in which the calculation of the primary sources of repayment are aside of the effects of the existing business. Projections of cash flows (*forecasts*) should show: what level of cash will be necessary for the duration of the investment, when will this need occur and how long there must be a certain level of cash. The result of the projection of cash flows is net cash flow after debt servicing. Net cash flow after debt service represents the total inflows and total outflows of funds from the business, investment and financial activity. Projections of cash flows (*inflows and outflows*) are derived from the previously projected income statement and balance sheet for each year of the projection.

Evaluation Methodology /Analysis of the Standard Model of Investment Credit Approval in Agriculture and Food Processing Industry

For the purposes of critical evaluation of the approval of investment credit in agriculture and food processing industry by commercial banks in the Republic of Serbia, the official indicators of the performance of the banking sector in the Republic of Serbia will be analysed, which are available on the websites of NBS and WB, from the period of 2009-2014. The subject of analysis are the following indicators: credits in use, asset quality expressed through the level of NPL, amount of equity, CAR, financial result, ROA and ROE.

Limitations of the analysis are as following: (1) the same NPL presents the corporate and retail sector in total; considering the individual values of disbursed credit, the percentage of participation of disbursed credit in corporate sector is higher than in retail sector; (2) demarcation of long-term and short-term credit approved to corporate sector is not possible;

(3) data presented does not have information on the total number of banks, and which part refers to banks that lost the licence; and whether there have been selling transactions of NPL to another bank or investment fund or other interested party. (4) All data which are available on the website of the NBS are stated in dinars, regardless of the fact that the structure of placement of NPL is dominated by those with foreign currency clause – there is a question about rate applied (usually on the last day of the month / quarter analysis, without taking into account the fluctuations that were in the course of the year/period). In the case of WB, all results are presented in the foreign currency. (5) All banks in Serbia do not use the same methodology for expressing exposure to the credit risk and reserves in the level of capital; (6) customer segmentation of the legal entity is different from the defined strategy of each commercial bank that operates in the Republic of Serbia.

Onwards, Pearson correlation coefficient will be applied, in order to determine the impact of NPLs on the financial result and capital of the banking sector in the Republic of Serbia.

Research Results

The results of the applied MICA can be seen through the achieved results of the banking sector in the Republic of Serbia, such as the amount of credit in use, the amount of NPLs, the amount of capital, the CAR, the realized financial result, ROA and ROE. It should be borne in mind that the period from 2004 to 2008 was marked by expansive credit activity of commercial banks (which could be characterized as liberal policy of placing funds and, consequently, increasing NPL), and from the end of 2008 is the period when the first effects of the global economic crisis in our country were starting to be felt, which were experienced by all participants of the financial market, through commercial banks' increased aversion to risk. In the period from 2009-2012 the growth of credit activity largely continued, and in 2012 we had a slowdown in credit activities of banks. The picture is not clear due to the fact that: (1) A good number of domestic banks is in foreign ownership, and that the legal entities have the possibility to use cross-border credits from their headquarters or funds from abroad, where Serbia has an arrangement on the avoidance of withholding tax, and where the country risk is consequently 0%. So, the price of credit (interest rate) was lower. In fact, these credits are registered to the NBS with a maturity of 13 months so they are credits in the long term and not short-term credits (liabilities). According to the recommended measures of the central banks of parent countries, from 2016 these credits should also be "transferred" to the domestic banks in the Republic of Serbia. (2) There are subsidized credit lines for the revival of corporate activity (since the widespread illiquidity of the economy began in 2009), where the state was late with the payment of subsidies and increasing the level of provisions of commercial banks in the coming years. (3) A number of state-owned banks have collapsed, some banks were taken over by foreign banking groups or investment funds, some banks continued to operate as a result of pioneering (where one bank bought the brand and assets were purchased by another bank) and there was a purchase of bad debts. However, we do not have transparent information about these types of activities. (4) There was a change of regulations in the way of expressing provisions on the basis of credit, of the classification of the client and taken collateral, i.e. of the structure of the credit transaction. Taking into

account the described trends of the volume of credit, this indicator will not be relevant for further research about the reliability of MICA to the corporate entity.

On the other hand, in the same period, the level of NPLs is growing in absolute terms, as a result of: (1) Worsened creditworthiness situation of the borrower, due to difficulties in collection of receivables; (2) Exchange rate fluctuations, since the largest number of disbursed credits are with foreign-currency clause; (3) Fluctuations in the reference interest rate - EURIBOR, which is an integral part of the predominantly disbursed credit with variable interest rates; (4) Ways of managing in the commercial bank, i.e. established procedures in accordance with the legally defined risk management framework. Studies show that 5 of the 30 banks (at the end of 2015) show a transparent risk management process (research of authors on the basis of data available on the website of NBS). (5) Moral hazard, i.e., motivation of managers that realized targets in the bank in the short term when it concerns the amount of disbursed credit, and they will get a certain bonus, i.e. not an objective assessment of the assumed risk in relation to expected returns. (6) Worsened country risk - causal business practices whether or not the borrower needs to pay. Which instruments has monetary authority used to ensure stability of the banking system? (7) "Subjective" reporting of the healthy placement in state-owned banks that were the subject of sales (e.g. Novosadska bank had 60% of NPL at the time of the sale to Erste group, and were portrayed to the potential investors as a healthy part of the credit portfolio). The largest number of activities of banks was aimed at resolving the existing NPLs, while a relatively little attention is paid to early recognition of potential NPL (i.e. Early Warning System - EWS). In the purpose of our further research, NPL will be taken as an important indicator of the reliability of approval investment credit to the entity.

The amount of capital has a fluctuating trend corresponding to developments in the market, in terms of: (1) Realized NPL and losses that are covered from the capital (in accordance with the Basel capital agreements guaranteeing the substance and determine what amount of maximum risk the banks are supposed to accept); (2) Reducing the number of banks that lost the licence. (3) As well as the capital increase that took place in order to maintain CAR at the appropriate level in the case of banks that remained open. CAR (according to the our legislation, account equity ratio and risk-weighted assets) is always above 19%, which is significantly above the legal minimum of 12%, which means that banks are overcapitalised and granting less loans to industry, i.e. that they have the money, but there is not enough good projects. The described trends of the volume of the capital are relevant indicator for determining the reliability of the investment credit approvals to the entity.

In the reporting period we can say that the banking sector had a positive financial result, especially in the first two years of the period under review (as a result of the growth of interest income based on extended credit). Then there was a drastic fall in 2011 (reduced level of disbursed credit, but the increased level of NPLs and provisions on the basis of assumed risks; also significant expenditure items are salaries, rental of office space and the cost of borrowed funds). The situation improved through the 2012 (a significant number of employees laid off, reduced the number of branches), in order to once again deteriorate in 2013 (primarily due to unpaid claims, and the cost of employees), and the improvement recorded in 2014 (reduced number of employees and drastically automated processes). If the indicators of profitability

compared with other risk-free investment and investment in NBS repo-transactions can be concluded that the yield is less than non-risk investment (which realizes the historical minimum in the second half of 2015 and amounted to 4.5% p.a.), and that banks did not capitalize well the money for managing. It remains an open (non-transparent) issue of the impact of regulatory changes on provisions on the basis of the accepted risks arising from the credit transactions (consequently of foreign exchange, interest rate, operational and of liquidity risk). Bearing in mind the described movement of financial results, which also consist of interest income and expense, it will be subject to further analyse of the reliability model of the approval of investment credit in agriculture and food processing industry.

Table 1. Basic indicators of the performance of the banking sector in the Republic of Serbia in the period from 2009 to 2014 (in billion RSD / %)

Year /Indicator	2009	2010	2011	2012	2013	2014
Credit	1,278.3	1,685.4	1,671.5	1,751.1	1,686.1	1,653.2
NPL	191	237.5	342.7	365.8	395.3	436.7
NPL agriculture (%)	n.a.	10	8	5	4	4
Capital	368.6	407	322.4	350.1	347.1	316
CAR (%)	21.44	19.91	19.11	19.87	20.94	20.0
Financial result	20,025	25,398	1,252	11,654	-2,100	3,500
ROE (%)	4.6	5.4	0.24	2.05	-0.36	0.58
ROA (%)	1.0	1.1	0.05	0.43	-0.07	0.12

Source: NBS (2009 - 2015), WB (2009-2015)

Next, the growth of NPL will be determined (because it is the only indicator which has a growth in the whole observed period; however, agriculture industry had increasing trend of NPL due to the fact that people during the crisis spent money on basic – life important items, but their percentage in total corporate credit portfolio of banks is low; furthermore NBS did not reported about NPL of food processing industry, which is relevant for people’s survival in general, so there is no full relevant information for further analysis) and how it affected the financial result (due to the fact that this is an indicator that had the most drastic fluctuations in the period under analysis). For this purpose we use Pearson’s correlation coefficient, where NPL is marked with an x, while y designates the level of financial results at the sector level (results are shown in Table no. 2).

Table 2. Pearson's correlation coefficient for the NPL and the financial result of the banking sector in the Republic of Serbia in the period from 2009 to 2014.

Correlations			
		Level of NPL-a (in billion RSD)	Financial results (in billion RSD)
Level of NPL-a (billion RSD)	Pearson Correlation	1	-.881
	Sig. (2-tailed)	.	.22
	N	6	6
Financial results (billion RSD)	Pearson Correlation	-.881	1
	Sig. (2-tailed)	.22	.
	N	6	6

Source: Authors' calculations, SPSS software

The resulting value of the Pearson correlation coefficient of -0.881 indicates a very strong relationship between the NPL and the achieved financial results. The result is logical given the fact that the credit is a basic banking product which generates a profit for the bank (principal, interest and related commission; or income arising from cross-selling products because with the conclusion of the credit agreement, the borrower may be directed to which other banking products he can use – payments, electronic banking, documentary products, etc.). If the results are considered in accordance with applicable regulations in the field of risk management and international accounting standards, we can say that the established connection makes sense, i.e. the amount of NPL, seen through the level of provisions for NPL, directly affects the financial results achieved in the context of that higher level of provisions includes a lower financial result, and vice versa. This further means that MICA is not set appropriately, in the sense that it the creditworthiness of the borrower, the amount and purpose of the placement, and the price of risk assumed is not adequately established. Further, it will be interesting to determine the effect of growth of NPL on the movement of capital in the banking sector in Serbia by using the Pearson correlation coefficient. Where NPL is marked with x, and the y shows the capital of the banking sector in the Republic of Serbia (the results are shown in Table No. 3).

Table 3. Pearson's correlation coefficient for the NPL and the capital/equity of the banking sector in the Republic of Serbia in the period from 2009 to 2014.

Correlations			
		Level of NPL-a (billion RSD)	Capital/Equity (total) (billion RSD)
Level of NPL-a (billion RSD)	Pearson Correlation	1	-.968
	Sig. (2-tailed)	.	.002
	N	6	6
Capital (total) (billion RSD)	Pearson Correlation	-.968	1
	Sig. (2-tailed)	.002	.
	N	6	6

Source: Authors' calculations, SPSS software

The resulting value of the Pearson correlation coefficient of -0.968 indicates a very strong relationship between the NPL and capital. The obtained result is meaningful, because the height of the assumed credit risk, in the form of extended credit (and consequently during the validity period of the credit relationship it is possible that the borrower will be in trouble with credit repayment) is determined by amount of capital that a bank possesses. If the results which we obtained are interpreted in accordance with applicable regulations in the field of risk management and international accounting standards, we can say that established connection makes sense i.e. the amount of NPL, seen through the level of provisions for bad credit, directly affects to the amount of capital in the context of that higher level provisions for NPL includes the capital spending and vice versa. This further means that MICA is not set appropriately, in the sense that they do not perceive assumed credit risks in accordance with the amount of capital that the bank has, i.e. the creditworthiness of the borrower, the amount and purpose of the placement has not been adequately established, especially in terms of a group of connected companies, of the existing exposure at the time of placement of funds group of related parties.

Next, a potential agency problem, in the sense that manager's bonus is tied to the amount of disbursed credit but not for charging them. This means that placing a large amount to the client can easily achieve defined target and increases the level of credit risk. Since the long-term credit are usually granted to the legal entities with foreign currency and variable interest rates, increased the exposure of this type of risk, endangers the creditworthiness of the borrower, but also increases the level of provisions of commercial banks.

Doubts to the reliability of MICA in the part of determining the creditworthiness of the legal entity are already supported by the information of the research (conducted in the period from 2009 to 2015) regarding of the authenticity of the elements of quantitative analysis of the borrower (ACFE, Mirdala et. al., Mirković, Barjaktarović et. al., Čerović et. al., Bugarčić, Stanišić et. al., Stanišić et. al., Vićentijević et. al., Knežević et al., Todorović et. al.), in terms of: (1) presentation of items in the financial reports (assets, calculation of depreciation, devaluation of receivables, revenues, operating cash-flow, the realized financial

result and applied financial analysis), i.e. practice of buying an external auditor's opinion. (2) The motives for the previously described actions (such as handling, tax, bonus payments, ignorance).

It can be concluded that the basic hypothesis are proven and that there is reasonable doubt about the reliability of MICA in commercial banks in the Republic of Serbia.

Conclusion

Research which is conducted in the period from 2009 to 2014 in the banking sector in the Republic of Serbia has shown that there is reasonable doubt about the reliability of MICA of commercial banks in the Republic of Serbia. The limitations that existed during the analysis do not diminish the significance of the results.

It was found using the Pearson correlation coefficient that NPL, as a result of set model for approval investment credit for agriculture and food processing industry, has a very strong link with the capital and the achieved financial results of the banking sector. It was the basis to further establish a causal link between the observed indicators, respecting the legislation in force in the field of risk management and of international standards of accounting reporting, based on the nature of the work which deals with the bank (credit placement). In the sense that it has not adequately established the creditworthiness of the borrower, the amount and purpose of the placement, and the price of risk assumed. This further means that the model of approval of investment credit for the agriculture and food processing industry to the large legal entities in use is not set appropriately, in the sense that they do not perceive assumed credit risks in accordance with the amount of capital that the bank has, or has not adequately established the creditworthiness of the borrower, especially in terms of the group of connected companies (investment fund or successful player in some other industrial sector), the existing exposure at the time of placement of funds of a group of connected entities. Also, there is a space for improvement of MICA in commercial banks in Serbia. Firstly and foremost, further education and training on the topic of financial literacy and business ethics of the employees of the bank, but also in the company of the borrower. In fact, everyone in the chain should look on that process as a lifelong learning process. Secondly, building partnerships between a bank and a client (the borrower), since only a healthy business cooperation of customer and the bank leads to making profit from their business. Thirdly, it should set an appropriate motivation system of employees (in the bank and to the business entity) which will be involved in evaluating and rewarding (as bonus would not be the only form of awards). Finally, negotiations with the various associations and relevant authorities in order to reduce tax burdens where possible, for the objective expression of the financial statements.

Future research will include reviewing of the applied model and the results achieved by any commercial bank in the Republic of Serbia, separately, in the segment of credit risk management of total corporate credit portfolio and specific – industry oriented corporate credit portfolio i.e. agriculture and food processing industry.

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KRITIČKA ANALIZA POUZDANOSTI MODELA ODOBRENJA INVESTICIONOG KREDITA U POLJOPRIVREDI I PREHRAMBENOJ INDUSTRIJI

Lidija Barjaktarović⁵, Renata Pindžo⁶, Azra Hanić⁷

Rezime

Investicije su novčana sredstva koja se ulažu u određena proizvodna dobra, prinos transformisanih novčanih sredstva, proces ulaganja, predmet u koje se investira, i koje se dobija kao rezultat procene investiranja. Svaki racionalan investitor ulaskom u neku investiciju očekuje konkretne koristi. Odluka o ulasku u određeni investicioni poduhvat nosi poslovni rizik, kako za investitora tako i za banku kofinansijera tog projekta. U skladu sa tim predmet rada je kritička analiza pouzdanosti modela odobrenja investicionog kredita za preduzeća u poljoprivrednoj i prehrambenoj industriji (MOIK) koji najčešće koriste domaće banke kada razmatraju da li će finansijski podržati ili ne investicijonu potrebu velikog preduzeća u segmentu sekundarne poljoprivredne proizvodnje i prehrambene industrije. Primenom modela korealacione analize kvantifikovan je stepen međusobne povezanosti indikatora kvaliteta aktive i poslovnih performansi bankarskog sektora Srbije.

Ključne reči: *investicija, analiza klijenata, analiza transakcije, novčani tokovi, EBITDA.*

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CHALLENGES OF INCREASING COMPETITIVENESS OF SERBIAN AGRO-INDUSTRY IN THE PROCESS OF MITIGATION OF EMERGENCY SITUATION¹

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Summary

Protection of agro-industry in emergency situations is of vital importance for economic and social development of a country. This paper is therefore created with a view of assessing the degree of resilience of economic entities within agro-industrial sector in the Autonomous Province (AP) of Vojvodina and partially in the Republic of Serbia in emergency situations, so that measures to increase their competitiveness could be undertaken. The methods adequate for social sciences were used: positive law method, logical induction and deduction, multidisciplinary approach, as well as statistical method. The research established that the economic entities mainly have their own fire rescue and procedure plans, but not emergency action plans. Special financial assets have not been allocated for that purpose either. Businessmen are not acquainted with the existence of ISO 22301:2012 standard, which may be exceptionally useful in solving this problem. The degree of resilience of economic entities in the AP of Vojvodina in emergency situations is 64.2%. It is necessary in the forthcoming period to improve the implementation of regulations, particularly in the field of emergency action plans, but also the possibilities to implement ISO 22301:2012 standard.

Key words: *agro-industry, emergencies, law, security.*

JEL: *Q10, Q54*

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Introduction

Emergencies cause a number of negative consequences for economy, affecting considerably all its sectors. Emergency situations involve disruption of normal livelihood and economic activity, destruction of property, housing and public services; breakdown of industrial, commercial and communications infrastructure; human displacement and loss of life (African Development Bank, African Development Fund, 2008). Numerous emergencies are radically changing the very basis of competitive advantage for organizations. Although competitiveness does not have a precise definition in economic theory, it can be understood as the ability to successfully face competition. In this sense, competitiveness is the ability to sell products that meet demand requirements (price, quality, quantity) and, at the same time, ensure profits over time that enable the firm to thrive (Wijnands, et al., 2015).

Doing business in any emergency is very risky for an organisation because it might have long term consequences in the case that something goes wrong (Radović, Domazet, 2016). Impossibility of regular business operations in emergencies may be expressed through the scope and range of products and services, procuring of raw materials and intermediate products, quality of production, placement and sale of goods, cost-effectiveness of business operations, amount of net working capital, human resources, technology and equipment, organization of a company, position in the market, and similar. Therefore, the consequences of emergencies are not reflected in huge material damages only, but also in decreased competitive strengths of economics entities in the market. This is why it is necessary to provide business continuity under such circumstances.

Naturally, a lot depends on the efficient implementation of positive law regulations, considering that an entire set of regulations has been adopted which govern the field of emergencies (such as the Law on Emergencies), but also the regulations which indirectly govern the issues related to the said field (Domazet, 2015). Regardless of numerous initiatives, the topic of protection of economic activities of Serbia in emergencies has not been sufficiently recognized as interdisciplinary problem the solution of which requires careful analysis and implementation of adequate measures in practice. Decision-makers have not created conditions for the expert public to get involved in solving this problem, or other interested parties for that matter, so that the consequences of inadequate response to an emergency have resulted in huge economic losses in floods that occurred in 2014 (Radović, Domazet, 2016).

One of the economic sectors which is particularly sensitive to emergencies is the sector of agro-industry. This particularly applies to the Republic of Serbia, i.e. the Autonomous Province (AP) of Vojvodina, which is a significant agricultural area.

It should emphasize at this point that there are various definitions of agro-industry, as well as different understanding of the scope of this concept. The authors take the stand that “agro-industry is the generic term applied to the industrial processing of raw materials and intermediate products derived from the agricultural sector (defined broadly to include forestry and fishing as well as crop production and animal husbandry)” (Marsden, Garzia, 1998). Agro-industry contributes to economic development in many ways. One of the most profound changes taking place in agro-food economy of developing countries is

the emergence of agro- industrial enterprises as a part of broader processes of economic development (Henson, Cranfield, 2009). The agro-food sector is defined as the subsector of agro-industry which encompasses food industry, beverages and tobacco manufacturing (Marsden, Garzia, 1998).

Potentially, agro industrialization presents valuable opportunities and benefits for Serbia, in terms of overall processes of needed industrialization and future sustainable development. Hence as the “accelerated growth of agro-industries in developing countries also poses risks in terms of equity, sustainability and inclusiveness there is a need for policies and strategies that, while promoting agro-industries, take into account issues of competitiveness, equity and inclusiveness” (Silva, Baker, 2009). In the most recent decades, developing nations have focused predominantly on economic prescriptions for ‘getting markets right’ by adjusting macroeconomic policy, privatizing state-owned enterprises and opening domestic markets to international trade in agricultural commodities and currencies (Christy et al., 2009). Economic consequences of extreme weather normally occur through losses in primary production inputs: human resources, physical capital, infrastructure, land endowments and productivity (Calzadilla et al., 2004). In emergencies the situations are more severe because “small farmers are faced with numerous obstacles in accessing all the factors that are needed for the delivery of agricultural products that comply with market requirements” (Zakic et al., 2014).

Taking into account the significance of agro-industry for the AP of Vojvodina, i.e. the entire Republic of Serbia, there comes a logical question in which way the resilience of economic entities in emergencies can be improved, in other words how business continuity in emergencies can be provided. Business continuity management represents a holistic management process which identifies potential threats for organization and influences on the operations which these threats can cause, if they occur, and which also provides a framework for building of organizational resilience capable of efficient response in order to protect the interests of key stakeholders, reputation, brand and value creation activities (Domazet, Radović, 2016).

This question is particularly important in the conditions of still current economic and financial crisis when huge efforts are made to preserve competitiveness of domestic economic entities at the international level. The problem is additionally increased by the fact that the EU countries allocate huge assets to support their own agro-industrial sector, as opposed to our country where these allocations are far lower. A typical example is the provision of state aid for the agricultural sector and rural areas awarded by the EU Member States. The allocation of state aid in the agriculture and forestry, as well as in rural areas in the EU is regulated by the European Union Guidelines for State aid in the agricultural and forestry sectors and in rural areas 2014 to 2020 (Domazet, 2015).

Taking the above said into account, this paper represents a contribution to the study of the degree of resilience of economic entities in agro-industrial sector of the AP of Vojvodina, i.e. the Republic of Serbia, in emergencies in order to improve the response to emergencies and climatic changes.

Methodology

When comprising this paper, the authors used the methodology adequate for social sciences: positive law method, logical induction and deduction, multidisciplinary approach, as well as statistical method. The aim of the positive law approach was to analyse the quality of legal solutions in the field of agroindustry resilience in emergencies and to draw attention to possible consequences which occur in practice if they are not implemented.

In addition to this method, logical methods of induction and deduction were used in the paper, considering that the aim was to derive corresponding general principles from certain solutions and consequences (inductive method). Deductive approach was also used considering that a starting fact was that the Republic of Serbia had suffered huge consequences caused by extreme weather and climatic events whose impact on agriculture was considerable. Other specific features are further derived from this rule, so that it can be said that the majority of the paper is dedicated to explanation and comprehension of the scope and logic of these rules. Therefore, in principle, the paper is dominated by the deductive method, while induction is applied in certain parts.

Finally, for better clarification of arguable questions the paper uses multidisciplinary approach, considering that economic knowledge and research which represent real basis for accepting a concept or a conclusion are particularly important for the analysis of challenges for increased competitiveness of Serbian agro-industry in the process of mitigating emergencies. This does not mean that the paper is based exclusively on economic research, but that economic research has been used to a certain extent, particularly when acceptance of alternatively offered solutions should have been defended. Economic appropriateness is used to explain acceptance or rejection of a principle or a specific solution.

The authors investigated the available literature in different fields: disaster management, agro-industry, sustainable development, sustainable agriculture, global climate change, natural disasters, state in society in general, etc. Literature was also searched from numerous libraries and through different websites.

This research was conducted in two different phases: the first one was conducted from August 2015 since the end of 2015; and the second in the first half of 2016. The characteristic methodology related to the first phase was implementation of the so-called 'desk top research', and in the next phase the field research. A part of the results has been obtained by processing the data from interviews with corresponding representatives of economic entities in the field of agro-industry in the territory of the AP of Vojvodina.

Based on the collected data it has been determined which steps should be taken in the AP of Vojvodina, i.e. the Republic of Serbia in order to prevent, mitigate, prepare and respond to the emergency impacts on agro-industry.

Results and discussion: The role of agro-industry in the mitigation of emergency impacts on society

The role of agro-industry in Serbia is rather specific in emergency management. The main responsibility of each organization is to uphold legal and normative regulations which govern this field primarily in the organization itself, but also in local community where it performs its activities. Considering that each segment of agro-industry is exceptionally significant for the security of employees and local community population, as well as for environmental protection and the entire concept of sustainable development, the role of agro-industry is immeasurable in each stage of an emergency (from the stage of readiness, prevention and response, to mitigation of consequences).

Agriculture is one of the hardest-hit sectors when natural disasters strike. Crops are leveled by winds, drowned by floods or scorched by heat and drought. Livestock perish from thirst and starvation. Lands are stripped of fertile topsoil by floods and wind storms, and salinized by seawater incursion. Seed and food stores rot under water from floods or are consumed during droughts. Loans taken to plant crops cannot be repaid. Processing and export industries cannot meet delivery obligations and lose out to competitors. Yet again, the poor are the biggest losers since they are the most dependent on agriculture for a living and have few buffer systems to cushion against these losses (Varma, Winslow, 2005). After any emergency the largest part of basic needs of the endangered population is related to provision of sufficient quantities of agro-industrial products, because of which in many documents at the level of national security it is recognized as so called “critical infrastructure”.

After an emergency (catastrophe) an organization faces the impacts on its operation if there are any disturbances in its activities, on the one hand, and the need to respond to the needs of (narrow or wider) community, on the other hand. In each of these activities the adequate response can actually strengthen the organization’s competitiveness, or the organization can lose it partially or completely if such a reaction is lacking. If an organization is prepared to respond quickly and to adapt to dynamic changes or unexpected working conditions, it shows capability to survive in turbulent times and it wins the public’s confidence. On the other hand, if it lacks sufficient skills in its activities to organize, not respecting generally accepted business ethics, it may be disgraced forever and lose its position in the market.

Agro-industry processes raw materials and intermediate products as well as the products obtained from agriculture, fishing and forestry. Due to the scope of its activities agro-industry is very vulnerable in any emergency. Partial or complete destruction of physical property in agro-industry such as processing plants, warehouses, transport facilities, access roads, buildings, disturbances in supply with raw materials or products, limited supply of energy and other, limit the possibility to mitigate consequences for both agro-industry and the economy of the entire country. Considering that the agriculture of Serbia is in considerable danger due to extreme weather conditions and evident climatic changes agro-industry is accordingly exposed to considerable risk (Radovic, 2014).

In the past many segments of agro-industry were in jeopardy in various emergencies. In catastrophic floods that affected one third of the territory of Serbia in 2014, the

consequences for the operation of many economic organizations were considerable. The greatest victims were season workers in agro-industrial sector who were left without work. Based on the field research the conclusion was drawn that due to the floods, for instance, the fruit processing factory of Krupanj expected two thirds less profit in comparison with the previous year (2013). Agro-industry can as a whole be more resilient to the existing risks if the risk reduction is primarily provided in the field of agriculture. Unfortunately, in practice so far the policy of such protection has been based on rash decisions which were not preceded by any expert analysis. The best example of such behaviour was transfer of anti-hail protection from Hydrometeorological Service of Serbia to the Sector for Emergencies of the Ministry of Interior of the Republic of Serbia. This Sector soon faced the same problems in work which it had reproached to the colleagues from the Hydrometeorological Service before that. The impossibility of the Sector to respond to the identical problems has led to the anti-hail protection being returned under the auspices of the Hydrometeorological Service, which does not mean that the problems have been solved with such a decision of the ruling structure. Farmers are in constant fear of extreme weather conditions, trying to provide adequate protection for their crops either on their own or with the help of grants (building anti-hail nets or various forms of insurance). The Provincial Secretariat for Agriculture, Water Management and Forestry allocated considerable assets for that purpose but systematic solution to the problem of anti-hail protection is missing in the Republic of Serbia and consequently in the territory of AP of Vojvodina.

Moreover, regardless of significant participation of local self-governments and some companies within public-private partnership, the situation has not improved considerably. In addition to the lack of material and financial assets, the training of the employees in the sector of agro-industry is also missing which would enable them to acquire necessary knowledge and skills in the response to mitigate the impacts of emergencies (Radović, 2012).

Results and discussion: Resilience of agro-industry in the AP of Vojvodina in emergencies as a prerequisite to preserve competitiveness

Respect of positive law regulations, as well as preventive activities in order to preserve competitiveness in emergencies are of the first-rate importance for the development of a country's economy. It can be stated that in the territory of the AP of Vojvodina, as well as in other parts of Serbia, the analysis has not been made of impact of emergencies on economic competitiveness. At the same time, the analysis was not made regarding the preparedness of economy to adequately respond to possible operation disturbances.

In this paper the results are presented following the field research carried out in the sector of agro-industry in the AP of Vojvodina in the following towns: Subotica, Sombor, Zrenjanin, Kikinda, Apatin, Novi Sad, Vršac, Vrbas, Kula, Ruma, Beočin, Crvenka, Bačka Topola, Sremska Mitrovica, Indija and Stara Pazova. The field research is based on the interviews with competent representatives of the most important economic entities in the agroindustrial sector.

As for the respect of positive law regulations governing emergencies, it has been established that economic entities have fire rescue plans and procedures.

Second, the field research shows that economic entities to the largest extent have fire rescue plans and procedures, but not the plans and procedures in emergencies. Also, special financial assets have not been allocated to these purposes.

Third, it has been determined that the representatives of economic entities are not acquainted with either the existence or the contents of ISO standard 22301:2012 – Business Continuity Management System, but at the same time it should point out that this issue belongs to the scope of activities of the Institute for Standardization of Serbia.

Fourth, it has been determined that emergencies can considerably influence the scope and range of products and services, purchase of raw materials and intermediate products, quality of production, placement and sale of goods, business cost-effectiveness, amount of net working capital, human resources, technology and equipment, organization of a company, as well as position in the market of economic entities in the field of agro-industry.

Fifth, the field research has shown that all economic entities in the field of agroindustrial sector helped local communities and population affected by emergency consequences, primarily in food products, particularly during 2014 floods. It is important to point out that help was given not only in their local communities, but it was sent to other parts of Serbia as well.

When assessing the resilience of the agro-industry of the AP of Vojvodina in emergencies a set of indicators was used which are shown in Table 1. The resilience indicators of economic entities to emergencies, the rating rationale and actual indicator ratings for each company, together with supporting evidence, justification and comments have been developed into a formal database for ease of data entry, storage and manipulation. The rating rationale was developed from specialist knowledge on Emergency Management good practice, enhanced and clarified by the experience of visiting the accident hazard sites and conducting the data collection. The scoring/rating was carried out with an experiential learning intent, by consultants, along with researchers who were present at the site visits. This dual observation and logging strategy contributed to the continuous development of transparency and accountability within the rating structure throughout the project (Larken et al., 2001).

The resilience of the agro-industry of the AP of Vojvodina was calculated based on the following formula:

$$\text{Rating for indicator (I)} = M_i \times (K_i + A_i + P_i + S_i) / (K_{\max} + A_{\max} + P_{\max} + S_{\max}),$$

where “K” is quality of a measure, “A” is harmonization of activity goals with general strategy, “P” means harmonization with the existing regulations, while “S” means preparedness to implement activities.

Scoring is based on the concept of good practice dictating that each of measures (indicators) should be addressed. They should be aligned to the company or legislative requirement and they should be of good quality. The value of measures “K”, “A”, “P” and “S” range from 1 to 4. If an indicator (I) exists, then it is assigned a value 1, and if it does not exist then its value is

0. After calculating the value for each indicator respectively, the values are added to get and arithmetic mean (Larken et al., 2001).

For instance, for Management structure (MS) indicator, using the above stated formula, we get:

$$MS = 1 \frac{(4+3+4+4)}{4+4+4+4} = 15/16 = 0.94 \times 100 = 94\%$$

Total results are shown in Table 1.

Table 1. Indicators of emergency management in enterprises in the field of agro-industry in the territory of APV

No.	Name of indicator	I	K	A	P	S	Total
1.	Management structure (MS)	1	4	3	4	4	94
2.	Application of standard ISO 22301:2012 (AS)	0	0	0	0	0	0
3.	Infrastructure and facilities (IR)	1	3	4	4	3	87
4.	Performing exercises (PE)	1	4	4	4	4	100
5.	Planning (PL)	1	2	3	4	4	81
6.	The willingness of teams to respond (TW)	1	3	4	4	3	87
7.	Emergency alerting systems (EAS)	1	3	4	4	4	93
8.	Relation with emergency services (RES)	1	4	4	4	4	100
9.	Prepare On site Emergency Plan (PEP)	0	0	0	0	0	0
10.	Review and testing of EM plans (RTP)	0	0	0	0	0	0
Total					64.2		

Source: Author's own work

Finally, the total value of agro-industry resilience in the AP Vojvodina in emergencies is calculated in the following manner = $(94+0+87+100+81+87+93+100+0)/10=64.2\%$.

Conclusion

Based on the research conducted, it can be concluded that the degree of resilience of economic entities in the field of agro-industry in the territory of the AP of Vojvodina is at relatively satisfactory level. Total resilience is somewhat over 60%, whereas the best results are noted regarding Management structure (94%), Performing exercises (100%), Emergency alerting systems (93%), as well as regarding Relation with emergency services (100%). In the second

group we have Infrastructure and facilities (87%), Planning (81%) and the Willingness of teams to respond (87%). Finally, considerably unfavourable result has been recorded regarding Prepare On site Emergency Plan, Review and testing of EM plans, as well as the Application of standard ISO 22301:2012.

Therefore, the results show that there is significant space for improving the overall conditions in this field, which by all means can be done in the nearest future.

First of all, it should considerably improve preventive measures for dealing with emergencies. This primarily refers to preparation of emergency action plans, as well as practices for the implementation of these plans. The implementation of ISO standard 22301:2012 will represent a special challenge, considering that it has not even been officially translated yet in Serbia. The problem with this standard is financial, considering that introducing a standard into business operation implies considerable costs for economic entities which in most cases they are not capable of bearing.

Although a set of regulations has been adopted in Serbia, as well as a range of sublegal documents for the purpose of harmonization with the European Union laws, it seems that challenges remain regarding the implementation of regulations in the field of agro-industry, particularly in the field of risk assessment in agro-industry, as well as adequate response to them. The problem can also be in both quality and quantity of time data which might represent a good tool in predicting extreme weather conditions. Serbia was obliged to perform a wide range of tasks in the field of agro meteorological, weather and hydrological services, but also flood and ice on rivers warnings and climate change (Radović, Keković, 2012). Taking into account that these activities are in accordance with the Law on Emergencies, it should not doubt that they will have great importance for agro-industry, considering the valuable data on unfavourable weather conditions which might affect this branch of economy and jeopardize its competitiveness. Therefore, the academic community should be more involved in the issues of improvement of emergency management in the area of agriculture protection, because the provision of the financial resources, necessary to mitigate the numerous natural and anthropogenic disasters, could be very challenging in the future (Radović, Andrejević, 2011).

Therefore, emergencies will beyond any doubt be the main challenge for competitiveness of agro-industry in the future. The lack of emergency action plans represents a serious handicap for economic entities (particularly those more important) in the field of agro-industry. Economic entities should not base their resilience to emergencies only on the qualifications of the Sector for Emergencies, or state bodies or organs of territorial autonomy or local self-governments. It is necessary to create a kind of symbiosis between businessmen and the government bodies in the field of exchange of information, offering mutual assistance and achieving a higher level of technical-technological equipment for adequate response in emergencies.

However, it should not neglect positive effects which can be seen in practice. This, primarily, refers to the structure of management of economic entities, practices in the field of protection at work and fire protection, as well as good relationship with rescue and protection services,

infrastructure and resources. What can particularly be highlighted is mutual solidarity of economic entities in the field of agro-industry. In this way it will certainly be far easier to prevent possible negative consequences for economic entities in case of emergency.

Recommendations on agriculture protection in Serbia emphasize the need for wider input and coordination even through this remains a challenge for many developed countries. In the United States of America, The United Kingdom of Great Britain, Australia, Netherlands and many other countries decision-makers devoted substantial funds to support the agriculture, and make plans which incorporate the need for monitoring and mitigation of climate change in each sector related to agricultural production (Radović et al., 2015). In this way the economic entities in the field of agro-industry can strengthen their competitive position in the market, considering ever increasing competitiveness coming from other countries. The research certainly showed that for preservation of competitive position in the relevant market only economic measures such as various forms of state aid (grants, subsidies, and similar) are not sufficient, but it is necessary to invest considerable efforts regarding improvement of economic entities' resilience to emergencies. Therefore, in Serbia, i.e. in the AP of Vojvodina, it is necessary to expand activities related to mitigation of consequences caused by emergencies, and this would be based on joint action of all participants in the process, which would enable more efficient action of local communities and economic entities.

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IZAZOVI POVEĆANJA KONKURENTNOSTI SRPSKE AGROINDUSTRIJE U PROCESU UBLAŽAVANJA VANREDNIH SITUACIJA

Siniša Domazet⁵, Vesela Radović⁶, Drago Cvijanović⁷

Rezime

Zaštita agroindustrije u uslovima vanredne situacije je od vitalnog značaja za ekonomski i društveni razvoj zemlje. Radi toga je kreiran ovaj rad sa ciljem da oceni stepen otpornosti privrednih subjekata u sektoru agroindustrije u AP Vojvodini, i delimično u Republici Srbiji u uslovima vanredne situacije, kako bi se mogle preduzeti mere za povećanje njihove konkurentnosti. U radu je korišćena metodologija adekvatna u oblasti društvenih nauka: pozitivno-pravni metod, logički metodi indukcije i dedukcije, multidisciplinarni pristup, kao i statistički metod. Istraživanjem je utvrđeno da privredni subjekti u najvećoj meri poseduju planove za spasavanje i postupanje u slučaju požara, ali ne i planove za postupanje u vanrednim situacijama. Takođe nisu planirana posebna finansijska sredstva predviđena za te svrhe. Privrednici nisu upoznati sa postojanjem standarda ISO 22301:2012 koji im može biti izuzetno koristan u rešavanju ovog problema. Stepenn otpornosti privrednih subjekata u AP Vojvodini u uslovima vanredne situacije iznosi 64.2%. U budućem periodu neophodno je poboljšati primenu propisa, posebno na polju izrade planova za postupanje u vanrednim situacijama, ali i mogućnosti primene standarda ISO 22301:2012.

Ključne reči: *Agroindustrija, vanredne situacije, pravo, bezbednost*

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PUSH AND PULL FACTORS DETERMINING WINE TOURISM DEVELOPMENT IN THE „TRI MORAVE“ SUB-REGION

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Summary

The subject of this paper are the factors affecting the decision of wine tourists to take a trip to a particular destination. These factors can be divided into internal (push) and external (pull) factors. The purpose of this study is to determine the development potential as well as the factors that influence participation in wine tourism in Tri Morave sub-region. In order to do that, two researches were conducted: one on the offer side and another on the demand side. Based on the results of the survey on the offer side, one can conclude that Tri Morave sub-region abounds in natural and anthropological resources that should be turned into an integrated wine product. On the other hand, research concerning tourist demand was conducted by polling winery visitors. The obtained data confirms assumptions about the appearance of modern tourists seeking authentic experience, satisfaction of hedonistic needs, and enjoyment of high-quality wine and food. Based on the results of the survey, the purchase of wine and wine tasting are the highest ranked benefits that tourists expect from visits to wineries. The application of Spearman's correlation coefficient points to statistically significant correlation between respondents, who referred to tasting, wine purchase, and authentic tourist experience as the basic motives of their visit, and future behavior of tourists in terms of revisiting and recommendations of the given wine destination to friends.

Key words: *wine tourism, motives for participation in wine tourism, wine tourist profile, pull and push factors, “Tri Morave” sub-region.*

JEL: Q13.

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Introduction

Under the influence of globalization trends, causing intense development of production forces and directly affecting the rising living standard of the population, an excess of free time, and the fragmentation of holidays, changes in tourism demand occurred, in the form of a modern tourist, characterized by increased tourist experience, striving for authentic experience, demand for products of higher quality, and the delivery of value for money. This gave rise to new forms of tourism and the creation of new, different tourism products to meet the demands of tourists who increasingly strive for hedonistic satisfaction (Bruwer, Alant, 2009) of their own needs. Formulation of wine tourism product and intensive development of wine tourism are phenomena that characterize tourism industry of the 21st century. Despite the fact that wine tours and visits to wineries date from the Middle Ages, tourism product, organized and shaped in this way, is characteristic of the last two decades.

Tourists' desire to become familiar with new types of wine, learn about the technology of production and aging of wine products, and enjoy different wine and food taste, as well as the response by the tourism offer, aimed at meeting the said demand, selling products without distribution costs, and building customer loyalty, have made the supply and demand coincide with the organization of visits to wineries with wine and food tasting and buying products at affordable prices. Basic wine tourism product, which includes visits to vineyards and wineries, is enriched with modern content, which allows tourists, in addition to wine tasting and buying, to spend time in the unpolluted natural environment and enjoy local tradition and culture, and visit cultural and historical attractions and wine events (Bruwer, Lesschaevé, 2012).

Methodology and data sources used

To fully answer the requirements and objectives of this study, two analyses were carried out: the first one focused on examining the wine tourism offer, and the second one on analyzing wine tourism demand. The aim of these analyses was to determine the development potential as well as the factors that influence participation in wine tourism.

Research on the side of the tourist offer was conducted by sending a questionnaire to managers and owners of wineries in the "Tri Morave" sub-region. The questionnaire consisted of 20 questions of open and closed type. The main objective of this study was to find the resources for the development of wine tourism in the "Tri Morave" sub-region, in terms of determining the size of the area under vineyards, annual output and sales of wine, capacity of tasting facilities, ways of organizing wine tourists' visits (independently or with the help of tourist agencies) number of labels in the offer, types and quantities of wines offered to visitors during the tasting, participation in wine fairs.

This study focused on tourists visiting wine destinations in Serbia, and examined their demographic and psychological profile, motives and expectations from the visit to the destination. The study included 160 respondents, wine tourism participants. Of the total number, valid responses of 150 respondents were analyzed. In order to ensure the

validity and credibility of the questions, the pilot research was organized first, which involved eight members of the focus group. Their answers to the questions pointed to certain ambiguities in formulating questions, which were promptly corrected. The questionnaire which analyzed the motives, characteristics, and attitudes of respondents on the demand side was highly structured, consisting of 14 mainly closed-type questions. It consisted of three parts, which studied:

- Basic demographic data on respondents (gender, age, educational structure, income structure, and geographical origin);
- Benefits which they, in their opinion, have from the visit to the winery;
- Their future behavior as wine tourists (revisit to a wine destination, the recommendation to friends) (Byrd, Canziani, Hsieh, Debbage, Sonmez, 2016).

Wine tourism

The most commonly cited literary definition of wine tourism was proposed by Hall et al., 2000, as part of the study *Wine Tourism around the World*, which reads: “Wine tourism includes visitation to vineyard, wineries, wine festivals, and wine shows, for which wine tasting and/or experiencing the attributes of a wine region are the prime motivating factors for visitors”. For the development of wine tourism, winescape is very important, which means vineyards, landscape, tasting rooms, and tourists facilities (Johnson, Bruwer, 2007). The conducted research indicates that winescape is the deciding factor for tourists when choosing a wine tourism destination (Bruwer, Alant, 2009). Wine, as a basic product of wine tourism, “was one of the first products of agricultural origin to develop a close and distinct relationship with its geographic place of origin, at first in European countries dating way back to the 15th century” (Bruwer, Lesschaeve, (2012). Therefore, quality of wine is associated with its geographical origin, so that it is very important to brand the region or country where the wine originates.

“Wine tourism could be defined as visits to wineries and wine events with the basic motive – wine tasting and enjoying the local food and specialties” (Pivac, 2012). Thus, as can be inferred from the given definitions, the basic products in wine tourism are wine and visits to wineries. However, additional content that can enrich the primary product includes enjoying the environment, physical activities in nature, food tasting, as well as supplementing offer with complementary products (cultural goods) that are available near wineries. Upon integrating a large number of secondary motives with the visit to wineries, which together with the primary products make “total wine experience” (Pivac, 2012), it can be concluded that it includes:

- Wine tasting and buying,
- Socializing with friends,
- Enjoying the day outdoors,
- Enjoying the rural environment and vineyards,

- Becoming familiar with wine production,
- Learning about wine,
- Wine tasting in restaurants,
- Tour of the winery,
- Visit or experience of other attractions and activities,
- Relaxation (Pivac, 2012).

Wine tourist profile

The emergence of tourists whose main motive of stay in a particular area is the vineyard tour and wine tasting has given rise to numerous studies dealing with the demographic structure and the psychological characteristics of these visitors. Rapid pace of life and work, characteristic of the late 20th and early 21st century, has caused a growing tourist demand for destinations and products offering relaxation, escape from the urban environment, stay in unpolluted natural environment, wine tasting and gaining experience on the local tradition and the culture of local people. First research defined wine tourist as someone who has the desire to try wine and experience the geographic area in which the wine is produced (Bruwer, Lesschaeve, 2012; Bruwer, Alant, 2009). Later definitions gave a broader description of a tourist as the one who wants a much broader set of wine experience and products (Bruwer, 2013).

Depending on the motives for the visit to the winery, according to some studies (Hall, 1996; Pivac, 2012), tourists who visit wineries can be divided into three categories:

- Accidental or curious wine tourists – For these tourists, winery is just another tourist destination; they visit it with friends and collect information in a fun and informal way.
- Interested wine tourists – These tourists gather more information on wine and production technology; they are casual wine buyers; they want to get acquainted with the varieties and quality of wine, because wineries can provide more information about that than the local liquor store.
- Lovers of wine tourism – They collect more information on the wine production technology and characteristics than the interested wine tourists; the winery is the sole reason for the visit to the destination; these are regular buyers of wine and wine and food magazines; they are usually employed in the wine or the food industry; they practice visiting wineries.

Analyzing the demographic characteristics of the wine tourist, certain studies have come to the conclusion that wine tourism participants are visitors between the age of 40 and 50, who have great knowledge on wine and the process of wine production (Heaney, 2003). Some other studies have shown that the basic difference between winery visitors can be made on the basis of the income structure, and that these are usually tourists

with higher income. However, other authors (Bruwer, Alant, 2009) indicate that it is impossible to make a precise segmentation with specifically determined characteristics of wine tourists. Despite this, the most widely accepted classification in literature is the one given by Hall in 1996, who divided wine tourists into wine lovers, wine interested tourists, and wine curious tourists.

Some other studies have been conducted in order to categorize wine tourists on the basis of psychological characteristics (Corigliano, 1996; Di-Gregorio, Licari, 2006; Italian Wine Tourism Association). Based on the results of their analysis, winery visitors can be classified as follows:

- An expert (professional) – These are tourists, aged between 30 and 35; they are good wine connoisseurs; they are able to establish communication on the technological characteristics of wine production; they are very interested in novelties and are willing to devote the necessary time to get familiar with them.
- A passionate lover – These are tourists aged between 25 and 35 with high purchasing power; they usually travel with friends; they love gastronomy and discovering new destinations; when choosing wine, they usually consult guides; they like to learn about wine, but less than professionals.
- A follower – These are usually tourists aged between 40 and 50 with high income; they are attracted by wine and know the technology of wine production; they are impressed by famous trendy wine.
- Drinker – These tourists are aged between 50 and 60; going to the winery is for them a substitute for going to a bar; they usually visit the winery on Sundays; during a tour of the winery, they continuously sip wine; they buy wine in huge quantities.

Despite the fact that the wine industry is most developed in Europe, most research on the behavior of wine tourists, motives for visits, and characteristics of visitors was conducted in Australia, New Zealand, and the United States. According to the 2025 Strategy, which was published in Australia, the Australian wine industry will by 2015 thrive, become a leader in the tourism industry, the consumers will be of higher payment capacity, and a new generation of women aged 18 to 35 will become new wine experts (Hall, Sharples, Cambourne, Macionis, 2000).

Push and pull factors that influence the decision to visit a wine destination

In order for a wine destination to successfully target a specific market segment, the destination management must determine factors affecting the specific behavior of tourists. Factors affecting the decision of wine tourists to take a trip to a particular destination can be divided into internal (push) and external (pull) factors. Internal factors pushing visitor to the destination are mainly related to wine tasting, learning about the technological processes of production and aging of wine, tours of wineries and their natural environment, stay in a rural setting, learning about food and wine, entertainment, and enjoying good restaurants and wine destination architecture that is

usually lively and rustic. In recent years, increasing focus is placed on motives such as participation in eco-tourism and health aspects of wine.

External factors arise from wineries and wine tourism destination that must form such a wine tourism product that will satisfy the high demand of modern wine tourists. Destination management and management of the winery must understand the demographic and psychological profile of visitors, as well as the motives of their arrival. On the basis of the research, it is necessary to make a segmentation of the market and design products that will meet their needs and wishes. They must be aware that wine tourists do not come to the destination just looking for wine, and that the whole ambience of the destination and winery needs to be designed and organized in order to attract tourists. Great importance should be given to the physical appearance of the winery, design and capacity of tasting rooms, wine quality, education level and professionalism of staff, as well as supporting amenities (transport and tourism infrastructure, access to the winery, promotional material with very detailed instructions on the product quality and price, and so on).

The experience that tourists will take with themselves when leaving the winery will not refer solely to wine tasted or purchased, but the overall experience that helped them escape from everyday stress, offered relaxation and enjoyment of the natural setting, food, wine, architecture, and culture.

Based on the foregoing, one can conclude that there are different motivational factors influencing visit to a certain destination, and that, consequently, winery management should shape an integrated wine tourism product that “represents a whole system of products and services that are more or less based on or related to winemaking, and the function of meeting the needs of tourism. That is why it incorporates wine, wineries with sampling option, events, wine routes, souvenirs, educational courses and workshops, gastronomy, etc.” (Škrbić, Jegdić, Milošević, Tomka, 2015).

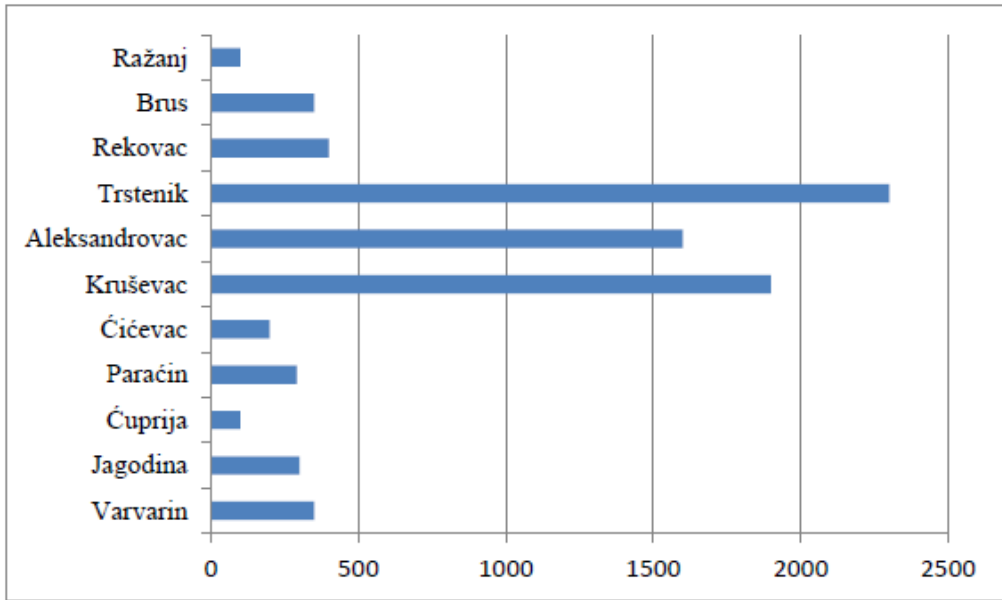
Resources for the development of wine tourism in the “Tri Morave” sub-region

Of the total area of the territory of the Republic of Serbia, it is considered that 25,000 ha is under vine. According to the Statistical Office of the Republic of Serbia, of the said area, 17,118 ha belong to the region of Central Serbia. “Tri Morave” sub-region is located in the specified region, and covers 7528.76 hectares of vineyards, of which 6161.22 ha with wine varieties. It is located in the valleys of the Great, South, and West Morava and their tributaries, surrounded by Bešnjaja, Gledičke, Goč, Željcin, Kopaonik, Jastrebac, Beljanica, Kućajske, Rtanj, and Ozren mountains, characterized by temperature and air flow suitable for growing grapes. The vineyards are situated on moderately steep to gentle slopes, at an altitude of 200 to 350 m, except for Župa vineyards, located at higher altitudes (Ivanišević, Jakšić, Korać, 2015)..

The “Tri Morave” sub-region includes nine vineyards: Paraćin, Jagodina, Jovac, Levač, Temnić, Trstenik, Kruševac, Župa, and Ražanj vineyards. Graph 1 shows the areas under arable vineyards. The largest arable land is located in the vineyards of Trstenik

and Aleksandrovac, while the smallest areas under vine are in the vineyards of Ražanj and Čuprija.

Graph 1. Area in the “Tri Morave” sub-region under arable vineyards in hectares



Source: Ivanišević, Jakšić, Korać, (2015);

18,129 households are engaged in viticulture, representing about 33.16% of the total number of farms in this sub-region (Ivanišević, Jakšić, Korać, 2015). Wine production in more than 70 market-oriented wineries is the most extensive wine production in Serbia (Jakšić, Ivanišević, Đokić, Brbaklić-Tepavac, 2015). Commercial wineries are mainly concentrated in Župa vineyard, Kruševac, near Jagodina, Rekovac, and Trstenik, while small traditional wineries are found in all areas of the sub-region. White, red, and rosé wines are produced in almost equal quantities.

The sub-region can offer a wide selection of wines, which is, in addition to monovarietal wine, made of autochthonous grape varieties Prokupac and Tamjanika, dominated by monovarietal wines of the world famous varieties, Sauvignon Blanc, Chardonnay, Rhine Riesling, Italian Riesling, Cabernet Sauvignon, Merlot, and Pinot Noir, as well as wine blends, obtained from the above grape varieties.

As for the wine events and festivals on the territory of the “Tri Morave” sub-region, Župa Grape Harvest and Wine Day are traditionally held. Župa Grape Harvest, as the most famous commercial and tourist event in this part of Serbia, is traditionally held in Aleksandrovac every September starting from 1963, to honor the beginning of the grape harvest. Wine Day is a festival of Serbian wines of relatively recent date, which is, starting from 2008, every year traditionally held in Kruševac on the eve of St. Vitus Day, and brings together the best Serbian winemakers.

To better analyze the internal and external opportunities, as well as threats for the development of wine tourism in this sub-region, SWOT matrix will be used, which shows strengths, weaknesses, opportunities, and threats.

Table 1. SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> - Large areas under vine - Monovarietal wines of domestic and foreign varieties - A wealth of cultural, historical, and religious goods - A wealth of rural tourism products 	<ul style="list-style-type: none"> - Poor transport infrastructure - Inadequate tourism infrastructure - Poorly designed wine tourism product - Insufficient promotion of wine tourism product
Opportunities	Threats
<ul style="list-style-type: none"> - Formulating complex wine products - Joint appearance of several wineries on the wine market - Organizing various wine events - Organizing wine tours 	<ul style="list-style-type: none"> - Winery competition from other regions - Winery competition from neighboring countries - Vaguely formulated wine tourism development strategy - Insufficient support from the Government

Source: Authors' analysis;

The above-mentioned analysis has shown that the “Tri Morave” sub-region possesses natural and anthropological resources for the development of wine tourism. The diversity of grape varieties and wine offer of varying quality, taste, and price could attract tourists of different educational and income profiles. The main obstacle to faster development of wine tourism in this area is inadequately designed wine tourism product and underdeveloped tourism infrastructure, as well as insufficient investment in the promotion of this product.

Along with the design of an integrated wine product, which could, in addition to wine purchase and tasting, include tourism products of cultural, historical, and religious nature, as well as the offer of rural tourism products and adequate promotion, the “Tri Morave” sub-region could use the existing natural and anthropological resources to create new chances and opportunities that would imply appearance and recognition on the European wine market. Offer of quality and complex products would result in attracting new visitors, and create loyalty with existing ones, because it would guarantee the delivery of value for money.

Research questions and hypotheses

In the course of the research on the offer side, the following basic hypothesis was established:

H0: The “Tri Morave” sub-region possesses natural resources for the development of wine tourism.

In addition, several specific hypotheses were established, to test the basic hypothesis:

H1: In the “Tri Morave” sub-region, there are large areas under vineyards.

H2: The “Tri Morave” sub-region can offer tourists a variety of autochthonous varieties of wine.

H3: In the “Tri Morave” sub-region, visits to wineries and wine tasting are organized.

In the course of the research on the tourism demand, the factors affecting the decision to visit a wine destination were analyzed. The main purpose of this research was to analyze the factors and motives that affect the visit to the wine area and the behavior of tourists during and after visiting the wineries.

For the purpose of operationalization of the above analyses, the following research questions were set:

- 1) Does the Tri Morave region have sufficient resources for shaping a recognizable wine tourism product?
- 2) Do differences in demographic characteristics influence the decision on participation in the wine tourism?
- 3) What are the main motivating factors affecting participation in wine tourism?
- 4) What are the future intentions of wine tourists (revisit and recommendation to friends)?

Research and research questions on the demand side are set on the basis of the literature review and previous studies (Bruwer, Lesschaeve, 2012; Bruwer, 2004; Bruwer, Alant, 2009; Alebaki, Iakovidou, 2010; Ivkov et al., 2015; Byrd, Canziani, Hsieh, Debbage, Sonmez, 2016).

At the start of the study, the hypotheses were set and tested using SPSS 20 software package, customized to the analysis of statistical data in social sciences. Using descriptive statistical analysis of data collected and Spearman’s correlation coefficient, the basic correlation between the defined variables was determined.

The basic hypothesis is:

H0: Different factors affect the decision on visiting a wine destination.

This hypothesis was operationalized by the following specific hypotheses:

H1: Tourists who are distinguished by different demographic factors make the decision to visit a destination in a different way.

This specific hypothesis was tested using the following individual hypotheses:

H11: There is the statistically significant correlation between the age of respondents and visits to wineries.

H12: There is the statistically significant correlation between tourists' income and visits to wineries.

Another specific hypothesis was set, which reads:

H2: The expected benefits from visits to wineries affect the decision to visit a winery.

The above hypothesis was tested using the following individual hypotheses:

H21: Buying and tasting of quality wines are the main motives for the visit to the wine destination.

H22: The emergence of sophisticated tourists and their tendency towards hedonism and gaining new experience affects the visit to wineries.

The third specific hypothesis examined the correlation between the motives for the visit to wineries and tourists' revisits:

H3: The motives for the visit to wineries will affect the future behavior of wine tourists in terms of revisits and recommendations to friends.

The above specific hypothesis was tested using the following individual hypotheses:

H31: There is the statistically significant correlation between the motives for buying and tasting wine and revisits.

H32: There is the statistically significant correlation between the motives of modern tourists to gain authentic experience and revisits to winery and recommendations to friends.

In trying to verify the set hypotheses, the arithmetic mean and standard deviation of the defined variables were first calculated (Table 1), followed by the identification of the measures of elongation and flatness (Table 1). In order to assess whether the data obtained belong to the normal distribution or deviate from it, which is very important in order to know whether the proposed hypotheses are to be tested using parametric or non-parametric tests, the Kolmogorov-Smirnov test was applied, for the purpose of assessment of data distribution, based on a sample of more than 50 respondents, presenting the data collected in histograms, normal Q-Q graphs and detrended charts. It was concluded that the collected data does not follow a normal distribution, and that non-parametric tests had to be applied.

The research results on the tourist offer side

By analyzing the responses of owners and managers of 28 wineries located in the area of the "Tri Morave" sub-region, it can be concluded that the "Tri Morave" sub-region has a long tradition of growing grapes and producing different types of wine. On the territory of this sub-region, there are some of the oldest wineries in Serbia, such as

Rubin AD, founded in 1955, as well as some of new ones, such as Čaša vina i priča (A Glass of Wine and a Story), established in 2014.

Area under vine ranges from about 0.5 ha, within the winery Rajković in the village of Gornje Zleginje – Aleksandrovac, 20 ha in the winery Temet from Lozovik near Jagodina, 12 ha in the winery Enocentrik from Lozovik, up to 1000 hectares, planted within Rubin plantations. The largest quantity of wine a year in this region is produced by the winery Rubin (10,000,000 l), and the lowest production is recorded by the winery in the village Pretrkovac (4000 l per year). The highest number of labels is offered by Rubin (50), then VINO Župa Aleksandrovac (20), as well as the winery of the high school Sveti Trifun (8).

Of the total number of surveyed wineries, 50% gave answers that their offer included wine tourism products. Of the total number of wineries involved in wine tourism, 71% said that they organized wine tours independently, while 4 wineries decided to hire travel agencies that could help with the organization of wine tourism. When asked how long they have been engaged in wine tourism, only 7% of wineries responded that they have been dealing with it for 10 years, while others said that they have been organizing this type of tourism between 3 and 5 years. When organizing visits to the wineries, 67% of wineries include educational content in the form of enologist's lectures, as well as various lectures by technologists, talking about the process of production and aging of wine.

By analyzing the quantity of wine that is sold as a result of wine tourism, it can be concluded that this percentage ranges between 1% (Rubin) and 40% (Nikolić Vineyards). In other wineries, this percentage is in the range from 3 to 5%. When asked about the goal of organizing tourist visits to the winery, the largest number of respondents answered that it is the promotion of the winery and direct sales of wine to consumers.

As for the tourist infrastructure which would enable the reception and stay of guests, the capacity of tasting area ranges from 20 to 80 seats. The vast majority of wineries have no accommodation facilities for a longer stay, except for the Nikolić winery, which can accommodate 9 visitors.

The management and owners of wineries in this sub-region often participate in wine trade fairs, exhibitions, and local events, in order to promote the winery and establish direct relationships with customers and partners. Most of the respondents participate in events such as Beo Wine Fair, Vinosaur Banja Luka, and the Wine Salon in Hyatt.

Comparing the obtained data from the “Tri Morave” sub-region with the data of the Statistical Office of the Republic of Serbia on 17,118 hectares of vineyards in the region of Central Serbia (77.3% of the total area under vineyards in Serbia), one can conclude that the major part is in the “Tri Morave” sub-region, 7,528,76 ha, which represents 33.99% of the total area under vine in Serbia. Of this area, 81.84% are table varieties. Wineries that participated in the study (28 of them) have 1150.2 hectares under vine, which represents a very significant part of total wine-growing area.

Based on the foregoing, one can conclude that in the sub-region of “Tri Morave”, there are large areas of vineyards, that this sub-region can offer tourists a variety of autochthonous varieties of wine, that wineries involved in wine tourism have tasting rooms of significant capacity, but without the possibility of a longer stay of guests, and that there are possibilities of organizing tours of the winery and wine tasting. This confirmed specific hypotheses on the basis of which a conclusion can be made that the “Tri Morave” sub-region has vast natural resources for the development of wine tourism, which confirmed the null hypothesis of the research conducted on the side of the wine tourism offer.

The research results on the tourist demand side

Table 2. Demographic profile of tourist respondents

Variables		Frequency	Shares	Mean	Standard deviation	Skewness	Kurtosis
Gender	- Male	77	51.3	1,49	.501	.054	-2.024
	- Female	73	48.7				
Age	a) 15-25	2	1.3	2.99	.843	.570	.427
	b) 26-35	38	25.3				
	c) 36-45	80	53.3				
	d) 46-60	20	13.3				
	e) 60 and older	10	6.7				
Income structure	a) 150-300 e	30	20	2.33	.981	.368	-.838
	b) 310-500 e	65	43.3				
	c) 510-700 e	30	20				
	d) More than 700e.	20	16.7				
Education structure	- High school	43	28.7	2.42	1.051	-.102	-.967
	-Higher school	20	13.3				
	- Faculty	70	46.7				
	- Master	15	10.0				
	- PhD	2	1.3				
First time in the winery	- Yes	85	56.7	1.43	.497	.272	-1.952
	- No	65	43.3				
City of residence	- Belgrade	81	54.0	2.09	1.439	.998	-.485
	- Niš	23	15.3				
	- Kragujevac	15	10.0				
	- Smederevo	13	8.7				
	- Vranje	18	12.0				

Source: Authors' calculation based on the survey data;

According to data in Table 2, one can conclude that the total number of respondents included about the same number of male and female respondents, which means that women are equally interested participants in wine tourism as well as men. The largest

number of respondents, 53.3% of them, was between 36 and 44 years of age, mainly with monthly income of 310-500 euros. Nearly half of the survey participants (46.7% of them) had university education and came from Belgrade (54%). Of the total number of respondents, 56.7% said that it was their first time in the winery; while 43.3% gave an answer that they had already visited some of the wineries. Based on this data, one can conclude that wine tourism attracts new tourists and those who are willing to repeat the experience gained from wine tourism. However, using the Spearman's correlation coefficient, no statistically significant correlation was identified between the respondents' gender and the decision on participation in wine tourism.

In order to check the first and second individual hypothesis on the correlation between the respondents' age and social status, i.e. their monthly income, Spearman's correlation coefficient was used. Since the value of the Spearman's correlation coefficient was in both cases .000, which is less than 0.005 (limit when determining statistical significance), it can be concluded that there is the statistically significant correlation between age and income structure of respondents and the decision to visit wineries. This confirms the first hypothesis, based on the proven individual hypotheses.

After completing the first part of the analysis of the collected demographic data, the focus shifted to the analysis of the collected responses on the motives and expected benefits from visits to wineries. The assumed benefits were grouped into three categories (purchase, education, and entertainment). The alternatives were ranked based on a five-point Likert scale (5 – very important, 4 – important, 3 – neither important nor unimportant, 2 – slightly important, 1 – unimportant). For the purposes of assessing the most frequent answers to the question on the importance of the offered items about the expected benefits, the arithmetic mean and standard deviation were calculated.

Table 3. Expected benefits from visits to wineries

Grouped benefits	Items	Mean	Standard deviation	Frequency	Percent
Purchase	- Purchase of high-quality wine	4.77	.497	3-5	33.0
				4-25	16.7
				5-120	80
	- Purchase of wine at lowered prices	3.93	.575	3-30	20.0
				4-100	66.7
				5-20	13.3
	- Purchase of souvenirs and gifts	2.67	.598	1-10	6.7
				2-30	20.0
				3-110	73.3
	- Purchase of organic food	2.45	.774	1-26	17.3
				2-30	20.0
				3-94	73.3

Grouped benefits	Items	Mean	Standard deviation	Frequency	Percent	
Education	- Knowledge of wine and production processes	3.59	.493	3-61	40.7	
				4-89	59.3	
	- Technologists' and enologists' advice	2.61	1.197	1-49	33.0	
				3-61	40.3	
	- Visit to cultural and historical monuments	2.33	1.191	4-40	26.7	
				1-63	42.0	
	- Participation in eco-tourism	2.05	1.573	3-61	40.7	
				4-26	17.3	
	Entertainment	- Wine tasting	4.77	.497	1-102	68.0
					3-5	3.3
4-25					16.7	
- Rest and relaxation		4.53	.501	5-120	80.0	
				4-70	46.7	
- Socializing with friends		4.18	.898	5-80	53.3	
	3-49			32.0		
- Gaining authentic tourist experience	4.95	.268	4-25	16.7		
			5-76	50.3		
			3-2	1.3		
- Enjoying food and wine	4.46	1.030	4-3	2.0		
			5-145	96.7		
			1-8	5.3		
			3-12	8.0		
- Stay in unpolluted nature	3.91	1.622	4-25	16.7		
			5-105	70.0		
			1-33	22.0		
			3-5	3.3		
				4-21	14.0	
				5-91	60.7	

Source: Authors' calculation based on the survey data;

Based on the data shown in Table 3, one can conclude that the purchase of wine and wine tasting are the highest ranked benefits that tourists expect from visits to wineries (arithmetic means have the same value of 4.77). Similar data was obtained by Byrd,

Canziani, Hsieh, Debbage, Sonmez, (2016), when ranking the benefits that tourists have from the visits to wine destinations. This supports previous work suggesting that wine itself and tasting it are core benefits of winery visits (Byrd, Canziani, Hsieh, Debbage, Sonmez, (2016). However, among the given answers concerning the benefits from winery visits, the item Gaining authentic tourist experience has the highest value of the arithmetic mean in this research. The obtained data confirms assumptions about the appearance of modern tourists seeking authentic experience, satisfaction of hedonistic needs, and enjoyment of high-quality wine and food. The obtained data confirms the second specific hypothesis, based on which wine purchase and wine tasting are the most important motives for tourist visits to wineries. Observed by groups (purchase, education, and entertainment), the lowest value was given to a group referring to education. This shows that the participation in eco-tourism and visits to cultural and historical monuments are the least important to winery visitors. The conducted research confirmed the second specific hypothesis, as well as individual hypotheses that helped its confirmation.

In order to further study the correlation between the expectations of tourists from the wine tourism product and future intentions, the arithmetic means of responses to the question about the probability of revisits and recommendations to friends were calculated first. The alternatives were ranked on a five-point Likert scale (5 – certainly, 4 – very likely, 3 – neither likely nor unlikely, 2 – unlikely, 1 – impossible). The data obtained is shown in Table 3. It can be concluded that it is more than likely that tourists will revisit the wineries, and recommend them to friends.

Table 4. Feedback from winery visitors

Future intentions	Mean
Revisit	4.25
Recommendation to friends	4.39

Source: Authors' calculation based on the survey data;

Testing the correlation between the expected benefits from visits to wine destinations and the future behavior of wine tourists was carried out by using the Spearman's correlation coefficient. While the results of previously conducted research (Byrd, Canziani, Hsieh, Debbage, Sonmez, 2016) showed very strong correlation between the motives for wine purchase and revisits and recommendation to friends, this study found stronger correlation between some other motives and future behavior of tourists.

Table 5. Correlation among motives for the visit and future intentions

Motives for the visit	Revisit to wineries	Recommendation to friends
- Purchase of high-quality wine	Spearman correlation .329 Sig. (two-tailed) .000	Spearman correlation .564 Sig. (two-tailed) .000
- Wine purchase at lowered prices	Spearman correlation .436 Sig. (two-tailed) .000	Spearman correlation .567 Sig. (two-tailed) .000
- Purchase of souvenirs and gifts related to a wine destination	Spearman correlation .304 Sig. (two-tailed) .000	Spearman correlation .415 Sig. (two-tailed) .000
- Knowledge of wine and production processes	Spearman correlation .622 Sig. (two-tailed) .000	Spearman correlation .161 Sig. (two-tailed) .000
- Visit to cultural and historical monuments near the winery	Spearman correlation .311 Sig. (two-tailed) .000	Spearman correlation .139 Sig. (two-tailed) .000
- Technologists' and enologists' advice	Spearman correlation .601 Sig. (two-tailed) .000	Spearman correlation -.248 Sig. (two-tailed) .000
- Participation in eco-tourism	Spearman correlation -.290 Sig. (two-tailed) .000	Spearman correlation -.449 Sig. (two-tailed) .000
- Wine tasting	Spearman correlation .329 Sig. (two-tailed) .000	Spearman correlation -.177 Sig. (two-tailed) .000
- Rest and relaxation	Spearman correlation .329 Sig. (two-tailed) .000	Spearman correlation .564 Sig. (two-tailed) .000
- Socializing with friends	Spearman correlation .808 Sig. (two-tailed) .000	Spearman correlation .070 Sig. (two-tailed) .000
- Gaining authentic tourist experience	Spearman correlation .973 Sig. (two-tailed) .000	Spearman correlation .109 Sig. (two-tailed) .000
- Enjoying food and drink in the winery	Spearman correlation .262 Sig. (two-tailed) .000	Spearman correlation .306 Sig. (two-tailed) .000
- Stay in unpolluted nature	Spearman correlation .019 Sig. (two-tailed) .000	Spearman correlation .901 Sig. (two-tailed) .000

Source: Authors' calculation based on the survey data;

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

Specifically, as shown by data in Table 5, there is the statistically significant correlation between the tourists' motives to learn something new about the wine and production processes and their intention to revisit the winery and recommend it to friends. There is also the statistically significant correlation between the motives related to socializing with friends and gaining authentic experience and revisiting wineries. So, tourists whose main motives are spending free time in wineries and socializing with friends, as well as gaining authentic experience, show tendency to revisit wineries. The least statistically significant correlation was found between staying in unpolluted nature and participation in eco-tourism and future revisits to wineries. The said tests confirmed the third specific hypothesis, which reads: the motives for visit to wineries affect the future

behavior of wine tourists in terms of revisits and recommendations to friends. The data obtained on revisits and recommendations to friends relating to tourists whose main motive for visits to wineries are wine purchase and wine tasting, as well as the gaining of authentic experience and socializing with friends, confirm this.

Practical implications, research limitations, and further research

Based on the analysis of the motives for the visit, as well as expectations of tourists from visits to the winery, guidelines to be suggested to the winery management in the sub-region “Tri Morave” relate to the necessity of differentiation compared to other wineries in the region, by offering wider range of products, organizing food tasting and wine tasting, and organizing transport of tourists to the winery.

Research limitations are reflected in the inability of application of research results in all wineries in Serbia, because the management and owners of the wineries in the sub-region “Tri Morave” were surveyed. The following limitation can be attributed to the period of data collection. Respondents were interviewed in the period from 15 November 2015 to 25 November 2015, which is not the period when the majority of tourists visit wineries.

Further research could be used for the purpose of analysis of secondary, complementary products that could enrich the basic wine product (wine tasting and tour of the winery). By designing a complex product, which would involve rural and spa tourism products and visiting cultural, historical, and religious monuments, wine tourism would attract market segments which are not the most frequent participants of wine tourism. Further formulation of an integrated product to be offered to the younger population, in the form of organization of entertainment parks for children in the winery yard while their parents taste wine, could attract couples with children. A wine product could also be enriched with the organization of activities in which the whole family could enjoy, by spending a weekend in a natural, unpolluted environment, tasting healthy food and wine.

Conclusion

The “Tri Morave” sub-region possesses natural and anthropological resources for the development of wine tourism. Huge areas under vineyards, production of autochthonous varieties of wine, organization of visits to vineyards and wineries, and wine tasting and sales are just part of the tourism product that the wineries in the mentioned sub-region can offer to their tourists. By overcoming the obstacles, such as inadequate transport and tourism infrastructure, and by organized and promoted wine tours, the “Tri Morave” sub-region can achieve a competitive advantage in relation to the wineries in the region.

Formulating an integrated tourism product, which will offer the sophisticated tourists, apart from enjoying quality wine, to stay in unpolluted natural environment, socialize with friends, escape from everyday stress and chaotic urban lifestyle, visit cultural, historical, and religious monuments, and enjoy rural tourism products, the vineyard “Tri Morave” sub-region can become the leader of wine tourism of Serbia and achieve recognition and marketing visibility on the European wine market.

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PUSH I PULL FAKTORI KOJI UTIČU NA RAZVOJ VINSKOG TURIZMA REJONA TRI MORAVE

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Predmet ovog rada predstavljaju push i pull faktori koji utiču na odluku vinskog turista o preduzimanju putovanja u određenu destinaciju. Ovi faktori mogu biti podeljeni na interne (pull) i eksterne (push) faktore. Cilj rada je da se utvrdi razvojni potencijal, kao i faktori koji utiču na učesnike vinskog turizma u rejonu Tri Morave. U tu svrhu sprovedena su dva istraživanja: jedno na strani ponude, a drugo na strani tražnje. Na osnovu rezultata istraživanja na strani ponude, može se zaključiti da rejon Tri Morave obiluje prirodnim i antropogenim resursima koji bi trebalo biti oblikovani u integrisani vinski proizvod. Na drugoj strani, istraživanje koje se tiče turističke tražnje je sprovedeno ispitivanjem posetilaca vinarija. Prikupljeni oidaci potvrđuju pretpostavke o pojavi modernog turista u potrazi za autentičnim iskustvom, zadovoljenjem hedonističkih potreba i uživanjem u kvalitetnom vinu i hrani. Na osnovu rezultata istraživanja, kupovina i degustacija vina su najviše rangirane koristi koje turisti očekuju od posete vinarijama. Primenom Spearmanovog koeficijenta korelacije je utvrđeno da postoji statistički značajna veza između ispitanika koji su kao osnovne motive svoje posete naveli degustaciju, kupovinu vina i sticanje autentičnog turističkog doživljaja i budućeg ponašanja turista u smislu ponovne posete i preporuke prijateljima date vinske destinacije.

Ključne reči: vinski turizam, motivi učestvovanja u vinskom turizmu, profil vinskog turista, pull i push faktori, rejon Tri Morave.

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ELECTRONIC WAREHOUSE RECEIPTS REGISTRY AS A STEP FROM PAPER TO ELECTRONIC WAREHOUSE RECEIPTS¹

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Abstract

The aim of this paper is to determine the economic viability of the electronic warehouse receipt registry introduction, as a step toward electronic warehouse receipts.

Both forms of warehouse receipt paper and electronic exist in practice, but paper warehouse receipts are more widespread. In this paper, the dematerialization process is analysed in two steps. The first step is the dematerialization of warehouse receipt registry, with warehouse receipts still in paper form. The second step is the introduction of electronic warehouse receipts themselves. Dematerialization of warehouse receipts is more complex than that for financial securities, because of the individual characteristics of each warehouse receipt. As a consequence, electronic warehouse receipts are in place for only to a handful of commodities, namely cotton and a few grains. Nevertheless, the movement towards the electronic warehouse receipt, which began several decades ago with financial securities, is now taking hold in the agricultural sector.

In this paper is analysed Serbian electronic registry, since the Serbia is first country in EU with electronic warehouse receipts registry donated by FAO. Performed analysis shows the considerable impact of electronic warehouse receipts registry establishment on enhancing the security of the system of public warehouses, and on advancing the trade with warehouse receipt.

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Key words: *commodity exchange, public warehouse, electronic warehouse receipt, short term loans.*

JEL: *Q13, Q14, G18.*

Introduction

The common questions in countries without public warehouses systems are: Is the public warehouse system needed? Is it necessary to establish public warehouse system with all three components (licensing procedure, Indemnity Fund and special inspection service)? Should the public warehouse system be embedded in the legislation or contractual relations between the interested parties are sufficient? Is it useful to establish an electronic warehouse receipts (EWR)?

An appropriate legal framework is a prerequisite for a functioning public warehouse system (IFC/WB, 2013). Although public warehouse system is possible even in poor legal environments, in such conditions transaction costs are higher and bank credit committees will be more reticent to approve transactions. Bank risk controllers and credit committees in particular feel more comfortable when there is strong legislation in place protecting the integrity of the system, establishing clear procedures in case of bankruptcy and default, and allowing the perfection of security interests (Zakić et al., 2014).

There were several attempts to create *private public warehouse systems*, like in Russia, Kazakhstan and Turkey, mostly from banks and commodity exchanges, but without success (Belozertsov et al., 2011). Recommendation can be given that public warehouse system has to be established through national legislation, while licensing and controlling function has to be done by government.

The public warehouse system is based on the licensing of warehouses for grains and oilseeds. To obtain a license, a warehouse must meet the requirements in terms of equipment and facilities and show positive business performance in the previous accounting period, including a sufficient level of a free capital (Law on public warehouses for agricultural products, 2009). A public warehouse may issue a warehouse receipt for its own stored commodity or for the commodity of a third party, as proof of storage (Zakić et al., 2014).⁷

The experience of USA, Canada, majority of EU countries, Ukraine, Serbia, etc., shows that fully functional warehouse receipts system is very beneficial for the agribusiness sector.

The warehouse receipts systems with all the supporting structures in place have been proven in practice to be more efficient compared with partly established systems (Hollinger, Rutten, 2009). If possible, countries opting for establishment of the system should have: 1) Licensing body and licensing procedures for warehouses in order to obtain public warehouses license; 2) Special inspection body in charge of controlling public warehouses; 3) Guarantee structure

⁷ In many warehouse systems, public warehouses are prohibited of issuing warehouse receipts for their own commodity. Serbia is allowing this action and this can be recommended for all other systems.

(such as Indemnity Fund (IF)) needs to be established to reimburse the grain owners/warehouse receipts holder if public warehouse cannot deliver grain to the owner. It is important to have out-of-court procedure for compensation.

If the system is not based on all three components, like it was in the case of Romania, players in the system will not have enough confidence when landing against warehouse receipts. As a consequence banks will be reluctant or interest rate will be higher, traders will have doubt that the grain will be delivered from warehouses and avoid trading with warehouse receipts, etc. (Mahanta, 2012). Development of warehouse receipts is also an essential base for futures and option markets, because warehouse receipts are needed for futures contracts delivery (Coulter, Onumah, 2002).

The warehouse receipt can be used as pledge for short-term loans, which typically have a lower interest rate compared to other short-term loans. The warehouse receipt can be traded and typically generate higher prices than the same product sold with other proof of storage (Giovannucci et al., 2000).

Besides being the pledge for short-term loans, warehouse receipt could also be used for repurchase agreement. Repurchase agreement is an agreement on the sale of securities with a commitment to repurchase them at a specified period and at a fixed price (Mirović, Bolesnikov, 2013). The seller of warehouse receipt (farmer) agrees to repurchase them from the buyer (bank) in predefined period and price.

The benefits of warehouse receipts such as a higher price for commodity stored in a public warehouse and the acceptance as pledge by commercial banks are the result of the confidence that banks and traders have in the system. This confidence is derived from so-called “*Three rounds of safety*” that are built into the system, i.e.: 1) only a first class warehouse with appropriate financial indicators and equipment can be licensed; 2) a special inspection service monitors the commodities stored in public warehouses; 3) Indemnity Fund, in situation when the owner of the commodity cannot get out the products from the public warehouse, has to indemnify the owner within five days through an out-of-court procedure.

One of the milestones of the public warehouse system is the fact that the Indemnity Fund has separate funds intended for compensation to owners of different types of products (Vasiljević, Zakić, 2006).

A warehouse receipt system can (Varangis, Larson, 1996): a) improve farm income and smooth domestic prices by providing an instrument to farmers to spread sales throughout the crop year; b) mobilize credit to agriculture by creating a secure collateral for banks; c) help create cash and forward markets and thus enhance price discovery and competition; d) provide a way to gradually reduce the role of government in agricultural commercialization; e) combine with price hedging instruments to predetermine the cost of future purchases or sales.

The warehouse receipt and warehouse receipt registry

Warehouse receipts (WR) are commodity securities (which can be in paper or electronic form) issued by a warehouse operator that proves that the commodity has been stored. The warehouse receipts prove ownership of the commodity and the warehouse's obligation to deliver the commodity to the legitimate holder of the receipt (Mor, Fernandes, 2009).

The physical (paper) warehouse receipt may consist of either one or two parts.

In the United States, the warehouse receipt is a single document. Two-part receipts are more common in continental Europe and Latin America, and have also been adopted elsewhere. Two-part receipts allowing trading on both commodity and pledge market: one of the parts is related to the ownership of the commodity, and the other to the pledge. Choice of the most appropriate type of warehouse receipt should be based on an evaluation of the situation in each country. A single-part receipt is simpler and more convenient tool for commercial transactions (USAID, 2002).

The warehouse receipt in paper form should be protected against fraud. The system should develop a reliable mechanism for keeping track of warehouse receipts both at the licensed warehouse level and for the overall system usually by sending regular periodical reports from each public warehouse to system administrator. Information on warehouse receipts in paper form is stored in central electronic register of warehouse receipts (Hollinger, Rutten, 2009).

Securities such as shares and bonds are in dematerialized form in many countries, commodity securities such as warehouse receipts are rarely in dematerialized form because of its individual characteristic dematerialization is more complex (Vasiljević et al., 2014).

The movement from paper to electronic warehouse receipt is relatively recent. Even today in the USA only cotton is fully operational in an electronic format, with several grains participating under a Department of Agriculture trial system. Still, even under this trial system, Electronic warehouse receipts (EWRs) are being used in a manner that was unheard of only 20 years ago. Thus, EWRs in these programs can be used as: pledge for loans through approved providers with financial lending institutions; for intra-company transactions to reposition grain to another approved warehouse; as pledge to meet margin or other financial requirements at futures exchanges; for transferring ownership to commodities between different warehouses, processors, ethanol plants and end users; and to transfer ownership to grains and oilseeds through the delivery process at futures exchanges.

The U.S. cotton industry set up an electronic cotton warehouse receipts in 1993. Led by Plains Cotton Cooperative Association of Lubbock, Texas, which was issued a patent for an electronic title system, and the National Cotton Council, the cotton industry pushed for electronic warehouse receipts as a means to introduce significant efficiencies into an antiquated system of handling commodity sales transactions. The structure envisioned by the cotton industry was one in which the Secretary of Agriculture would establish standards that would govern so-called "system providers." These providers would maintain a computer system as required by the secretary. Individual warehouses would

then contract with the system providers in order to use electronic warehouse receipts for cotton (USAID, 2011).

As example South Africa's Electronic Silo Certificates system keeps the whole process, from issuance to trade and pledging, in an electronic format. Certified warehouses enter information on stored commodity in an electronic database. The database serves as a basis for exchange delivery systems, as well as for lending against warehouse receipt. Banks has possibilities to enter pledge on warehouse receipt directly into the system, trading of dematerialized warehouse receipts (as an interface with traders and investors) and information supply (to clients, government agencies, etc.).

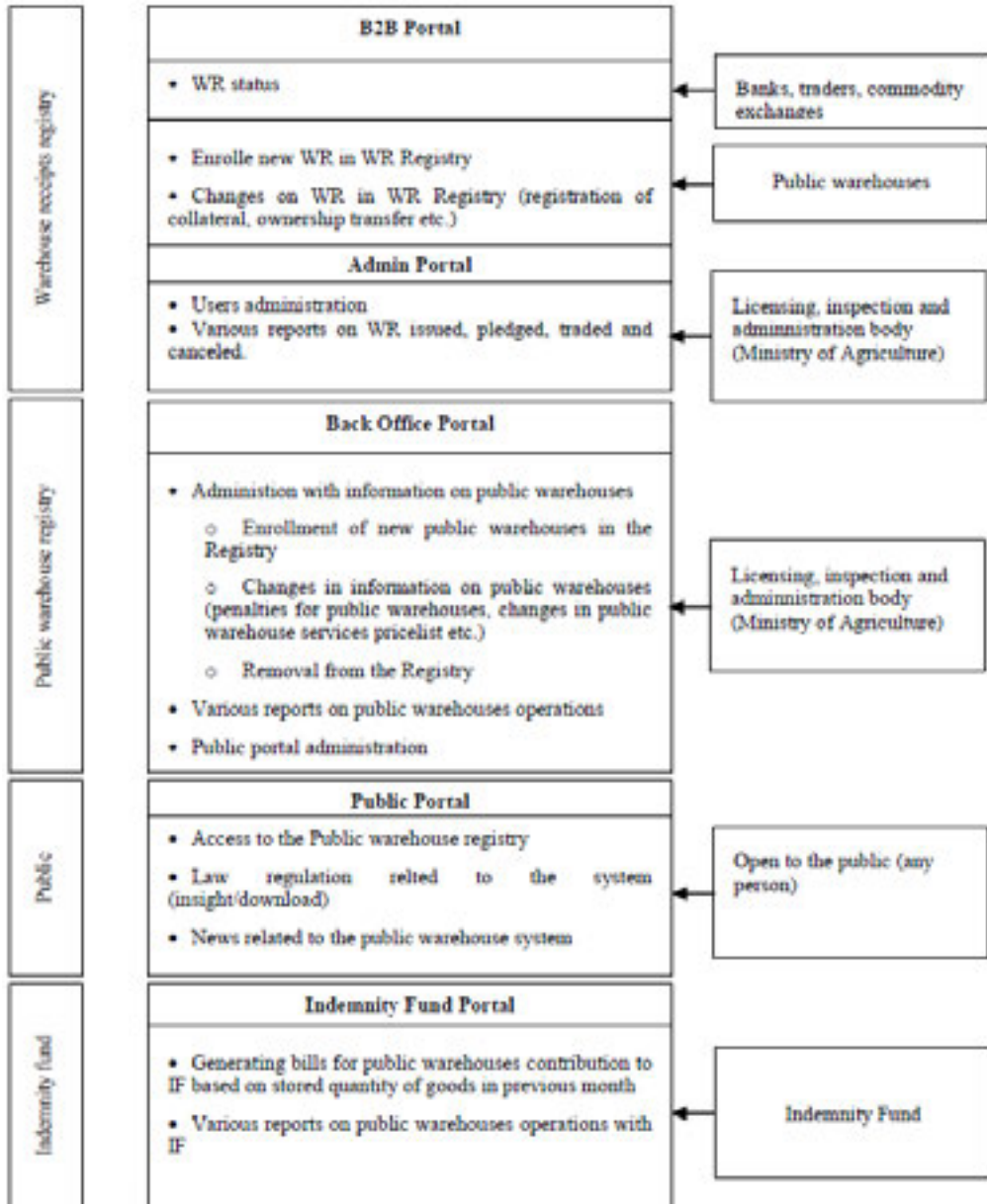
In the Western Europe, central registers for warehouse receipts are not common. Commodity exchanges generally have their own registers to ensure an efficient delivery mechanism. Nevertheless, it would be advisable for ECA countries to set up a registers. Doing so is not costly, and registers provide a significant level of protection against risks of fraud (Gashayie, Singh, 2015).

One positive example is Ukraine's Central electronic warehouse receipt register, which uses software to keep track of the receipts (which are still issued in paper form) and to perform various regulatory and control functions (Hollinger, Rutten, 2009). Advantages of electronic warehouse receipts vs. paper warehouse receipts are:

- Electronic system is safer because public warehouse will be allowed to issue warehouse receipts up to the licensed capacity (electronic system will stop issuing the warehouse receipt for any quantity over the licensed capacity), while in paper form public warehouse can issue warehouse receipts in quantity greater than the licensed capacity. In this manner, the electronic system would increase the overall safety and the lower needed amount of funds in the Indemnity Fund;
- Electronic warehouse system is secured from fraud and forgery. As the information resides on the central database it is not possible to make duplicate or use an outdated receipts;
- It also breaks all the geographical barriers as the physical production and exchange of documents not needed. The seller can transfer electronic warehouse receipt to the buyer and transaction completes when the buyer confirms it;
- Electronic warehouse receipt can be split and this fractionalization can be done in instant;
- Electronic warehouse receipts can supplement e-business as the buyer can be sure in quality and quantity of offered product;
- Inspection service in charge of inspecting public warehouse system is in position to follow in real time status of commodity in each public warehouses instead of relying on periodical reports from public warehouses;
- There is no need for public warehouse to purchase blank paper warehouses receipts forms and registries for keeping public warehouse receipts records, so the overall system would be less expensive;
- Reports on warehouse receipts issuance, trade with warehouse receipts, loans against

warehouse receipts can be easily derived from electronic system for purpose of analytics, i.e. for different kind of subsidies of public warehouses systems indicators as number of new warehouses, change in overall licensed capacity, data on loans, etc.

Scheme 1. Electronic registry for warehouse receipts (Design of FAO/Ministry of Agriculture and Environmental Protection of the Republic of Serbia)



Source: Authors' interpretation of established electronic registry.

Ministry of Agriculture and Environmental Protection of the Republic of Serbia, was develop Electronic registry for warehouse receipts with FAO support and supervision. This Registry is in the testing faze by all participants in the public warehouse system and it is expected to enter in the work (Jovičić et al., 2014).

Registry is planned to be introduced gradually, public warehouses with good internet access, will be transferred from paper evidence of warehouse receipts (WR) to electronic while other with not sufficient capacities will continue to work in paper WR evidence until requirements for electronic Registry are met.⁸

Registry is designed to improve public warehouse system by increasing system transparency. This electronic warehouse receipts is designed with possibility to be upgraded to electronic warehouse receipts system (Shamos, 2004).

Electronic registry is allowing public warehouse and other participants to gain experience in operating in electronic system before electronic warehouse receipts (EWR) system implementation.

According to Scheme 1., banks, traders, commodity exchanges will have possibility to observe the warehouse receipts (WR) status in WR Registry. Public warehouses will still operate with paper form of warehouse receipts, but they will enrolled all information on new opened WR and changes in warehouse receipts status in WR Registry which will automatically prevent opening WR in quantity greater than licensed capacity.

In the Back office portal licensing, inspection and administration body will be able to automatically generate various kinds of reports on public warehouses and warehouse receipts. In paper warehouse receipts system public warehouses are sending information on WR issued, pledged and cancelled in usually two weeks period by e-mail or fax, and operator needs to enrol this information in database manually (Zakić, Kovačević, 2012). Public portal is open to the public where the goods owners can access public warehouse registry to check closest public warehouse to store goods, have insight in public warehouses services pricelists, etc. Warehouses may download all forms for licensing procedures, manuals, etc.

Indemnity fund (IF) portal is automatically generating bills for public warehouses which they are obliged to contribute to IF on monthly basis, based on quantity of stored products. In paper warehouse receipts system public warehouses are calculating this contribution which is time consuming and there is possibility of mistake.

Methodology and data sources

In this paper is analysed system of: Paper warehouse receipts; Electronic warehouse receipts registry; and Full electronic warehouse receipts.

Analysis is performed by questionnaire submitted by next participants in the pubic warehouse

⁸ Important is to be fully transferred to electronic Registry. Situation to use both paper and electronic warehouse receipts (WR) registry is not allowed.

system: banks (5 commercial banks actively engaged in lending against warehouse receipts; 5 public warehouses; 5 warehouse receipts owners; licensing, inspection and administration body (Ministry of Agriculture and Environmental Protection); Indemnity Fund; Commodity Exchange - Novi Sad.

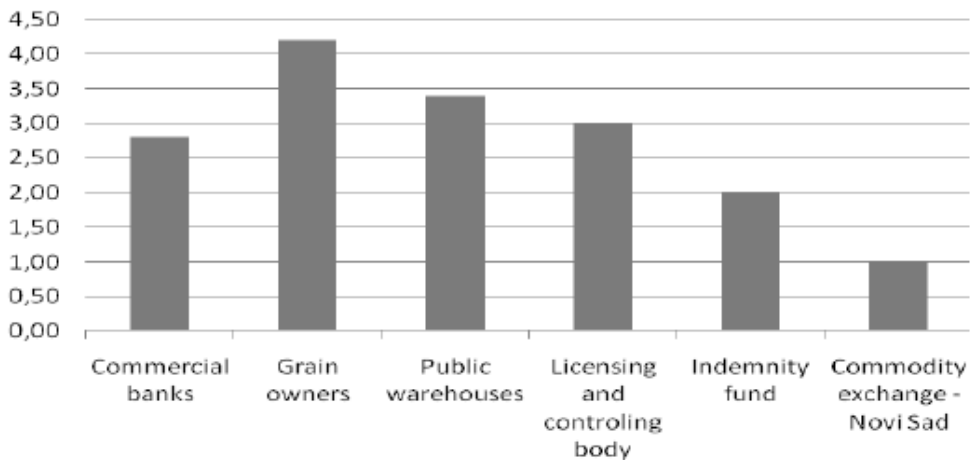
Participants in survey are rating this three warehouse systems by 1 to 5 marks. Mark 1 represents lower importance, while mark 5 is high importance. Questionnaire was conducted in the period of 25th May to 3rd September 2014. Beside mentioned, in paper writing are used all available scientific papers and relevant public documents focused on observed topic.

Results and discussion

Paper warehouse receipts (WR) system

Average mark for paper warehouse receipts system from banks are moderate (2,8), as a result of extensive procedures and increased risk when lending against warehouse receipts. After providing loans against warehouse receipts, a bank: 1) writes information on the pledge on the warehouse receipt; 2) sends information on the pledge and a copy of the warehouse receipt to the public warehouse that issued the warehouse receipt for the public warehouse to record the pledge in the register of warehouse receipt; 3) keeps the warehouse receipt until the debt is paid. It is time consuming procedure and carries an additional risk for lender.

Graph 1. Paper warehouse receipts (WR) system rating



Source: Kovačević et al., 2014

Grain owners are rated paper warehouse receipts system with average mark 4,2 what can be explained by broad acceptance and low interest rate on warehouse receipts' loans in Serbia. Communication in the case of the paper warehouse receipts system is slow, and based on periodical reports from each public warehouse to the public warehouse management system. In case of fraud by a public warehouse, the inspection service cannot immediately prevent the issue of warehouse receipt. Informing warehouse receipt owners or lenders against warehouse

receipts is based on tracking a web page or exchange of information in written or oral form. Slow communication and existing high risk level is reason for moderate average mark for paper warehouse receipts system from Ministry of Agriculture and Indemnity fund.

Lowest rate for paper warehouse receipts system is given form Commodity exchange, because of complicated procedure when trading with warehouse receipts which needs to be sent to exchange together with trading order, if the warehouse receipts is sold it will be sent to the buyer, and if not, it will be returned to the owner. The buyer and seller of a warehouse receipt fill the data on trade and need to sign warehouse receipts. The buyer is obliged to provide data on the trade immediately to the public warehouse that issued the warehouse receipt so that it may enter the data in its register of warehouse receipt. This is complicated procedures and warehouse receipts needs to circulate between exchange and traders which increase a risk of losing warehouse receipts and increases transaction costs.

Public warehouse system with electronic register of warehouse receipts

In the system of electronic warehouse receipts (EWR) register, the warehouse receipt itself is still in paper form, while the evidence on warehouse receipts is electronic. This system offers many advantages over the previous one. Sending data on warehouse receipt is unnecessary, as the administrator and inspection services in the public warehouse system have direct access to the electronic register of warehouse receipt and can generate a range of reports for each public warehouse. The volume of work for the public warehouse and its administrator is thus reduced, as there is no need for the administrator to send reports or enter them. Security in the public warehouse system is improved, since in case of fraudulent behaviour in the public warehouse, the inspection service can immediately prevent the issue of warehouse receipt.⁹ Furthermore, the public warehouse may issue warehouse receipt only for the quantity of commodity for which it is licensed¹⁰. The electronic register also reduces the public warehouse costs to a small extent since it no longer needs to procure paper diaries for warehouse receipt. All those factors resulted in better rating than the paper warehouse receipts system from commercial banks, Ministry of Agriculture and Indemnity Fund.

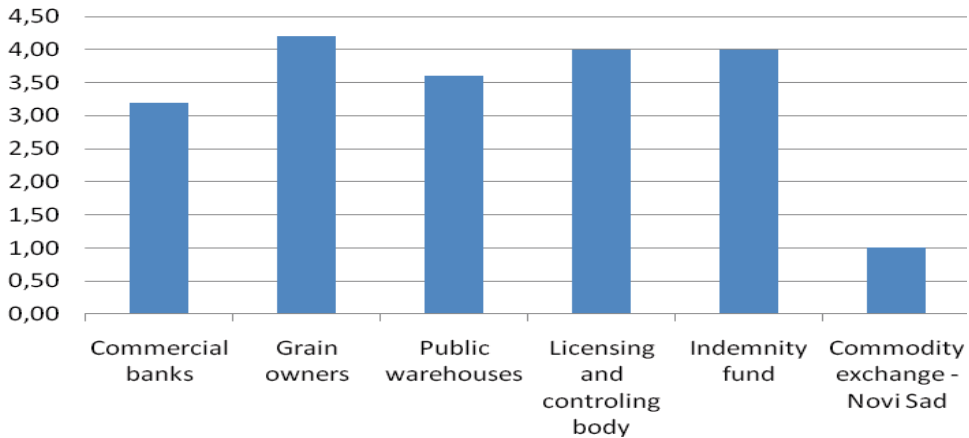
In this system, a bank issues a loan against a warehouse receipt in the same way as in the all-paper system, in other words, it records the credit data on the paper and sends the information to the issuing public warehouse. The advantage of the system of electronic registers is that the bank can see the evidence of ownership of the warehouse receipts and any encumbrance on the warehouse receipts directly in the electronic register, and after sending information on pledges on the warehouse receipts can check the warehouse receipts in the register to see whether the public warehouse has correctly entered the data sent. Increasing the security in

9 In contrast to the completely electronic warehouse receipts system, the public warehouse still possesses the WRs and can still issue receipts until the inspectors arrive at the warehouse, but cannot enter them into the register. A banker or dealer must be trained to check whether the record is entered into the electronic register before buying it or lending against it.

10 The electronic system prevents the issue of commodity records that surpass the licensed capacity of the public warehouse.

the electronic warehouse receipts system in this way has a positive impact on lending against warehouse receipts.

Graph 2. Public warehouse system with electronic register of warehouse receipts rating



Source: Kovačević et al., 2014.

Buyer and seller of warehouse receipt enter the trade data and sign the warehouse receipt just as in the all-paper system. The advantage of the electronic warehouse receipts (EWR) register lies in the buyer being able to see information on the ownership of the WR and any encumbrance on the warehouse receipts (WR) directly in the electronic register, and after sending the information on trade with WR can check the warehouse receipts in the register to see whether the public warehouse has entered the data correctly as sent. Increasing the security in the electronic WR system in this way has a positive impact on lending against warehouse receipts. Survey shows that warehouse receipts' owners are not seeing benefits from electronic WR registry, same as Commodity exchange because of need for operation with complicated and risky procedures with warehouse receipts exist.

Electronic warehouse receipts system

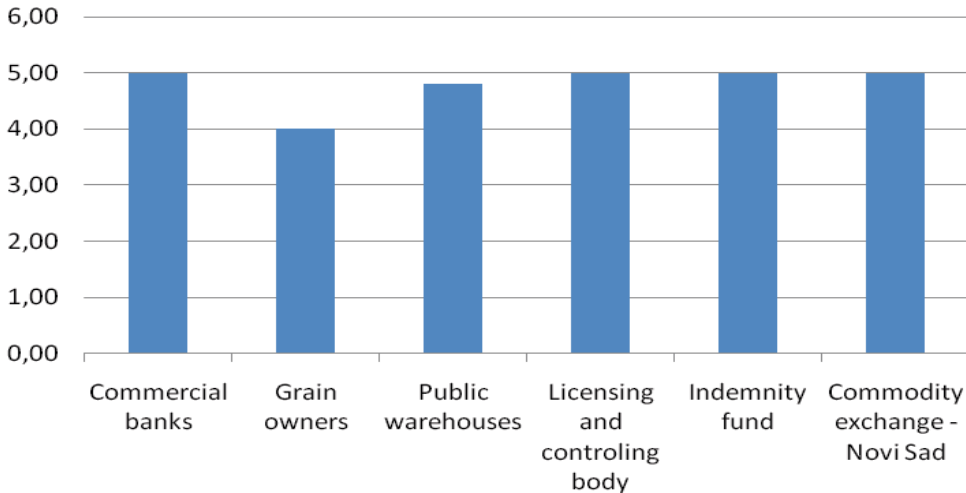
In the Graph 3. is shown rating of the electronic warehouse receipts. Banks will be allowed to access the electronic warehouse system and enter pledge at the warehouse when lending against a warehouse receipt. The procedure for banks is less time consuming (for receipts in paper form banks need to send a query to the warehouse by fax and, when the pledge is established, again need to fax the warehouse to inform it that pledge is established on the warehouse receipt, etc.) and more secure, leading to lower interest rates.

In case of fraud by the public warehouse the inspection service can immediately block the issue of warehouse receipt. The electronic system automatically prevents the public warehouse from issuing warehouse receipt for the complete quantity of products that surpass the licensed capacity of the public warehouse. It also reduces the possibility of errors in issuing warehouse receipt since the system automatically warns of errors, which increases the overall security of the system. The inspection services responsible for monitoring the public warehouse

may stop further issue of warehouse receipt by the warehouse until they complete checks. Information to the system administrator and inspection is carried out with automatic insight into the system, and the public warehouse does not have to send a report. Increased in safety and procedures lead that banks, Ministry of Agriculture, Indemnity Fund and Commodity Exchange rated the Electronic warehouse receipts (EWR) system with highest rate.

The public warehouse's costs are reduced as there is no need to purchase blank warehouse receipts and register diaries.

Graph 3. Electronic warehouse receipts (EWR) system rating



Source: Kovačević et al., 2014.

Trade with warehouse receipts in an electronic warehouse world

Buyer and seller of warehouse receipt enter data on the trade and sign the warehouse receipt. The buyer is obliged without delay to deliver the data on the transaction to the public warehouse that issued the warehouse receipt, so that it can enter the new ownership data into the register of warehouse receipts.

Commodity exchanges will have direct links, and trading orders may be sent in electronic form. Paper warehouse receipts need to be sent to the commodity exchange by post. In the case of electronic warehouse receipts, a trading order can be submitted to local brokerage firms.

Conclusion

On the basis of this research, it may be concluded that warehouse receipts play an important role in the agribusiness sector, above all because they assure a greater security of warehousing, they make possible delayed sale in that sale takes place not from the sack but rather by the warehouse receipt being used as pledge for credit with the commodity actually being sold later in the year when the price is usually higher, and because commodity are stored in regulated public warehouses rather than unregulated private warehouses, as is often the case now.

Finally, the research results underlining the great significance of the public warehouse system for agriculture financing. For the development or improvement of the existing public warehouse system, several recommendations can be made:

- Establishment of the public warehouse with all three components: licensing procedures, inspection body and indemnity fund;
- Development of the public warehouse system uniquely for agricultural products Public warehouse system for industrial products must be established separately;
- The system must be based on legislation, rather than on private contracts among its parties;
- The system should be developed in cooperation with the National Bank, to provide the best credit rating for loans against warehouse receipts;
- It is of great importance to introduce electronic warehouse receipts.

Paper warehouse receipt system has the simplest model of the public warehouse. As a disadvantage this system requires long procedures and has a highest risk because of low transparency compared to other two public warehouse systems.

Introducing electronic warehouse receipt register has a positive effect on the administration of the public warehouse system, since there is no need to receive and consolidate regular periodic reports sent by the public warehouse, saving time and staff resources among warehouse operators and administrative employees. The security of the system is also enhanced since the inspection services have direct access to the electronic register of each public warehouse and can rapidly react or prevent the issue of warehouse receipt by a public warehouse. Improving the overall security of the system and insight into the electronic register and the status of each warehouse receipt, even with the same procedure for entering credit on each warehouse receipt has a positive impact on lending against warehouse receipts. In the case of trading in warehouse receipts too, even if the trade is entered on the warehouse receipt itself by the same procedure as in the paper system of warehouse receipts, the improvement of overall system security and the possibility of viewing the electronic register for the status of each warehouse receipt has a positive impact on lending against warehouse receipts. The operating costs of the public warehouse are also reduced since there is no need for purchasing neither blank warehouse receipts forms, nor register diaries, as in the saving of public warehouse staff time needed for purchase and collecting warehouse receipts and registries.

The fully electronic system of warehouse receipt offers the best way of administering the public warehouse system. As in the previous case there is no need to send regular periodical reports to the public warehouse administrator, and the time of warehouse operators and administrators is saved. The security of the system is at the highest level since the electronic system prevents the issue of warehouse receipt above the licensed capacity, and in the case of suspicious operations of a public warehouse the inspection services can halt the issue of warehouse receipt by the public warehouse, while it investigates the facts. Issuing credit is simplified as the banks have access to add pledges to the warehouse receipt themselves, shortening procedures and improving security when lending against warehouse receipts. Trade of warehouse receipt outside the exchanges may be made by directly changing ownership,

simplifying the procedure. The positive impact mentioned on commodity exchange trading of electronic warehouse receipts occurs through commodity exchanges having direct access and the ability to enter ownership data after trading. The second positive effect of electronic warehouse receipts is the possibility for trading orders to be sent in electronic form. Paper warehouse receipts need to be sent to the commodity exchange by post. Trading orders in the case of electronic warehouse receipts can be submitted via local brokerage firms.

Based on previously mentioned, it may be concluded that the introduction of electronic warehouse receipt has a positive effect on the entire agribusiness sector. Considering the complexity of introducing the electronic system, a two-step introduction may be recommended, whereby electronic registers of warehouse receipt are introduced first, which is simpler and bears a lesser risk of system collapse compared to an electronic warehouse receipt system and in which public warehouses, administrators, inspections, banks and traders may gain experience in preparation for working in a fully electronic system of warehouse receipt.

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ELEKTRONSKI REGISTAR ROBNIH ZAPISA KAO KORAK OD PAPIRNOG KA ELEKTORSKOM ROBNOM ZAPSIU

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Sažetak

Cilj ovog rada je da se utvrdi ekonomska opravdanost uvođenja elektronske evidencije robnog zapisa, kao koraka ka uvođenju u potpunosti elektronskog robnog zapisa.

Obe forme robnog zapisa postoje u praksi, ali je papirni oblik robnog zapisa više u upotrebi. U ovom radu proces dematerijalizacije je analiziran u dva koraka. Prvi je dematerijalizacija knjige robnih zapisa, dok je robni zapis u papirnoj formi. Drugi korak je uvođenje potpunog sistema elektorskog robnog zapisa.

Dematerijalizacija robnog zapisa je kompleksnija u odnosu na dematerijalizaciju efektivnih hartija od vrednosti zbog individualnih karakteristika svakog robnog zapisa. Kao rezultat ovoga, elektronski sistemi robnih zapisa su retki u svetu i u praksi su za samo nekoliko vrsta roba, poput pamuka i nekoliko vrsta žitarica. Ipak promena od papirnih hartija od vrednosti ka elektronskim u finansijskom sektoru, koja je počela pre nekoliko decenija, sada se intenzivira i u oblasti poljoprivrednih proizvoda.

Analize u ovom radu pokazuju značajan uticaj elektronske evidencije robnih zapisa na povećanje sigurnosti sistema javnih skladišta i unapređenje trgovanja robnim zapisima.

Ključne reči: *robne berze, javna skladišta, elektronski robni zapi, kratkoročni krediti*

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THE IMPACT OF MINERAL FERTILIZATION AND ATMOSPHERIC PRECIPITATION ON YIELD OF FIELD CROPS ON FAMILY FARMS¹

*Mihajlo Munćan*²

Summary

The field crop production, as the most important branch of plant production of the Republic of Serbia, in the period 2002-2011, was carried out on an average of over 2.7 million hectares, 82.7% of which took place on the individual farms/family holdings. Hence, the subject of research in this paper covers yields of major field crops realized on family farms in the region of Vojvodina in the period 1972-2011. The main objective of the research is to study the interdependence of utilization of mineral fertilizers and atmospheric precipitation during the vegetation period and realized yields of major field crops on family farms in the observed period. The regression analysis was applied in order to verify dependencies and determine the form of dependence of achieved yields from examined variables. The results showed that the main limiting factors for obtaining high and stable yields of field crops is inadequate use of fertilizers and the lack of precipitation during the vegetation period.

Key words: *interdependence, mineral fertilizers, atmospheric precipitation, field crop, family farm*

JEL: *Q15, C35*

Introduction

Field crop production, as the most important branch of plant production in Serbia, in the period 2002-2011, was carried out on an average of over 2.7 million hectares per year, while its share in the value structure of the total agricultural production in the reporting period ranged from 46.8% to 59.2%. The field crop production of the Republic of Serbia is mostly realized on the territory of Vojvodina region. This area on average comprises about 52% of the total area under grains and over 92% of the total area under industrial plants (Bošnjak, Rodić, 2010). Family farms are the most important carriers of organized agricultural production in Vojvodina.

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In the conditions of modern (conventional) agricultural production, the realized yields are under decisive impact of the adequate application of agro-technical measures/agricultural practices (fertilization, irrigation, new varieties and hybrids, the use of plant protection products, modern means of mechanization, etc.). However, not all of the agricultural practices exert the equal impact on yields. The mineral fertilizers are particularly important, as confirmed by the results of numerous studies and assessments by FAO showing that the use of fertilizers contributes with 50% to the increase of yields (Kresović, 2010). From the above it can be concluded that the mineral fertilizers represent a powerful tool in increasing yields with high impact on the level of intensity of production. In addition to mineral fertilization, the atmospheric precipitation is the main source of water for the land, and thus for the plants. The precipitation is necessary for plants throughout the growing season, but there is a period of particular sensitivity to the water deficit in the development of the plant. The precipitation is of the greatest significance during the vegetation period. These two production factors have had a decisive impact on the level of realized yields of major field crops in the period 2002-2011, characterized by significant annual variations in the realized yields as well as in the total volume of plant production. The realized yields of main field crops - wheat, maize, sunflower, soybean and sugar beet, during the mentioned period, on average, were 3.57 t/ha, 5.12 t/ha, 2.18 t/ha, 2.52 t/ha and 41.99 t/ha, respectively, and were lower on average by 50% compared to the yields achieved in highly developed European countries (France, Germany, the Netherlands).

The subject and objective of the study

On the basis of above presented facts and results, the analysis of realized yields of major field crops on family farms in the region of Vojvodina in the period 1972-2011 was set as the subject of the research in the present study. Given the importance of the subject of research, the following objectives were formulated:

- Analysis of the sowing structure, realized yields and utilization of mineral fertilizers in the production of major field crops on family farms, and the amount of precipitation during the vegetation period in the Vojvodina region in the period 1972-2011;
- Examination of the interdependence of utilization of mineral fertilizers and atmospheric precipitation during the vegetation period and realized yields of major field crops on family farms in the period 1972-2011.

Data sources and method of the study

The data from multiple sources were used in the realization of the set tasks. Data on the variations in the structure of field crop production, realized yields and utilization of mineral fertilizers on family farms in the region of Vojvodina in the period 1971-2001, were taken from the statistical bulletins "Field crop production, fruit production and viticulture", published in 2001 by the Federal Bureau of Statistics. Since the Statistical Office of the Republic of Serbia does not observe/monitor the information of interest for the present study, or publishes the relevant bulletin, the data for the period 2002-2011 on the structure of field crop production

and the realized yields on family farms in Vojvodina were taken from the documentary materials of the Statistical Office of the Republic of Serbia, and data on utilization of mineral fertilizers from FAO base. Data on the atmospheric precipitation in Vojvodina, in the period 1972-2011, were taken from the documentation of the Hydro meteorological Service of the Republic of Serbia.

The relative indicators of dynamics, i.e. base indices and average growth rates were used in the analysis of the situation and variations of the phenomenon. Data analysis was performed using the analytical statistics with the help of statistical package IBMSPSS statistics 17.0. First, the indicators of the descriptive statistics were calculated to obtain a general trend of the variability of the crop production structure, yields and utilization of mineral fertilizers on family farms and precipitation in the observed forty-year period (1972-2011) in Vojvodina. Relative dependence was measured using the Pearson's correlation coefficients, tested at a significance level of 5% and 1%.

The research results

The observed forty-year period of research (1972-2011) was divided into four ten-year sub-periods, as follows: from 1972 to 1981; 1982 to 1991; 1992 to 2001 and 2002 to 2011. In order to determine the basic characteristics of the observed phenomena for individual sub-period and the observed period in its entirety, the following statistical indicators were calculated: mean value, interval of variation, coefficient of variation and rate of change.

The trends in the structure of field crop production

In the structure of field crop production in Vojvodina, the most common are two groups of crops: the grains/cereals, with dominant wheat and maize, and industrial plants, with the most common crops - sunflower, soybean and sugar beet. The average share of the grains/cereals in the structure of sowing on family farms in the period 1972-2011 was 67.81% (Table 1).

Table 1. The share of grain in the structure of used arable land on family farms in Vojvodina, in the period 1972-2011

Period	Mean value	Coefficient of variation (Cv)	Interval of variation		Rate of change
			Min	Max	
Wheat					
1972-1981	15.85	12.57	13.44	19.24	-3.50
1982-1991	16.48	18.62	10.38	20.80	1.69
1992-2001	18.19	17.27	11.50	22.38	6.03
2002-2011	15.74	15.07	13.14	21.21	-4.78
1972-2011	16.57	17.27	10.38	22.38	-0.88
Maize					
1972-1981	49.92	6.57	43.75	53.54	-0.21
1982-1991	55.79	5.26	52.02	60.66	-0.74
1992-2001	50.94	6.35	45.61	58.89	-2.05
2002-2011	48.32	2.42	47.07	50.71	0.63

Period	Mean value	Coefficient of variation (Cv)	Interval of variation		Rate of change
			Min	Max	
1972-2011	51.24	7.70	43.75	60.66	-0.18

Source: Author's calculations based on data from the bulletin "The field crop production, fruit production and viticulture" and documentary material, the Statistical office of the Republic of Serbia, Belgrade.

The share of industrial plants in the structure of sowing of arable land on family farms was on average 11.89% (Table 2).

Table 2. The share of industrial plants in the structure of used arable land on family farms in Vojvodina, in the period 1972-2011

Period	Mean value	Coefficient of variation (Cv)	Interval of variation		Rate of change
			Min	Max	
Sunflower					
1972-1981	7.20	24.04	5.28	10.51	0.70
1982-1991	4.13	56.96	0.51	7.96	8.84
1992-2001	7.21	29.86	1.23	9.58	-0.14
2002-2011	10.09	6.31	9.23	11.01	1.03
1972-2011	7.16	39.11	0.51	11.01	1.71
Soybean					
1972-1981	0.15	83.09	0.00	0.31	80.57
1982-1991	1.00	31.69	0.43	1.44	-5.83
1992-2001	2.20	67.26	0.91	5.88	8.46
2002-2011	6.78	19.74	5.03	8.93	6.20
1972-2011	2.53	108.74	0.00	8.39	24.98
Sugar beet					
1972-1981	2.18	15.40	1.53	2.58	3.73
1982-1991	2.49	28.52	1.66	3.81	4.17
1992-2001	1.74	20.99	1.31	2.61	-6.32
2002-2011	2.41	15.28	1.59	3.04	-0.84
1972-2011	2.20	25.11	1.31	3.81	0.79

Source: Author's calculations based on data from the bulletin "The field crop production, fruit production and viticulture" and documentary material, the Statistical office of the Republic of Serbia, Belgrade.

The realized yields of major field crops

During the forty-year period, the average yield of wheat was 3.86 t/ha, showing a tendency of increase (Table 3). At the beginning of the observed period, the yield of wheat exhibited a tendency of increase at an average annual rate of 4.48%, and in the second sub-period it reached the highest observed value of 4.62 t/ha while retaining still the growth rate of 2.23%. The nineties of the last century, i.e. the third observed sub-period, were marked by great economic crisis (caused by UN sanctions and the war in the former Yugoslavia) that had a great impact on the total agricultural production, and therefore the production of

wheat. In fact, during this period the lowest average yields of wheat in the whole observed period were recorded.

The average maize yield in the reporting period was 5.04 t/ha and ranged from a minimum of 3.31 t/ha, to a maximum of 6.83 t/ha. The yield of maize in the entire observed period was accompanied by a significant variation (Cv = 19.67) with the manifestation of the tendency of slight increase at an average annual rate of 0.69%. As in wheat production, in the third analysed sub-period, the lowest average yields of maize were realized, only 4,09 t/ha, as a result of the reduced level of intensity of production caused by the economic crisis which marked that period.

Table 3. The realized yields of wheat on family farms in Vojvodina in the period from 1972 to 2011

Period	Mean value	Coefficient of variation (Cv)	Interval of variation		Rate of change
			Min	Max	
Wheat					
1972-1981	3.75	15.30	2.69	4.75	4.48
1982-1991	4.62	7.30	4.19	5.22	2.23
1992-2001	3.52	11.42	2.77	3.96	3.29
2002-2011	3.57	16.38	2.09	4.36	3.50
1972-2011	3.86	17.07	2.09	5.22	1.25
Maize					
1972-1981	5.37	10.13	4.42	6.18	2.95
1982-1991	5.57	19.62	3.62	6.83	0.36
1992-2001	4.09	14.91	3.31	5.47	5.74
2002-2011	5.12	17.16	3.34	6.18	1.81
1972-2011	5.04	19.67	3.31	6.83	0.69

Source: Author's calculations based on data from the bulletin "The field crop production, fruit production and viticulture" and documentary material, the Statistical office of the Republic of Serbia, Belgrade.

Unlike wheat and maize, the highest sunflower and soybean yields were achieved in the fourth sub-period and the highest yield of sugar beet in the second sub-period (Table 4).

Table 4. The realized yields of industrial crops on family farms in Vojvodina in the period 1972-2011

Period	Mean value	Coefficient of variation (Cv)	Interval of variation		Rate of change
			Min	Max	
Sunflower					
1972-1981	1.82	21.96	1.39	2.49	-0.14
1982-1991	2.08	16.22	1.31	2.60	6.04
1992-2001	1.76	13.35	1.32	2.11	1.11
2002-2011	2.18	11.39	1.83	2.48	2.44
1972-2011	1.96	18.26	1.31	2.60	1.09

Period	Mean value	Coefficient of variation (Cv) Min	Interval of variation		Rate of change
			Max		
Soybeat					
1972-1981	1.67	31.89	0.52	2.34	1.36
1982-1991	2.00	18.05	1.53	2.53	0.36
1992-2001	1.91	25.30	1.24	2.66	7.62
2002-2011	2.52	15.08	1.73	3.11	0.60
1972-2011	2.02	26.77	0.52	3.11	1.13
Sugar beet					
1972-1981	39.11	11.69	28.52	43.72	2.59
1982-1991	42.47	10.79	34.70	48.86	1.49
1992-2001	34.49	17.16	23.54	42.39	2.83
2002-2011	41.99	14.24	28.40	47.64	3.19
1972-2011	39.51	15.65	23.54	48.86	0.75

Source: Author's calculations based on data from the bulletin "The field crop production, fruit production and viticulture" and documentary material, the Statistical office of the Republic of Serbia, Belgrade.

The trends in the utilization of mineral fertilizers

The utilization of mineral fertilizers is expressed as the average utilization in kilograms per unit of surface area, for the entire period and by individual sub-period (Table 5).

Table 5. The utilization of mineral fertilizers on family farms in Vojvodina in the period 1972-2011

Period	Mean value	Coefficient of variation (Cv)	Interval of variation		Rate of change
			Min	Max	
1972-1981	344.60	20.23	256	465	5.80
1982-1991	417.10	11.13	323	474	-3.19
1992-2001	56.50	47.01	26	122	-4.58
2002-2011	130.00	16.10	87	153	6.24
1972-2011	234.55	65.3	26	476	-1.59

Source: Author's calculations based on data from the bulletin "The field crop production, fruit production and viticulture" and documentary material, the Statistical office of the Republic of Serbia, Belgrade.

At the beginning of the analysed forty-year period, the utilization of mineral fertilizers exhibited a tendency of increase at an average annual rate of 5.80%, to reach the highest average value of 417.10 kg/ha in the second observed sub-period. In the third sub-period (1992-2001), the greatest variation in the utilization of mineral fertilizers (Cv 47.01) was registered and the average utilization was only 56.5 kg/ha. It is in this period that the greatest decrease in the utilization of mineral fertilizers at a rate of -4.58% a year on average is recorded. These trends in the utilization of mineral fertilizers were results of the great economic crisis in Serbia, which marked the nineties of the last century. A significant drop in the utilization

of mineral fertilizers in this sub-period is caused, on the one hand by reducing the intensity of agricultural production imposed by the worsening economic position of family farms, and on the other, by the high prices of mineral fertilizers because of the relatively small domestic production, importer monopoly and disturbed relationships in the market. Although in the last, fourth sub-period, the utilization of mineral fertilizers exhibited a tendency of increase (6.24%), the level of average realized utilization was by about 2.5 times lower compared to the level achieved in the initial period of analysis (1972-1981) and approximately by 3.2 times compared to the level achieved in the second sub-period. Compared to the average utilization of mineral fertilizers in the EU-27 in the period 2002-2011, the utilization of mineral fertilizers in Serbia is lower by more than 25%. Compared with individual EU-27 member States, it is observed that Ireland has the highest utilization, 3.3 times higher than Serbia, followed by The Netherlands 2.2 times, Croatia 1.73 and Great Britain 1.4 times. Somewhat lower utilization of mineral fertilizers in relation to Serbia is recorded for Estonia, Lithuania, Latvia, Malta and Romania.

The amount and distribution of atmospheric precipitation

The water deficit in the area of Vojvodina was especially pronounced in the summer months of July, August and September, when the air temperature was high, relative humidity at a minimum, and evapotranspiration very high. Presumably, 60% or about 362 mm of the average annual rainfall in Vojvodina comes in spring and summer (April-September), and considering that the total water requirements of field crops during the vegetation period, according to findings from several authors (Bojović, 2014; Glamočlija, 2004; Maksimović, Dragović, 2002; Pejić, 2008; Tabaković, 2012) are as follows: wheat, about 200 mm, maize 430-510, sunflower 300-400 mm, soybean 380-545 and sugar beet 560 mm, it can be concluded that the production of field crops in Vojvodina is certainly facing water shortage/deficit.

The analysis of atmospheric precipitation in Vojvodina shows that in the period 1972- 2011, there were 11 years with the annual sum of precipitation below 500 mm, 6 years with the annual sum of precipitation of 500 - 550 mm and 4 years below 600 mm (Table 6). If it is taken into consideration that the total water requirements of field crops in this area are as follows: wheat 320-360 mm, maize 450-530 mm, sunflower about 450 mm, soybean 450-480 mm and sugar beet 550-560 mm (Pejić, 2008), it can be concluded that the production of maize, sugar beet and especially soybeans is mostly endangered by the water deficit.

Table 6. The amount and distribution of precipitation in Vojvodina in the period 1972 to 2011

Period	Mean value	Coefficient of variation (Cv)	Interval of variation	
			Min	Max
Total				
1972-1981	630.77	9.33	496.57	711.14
1982-1991	549.17	14.06	441.14	687.20
1992-2001	609.83	26.51	277.06	854.81
2002-2011	669.43	26.30	412.67	940.39
1972-2011	604.62	22.14	277.06	940.39

Period	Mean value	Coefficient of variation (Cv)	Interval of variation	
			Min	Max
Vegetation period				
1972-1981	387.69	14.17	309.29	509.00
1982-1991	328.97	18.73	242.43	430.96
1992-2001	366.16	35.29	143.59	596.99
2002-2011	394.06	34.52	234.60	605.29
1972-2011	361.90	28.60	143.59	605.29

Source: Source: Author's calculations based on data of Republic Hydrometeorological Service of Serbia.

Periodic droughts, as they occurred in 1973, 1983, 1988, 1990, 1993, 2000, and 2002, inflict great damage to agriculture. According to the Statistical Office of the Republic of Serbia, in Vojvodina, in year 2003, which was very dry, the average yields of wheat, maize, sunflower, soybean and sugar beet were 2.01 t, 3.34, 1.82, 1.52 and 28.49 t/ha, respectively. In extremely dry year 2000, which was characterized by the lowest annual total precipitation of only 277 mm, of which only 143 mm recorded during the vegetation period, the realized average yields of wheat, maize, sunflower, soybean and sugar beet were very low: 2.98, 2.82, 1.42, 1.15 and 22.54 t/ha, respectively.

The correlation - regression analysis

The regression analysis is applied in order to verify dependencies and determine the form of dependences between achieved yields and the examined variables: the quantity of used mineral fertilizers and atmospheric precipitation during the vegetation period. The regression analysis is one of the most commonly used statistical techniques, which has found a wide application in the most diverse areas of research. Formally, it is a model that represents a powerful and flexible procedure for the analysis of the connection/correlation between the metric dependent variable and one or more independent variables, which are usually measured also on the metric scale.

Considering that the impact of two independent variables (quantity of used mineral fertilizers and atmospheric precipitation during the vegetation period) on the realized yields of major field crops is investigated, the models of standard multiple (*Multiple*) linear regression are defined.

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \varepsilon$$

where:

Y – independent variable

x_1, x_2, \dots, x_n – independent variables

β_0 – constant (intercept)

$\beta_1, \beta_2, \dots, \beta_n$ – coefficients of independent variables

The significance of the impact of all key parameters of regression models that have investigated

the influence of the quantity of used mineral fertilizers and atmospheric precipitation during the vegetation period on the yields of major field crops on family farms was evaluated for the risk level of 5% and 1%.

The analysis of yield of wheat

$$Wheat = 3041.39 + 2.543 \text{ mineral fertilizers} + 0.614 \text{ precipitation}$$

Based on the estimated equation and obtained related statistical indicators, it can be concluded that the observed factors (mineral fertilizers and atmospheric precipitation during the vegetation period) contributed to changes in the realized yields of wheat with $R^2=34.1\%$. However, the standardized values of beta (β) coefficients are used in order to examine more accurately the impact of these factors on the yield of wheat, because the analysed values are expressed in different units, and these coefficients do not depend on the units of measurement of variables.

Table 7. The regression of the amount of used mineral fertilizers and atmospheric precipitation during the vegetation period on wheat yield

N=40	Regression Summary for Dependent Variable: Yield of wheat				
	R = 0.584 R Square = 0.341 Adjusted R Square = 0.305 F = 9.553 (Sig. = 0.000) Std. Error of the Estimate = 556.860				
	B	Std. Error	Beta	t	Sig.
Constant	3041.399	369.701		8.227	0.000
Used mineral fertilizers	2.543	0.582	0.591	4.371	0.000
Atmospheric precipitation during the vegetation period	0.614	0.844	0.098	0.727	0.472

Source: Author`s calculations

The used mineral fertilizers have higher value of beta coefficient ($\beta = 0.591$), while the atmospheric precipitation during the vegetation period showed much lower value ($\beta = 0.098$). Obtained values of beta coefficients show that mineral fertilizers had more significant impact on the amount of realized yields of wheat than the amount of precipitation during the vegetation period. The connection/correlation between the yield and used mineral fertilizers is statistically highly significant ($p<0.01$), i.e. this variable significantly contributed to the prediction of the dependent variable. The second independent variable, atmospheric precipitation during the vegetation period, exerted no statistically significant effect on the amount of wheat yields ($p>0.05$). In addition, the regression model in its entirety indicates statistical significance because the F - ratio = 9.553 is rated as very significant ($p<0.01$).

The analysis of yield of maize

$$\text{Maize} = 2486.872 + 4.188 \text{ mineral fertilizers} + 4.234 \text{ precipitation}$$

The yield of maize can be explained by the estimated regression model with $R^2=56.7\%$ while the strength of connection/correlation between observed variables is $R=0.753$. The influence of independent variables on the yield of maize is positive and statistically highly significant and both in the case of used mineral fertilizers ($\beta=0.668$, $p<0.01$) and the precipitation during the vegetation period ($\beta=0.446$, $p<0.01$). This regression model in its entirety indicates statistical significance because the F-ratio = 24.225 is rated as very significant ($p<0.01$).

Table 8. The regression of the amount of used mineral fertilizers and atmospheric precipitation during the vegetation period on maize yield

N=40	Regression Summary for Dependent Variable: Yield of maize				
	B	Std. Error	Beta	t	Sig.
	R = 0.753 R Square = 0.567 Adjusted R Square = 0.544 F = 24.225 (Sig. = 0.000) Std. Error of the Estimate = 656.700				
Constant	2486.872	435.984		5.704	0.000
Used mineral fertilizers	4.188	0.686	0.668	6.103	0.000
Atmospheric precipitation during the vegetation period	4.234	0.995	0.446	4.254	0.000

Source: Author's calculations

The analysis of yield of sunflower

$$\text{Sunflower} = 1730.36 + 0.366 \text{ mineral fertilizers} + 0.383 \text{ precipitation}$$

The model of formation of sunflower yield indicates a very low estimation of the regression model $R^2=3.2\%$, while the strength of connection between the observed variables $R=0.178$ shows that none of the observed factors of production has statistical significance ($p>0.05$). Also, the model cannot be accepted as statistically significant as indicated by the F-ratio = 0.607 rated as statistically insignificant ($p>0.05$).

Table 9. The regression of the amount of used mineral fertilizers and atmospheric precipitation during the vegetation period on sunflower yield

N=40	Regression Summary for Dependent Variable: Yield of sunflower R = 0.178 R Square = 0.032 Adjusted R Square = -0.21 F = 0.607 (Sig. = 0.505) Std. Error of the Estimate = 366.141				
	B	Std. Error	Beta	T	Sig.
Constant	1730.364	243.082		7.118	0.000
Used mineral fertilizers	0.366	0.383	0.157	0.956	0.345
Atmospheric precipitation during the vegetation period	0.383	0.555	0.113	0.689	0.495

Source: Author`s calculations

The analysis of yield of soybean

$$Soybean = 1234.61 - 0.257 \text{ mineral fertilizers} + 2.299 \text{ precipitation}$$

Rating of the regression model of the formation of soybean yields shows that the yield can be explained by the rated regression model with $R^2=21.6\%$ and strength of connection between observed variables is $R=0.465$. The influence of independent variables on the yield of soybean is positive and highly statistically significant only in terms of quantity of atmospheric precipitation during the vegetation period ($\beta=0.448$, $p<0.01$), while the quantity of used mineral fertilizers has no statistical significance ($p>0.05$). However, the model cannot be accepted in its entirety as a statistically significant, bearing in mind that also the F-ratio = 5.106 is rated as statistically insignificant ($p> 0.05$).

Table 10. The regression of the amount of used mineral fertilizers and atmospheric precipitation during the vegetation period on soybean yield

N=40	Regression Summary for Dependent Variable: Yield of soybean R = 0.465 R Square = 0.216 Adjusted R Square = 0.174 F = 5.106 (Sig. = 0.011) Std. Error of the Estimate = 498.554				
	B	Std. Error	Beta	T	Sig.
Constant	1234.613	330.991		3.730	0.001
Used mineral fertilizers	-0.257	0.521	-0.073	-0.493	0.625
Atmospheric precipitation during the vegetation period	2.299	0.756	0.448	3.043	0.004

Source: Author`s calculations

The analysis of yield of sugar beet

$$\text{Sugar beet} = 25770.29 + 16.875 \text{ mineral fertilizers} + 26.907 \text{ precipitation}$$

The formation of sugar beet yields can be explained by the rated regression model with $R^2=33.1\%$ and strength of connection between observed variables is $R=0.575$. The influence of independent variables on the realized yield of sugar beet is positive and statistically significant in both cases. In the case of used mineral fertilizers, the coefficient $\beta=0.421$ is rated to be statistically significant ($p<0.05$), also in the case of atmospheric precipitation during the vegetation period, the coefficient $\beta=0.462$ is rated as statistically significant ($p<0.05$). The model can be accepted in its entirety because the F-ratio = 9.133 is rated as statistically very significant ($p<0.01$).

Table 11. The regression of the amount of used mineral fertilizers and atmospheric precipitation during the vegetation period on sugar beet yield

N=40	Regression Summary for Dependent Variable: Yield of sugar beet				
	B	Std. Error	Beta	T	Sig.
	R = 0.575 R Square = 0.331 Adjusted R Square = 0.294 F = 9.133 (Sig. = 0.001) Std. Error of the Estimate = 5227.083				
Constant	25770.299	3470.272		7.426	0.000
Used mineral fertilizers	16.875	5.462	0.421	3.090	0.004
Atmospheric precipitation during the vegetation period	26.907	7.922	0.462	3.396	0.002

Source: Author's calculations

On the basis of the correlation-regression analysis of observed variables, the following conclusions may be drawn:

The correlation-regression analysis has confirmed that there is a positive dependence of realized yields of maize on utilized mineral fertilizers, and significant positive correlation between yield and precipitation during the vegetation season. Due to the development of large above-ground biomass and grain weight, maize requires adequate amounts of nutrients in the soil, i.e. the shortages in plant nutrition often have very significant negative impact, both on the yield and on the quality of products, as confirmed in the numerous studies by following authors (Vučković, 1999; Glamočlija, 2004; Bogdanović et al., 2005; Živanović, 2012). Also, maize is a plant with strongly developed root system, but in critical periods is very sensitive to drought, especially in the period of flowering and fruit set (July and August), when in the ecological conditions in Vojvodina, the amount of atmospheric precipitation is at the minimum. The lack/absence of rainfall throughout the vegetation season, especially in the critical months, adversely affects the yield, which is confirmed by the analysis of interdependence between the yield and precipitation by research years, which is in

accordance with the results of the researches performed by numerous local authors (Jevtić, 1986; Bogdanović et al., 1999; Glamočlija, 2006; Stojković et al., 2008).

- The correlation-regression analysis confirmed that the yield of wheat is under highly significant effect of the amount of used mineral fertilizer, which is confirmed in numerous previous studies (Jevtić, 1986; Vučković, 1999; Malešević et al., 2005; Stanković 2009; Popović, 2010). The reasons for these results are in the fact that wheat has a shallow root system that is very sensitive to the lack of the main elements of nutrition (N, P, K), i.e. herbal assimilative to be entered by supplementary mineral fertilization of plants. At the same time, the analysis showed no statistical dependence between the wheat yield and atmospheric precipitation, i.e. precipitation during the vegetation period, although it is known that wheat is markedly hygrophilous species (Glamočlija, 2004). The reason for this statement is the fact that wheat goes through phases of intense water utilization in months of May and June, which, in the ecological conditions of Vojvodina, are the wettest months during the year.

- The correlation-regression analysis has confirmed that there is a positive dependence of realized yields of maize on utilized mineral fertilizers, and significant positive correlation between yield and precipitation during the vegetation season. Due to the development of large above-ground biomass and grain weight, maize requires adequate amounts of nutrients in the soil, i.e. the shortages in plant nutrition often have very significant negative impact, both on the yield and on the quality of products, as confirmed in the numerous studies by following authors (Vučković, 1999; Glamočlija, 2004; Bogdanović et al., 2005; Živanović, 2012). Also, maize is a plant with strongly developed root system, but in critical periods is very sensitive to drought, especially in the period of flowering and fruit set (July and August), when in the ecological conditions in Vojvodina, the amount of atmospheric precipitation is at the minimum. The lack/absence of rainfall throughout the vegetation season, especially in the critical months, adversely affects the yield, which is confirmed by the analysis of interdependence between the yield and precipitation by research years, which is in accordance with the results of the researches performed by numerous local authors (Jevtić, 1986; Bogdanović et al., 1999; Glamočlija, 2006; Stojković et al., 2008).

- The sunflower yield in the observed forty-year period showed no statistical dependence on the quantity of used mineral fertilizers. Sunflower has not reacted significantly to changes in the quantity of nutrients in the reporting period, so that lower or higher quantity of used mineral fertilizer NPK did not affect the significant variations in the grain yield. This can be explained by the fact that sunflower has a strong root system and deep and uses very well herbal assimilatives that have not been spent by the preceding crop. This refers especially to potassium and phosphorus (Glamočlija, 2006). Therefore, additional fertilization of plants should be based on the natural fertility of the soil, preceding crop, applied agro-technical measures and practices and actual needs of the plants. It can be seen that the sunflower expressed its xeromorphic character, so that the success of the production is not so much dependent on the amount and distribution of precipitation during the vegetation period in the studies area (Glamočlija, 2006). It can be concluded that the water regime in the ecological conditions of Vojvodina is satisfactory for the production of this field crop.

- The amount and distribution of precipitation during the vegetation season had a very strong positive impact on the soybean yield. Soy is a plant species very sensitive to drought, especially in the period of flowering and fruit set which, depending on the varieties, lasts from 50 to 70 days. In order to achieve high and stable yields of grain and soybean aboveground mass, it is necessary that in the critical period of development (the second half of June, July and August) there is about 250-300 mm of rainfall evenly distributed (Glamočlija, 2004; Bošnjak, Pejić, 2004). In addition to the soil drought, soy reacts extremely strongly to air drought. In contrast, due to a strong root system, soy exceptionally adopts phosphorus and potassium from the deeper soil layers, as nitrogen collector, soy grows equally well in conditions of lower soil fertility, and natural, as well as slight supplementary fertilization of plants. Due to the aforementioned facts, the analysis showed no significance of used mineral fertilizers on the grain yields in the reporting period, which has been established in the research of Glamočlija et al. (1998) and Đukić, V. et al. (2009).

- The correlation and regression analysis showed a statistically significant positive correlation between the yield of sugar beet and observed production factors (used quantity of mineral fertilizers and atmospheric precipitation during the vegetation period). Sugar beet is a major consumer of the main nutrients of the diet which was confirmed by this study, i.e. a significant reduction in yield due to lack of abundant plant nutrients is established, as confirmed in the published research results (Lazović, 1984; Glamočlija, 1990; Jaćimović et al., 2006; Bojović, 2014). Also, this plant species is relatively drought resistant, although in critical periods (the phase of the secondary roots thickening - July, the first half of August) due to water deficit, significant increase of sugar beet is missing, which is why the analysis of the dependence of sugar beet yield on the atmospheric precipitation showed significance (Maksimović, Dragović, 2002; Grujančić et al., 2008; Maksimović et al., 2010; Bojović, 2014). However, in dry years with lower root yield, sugar beet has a significantly higher digestion (total sugar content of the root), because the lack of water is partially compensated by increased synthesis of sucrose.

Conclusion

Based on the results of performed research it can be concluded that the yields of major field crops realized on family farms in the region of Vojvodina are significantly lower than yields in developed countries, resulting in the reduction in their economic efficiency and rationality of operation. The reasons for this situation are in the fact that, despite the favourable natural conditions, the agricultural production in the region is characterized by unfavourable property structure of family farms, the heavy dependence of realized yield on the precipitation and relatively low utilization of mineral fertilizers.

The correlation and regression analysis showed that the realized grain yields of major field crops on family farms in the region of Vojvodina, in the forty-year study period, the statistically significant or very significant impact is determined for the application of mineral fertilizers and atmospheric precipitation during the vegetation period. The obtained results show that with the increasing intensity of production, primarily through rational mineral fertilization based on the results of analysis of soil fertility parameters and received recommendations

from expert advisory services, as well as through the application of irrigation, especially during critical periods of the vegetation season, the yields of major field crops on family farms can increase significantly, and hence their competitiveness. It is therefore necessary that the agricultural policy measures are defined at the national level, which would provide the necessary financial and technical support to those family farms that are willing to invest in the intensification of production and improve their economic performance.

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UTICAJ MINERALNE ISHRANE I ATMOSFERSKIH PADAVINA NA PRINOS RATARSKIH USEVA PORODIČNIH GAZDINSTAVA³

Mihajlo Munćan⁴

Rezime

Ratarska proizvodnja, kao najvažnija grana biljne proizvodnje Republike Srbije, u periodu 2002-2011. godina, odvijala se prosečno na preko 2,7 miliona hektara, od čega se 82,7% ove proizvodnje odvija na posedima porodičnih gazdinstava. Otuda su i predmet istraživanja u ovom radu ostvarni prinosi osnovnih ratarskih useva na porodičnim gazdinstvima regiona Vojvodine u periodu 1972-2011. godina. Osnovni cilj istraživanja je ispitivanje međuzavisnosti potrošnje mineralnih đubriva i atmosferskih padavina u vegetacionom periodu i ostvarenih prinosa osnovnih ratarskih useva na porodičnim gazdinstvima u posmatranom periodu. Radi potvrđivanja zavisnosti i utvrđivanja oblika zavisnosti ostvarenih prinosa od ispitivanih varijabli primenjena je regresiona analiza. Dobijeni rezultati pokazali su da su osnovni ograničavajući faktori za dobijanje visokih i stabilnih prinosa ratarskih useva neadekvatna upotreba mineralnih đubriva i nedostatak atmosferskih padavina u vegetacionom periodu.

Ključne reči: *međuzavisnost, mineralna đubriva, atmosferske padavine, ratarski usev, porodično gazdinstvo*

3 Rad je rezultat istraživanja na projektu „Ruralno tržište rada i ruralna ekonomija Srbije – diverzifikacija dohotka i smanjenje ruralnog siromaštva“, broj 179028, finansiranom od strane Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije

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COMPARATIVE ANALYSIS OF EXPONENTIAL SMOOTHING MODELS TO TOURISTS' ARRIVALS IN SERBIA

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Summary

Seasonality is one of the main aspects affecting tourism. Considering the rapid increase in international tourism demand over the last few decades, predictions of future trends of tourism demand are of particular importance for the Government and the economy. We analyze the seasonality of tourist presence in different cities in Serbia. In this paper, the exponential smoothing models have been applied on the data that was taken from Republic Statistical Office (RSO). The research was conducted on monthly data relating to the number of overnight stays in Belgrade, Novi Sad and Niš during the period from January 2000 to December 2013. The precision of the obtained predictions is determined by comparing the RMSE and BIC precision measures. Based on the selected data, forecasting was made and it is concluded that the selected models correspond to the observed data very well.

Key words: time series forecasting, exponential smoothing models, tourist arrivals, Serbia

JEL: Q11

Introduction

Tourism is attributed to the “power” to foster socio-economic and demographic development. There are numerous examples of entire regions where tourism is the dominant or unifying activity (Vujko, Gajić, 2014). The tourism industry is one of the most crucial sectors for a thriving economy as it accounts for a large part of some countries' Growth Domestic Product (GDP) and employment figures. Tourism is characterized by large variations in numbers on a yearly basis and, as a result, predicting future arrivals is a very difficult task (Gounoploulos et al., 2012). According to Nunkoo and Smith they involve comparative economic advantages in relation to the regions which do not develop tourism. It is therefore not surprising when we refer to tourism as a development catalyst (Nunkoo, Smith, 2013). These effects are present in our experiential heritage, so they are considered logical, almost axiomatic. They clearly

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explain why tourism is recognized as an “industry-initiative” of demographic and economic recovery, but not sufficient for generalization according to which any attempt to tourism development necessarily results in prosperity (Vujko, Gajić, 2014).

The most important urban tourist destinations in Serbia are the main administrative centers, Belgrade, Novi Sad and Niš. Thanks to the favorable tourist and geographical position, natural values in the area, a rich cultural and historical heritage and a solid material basis, these urban centers develop various forms of tourist movements. Therefore, it is necessary to make the analysis of tourist turnover, in order to highlight the main directions of tourism development.

Over the past 40 years, time-series models adopted mostly ARIMA models for tourism demand forecasting, followed by Naïve 1, Naïve 2, exponential smoothing models, and simple autoregressive models (Lin, Lee, 2013; Song, Li, 2008). In order to find the best fitting forecast model for the observed data, authors choose exponential smoothing models.

For the purpose of research, the exponential smoothing models have been applied to the historical data of the number of tourists in the three cities. Our aim is to provide the empirical evidence that is the use of exponential smoothing model is useful for generating accurate prediction intervals, in practice. The autoregressive integrated moving average (ARIMA) model has excellent natural statistical characteristics and is the most popular (Sudheer, Suseelatha, 2015). The results are compared based on the Bayesian Information Criterion (BIC) and Root Mean Square Error (RMSE) as accuracy measures and it was concluded that the chosen models correspond to the selected data very well. The used data were taken from the Tourism Bureau of Republic of Serbia (RZS) and the research was conducted on monthly data relating to the number of tourists in Novi Sad, Belgrade and Niš during the period from January 2000 to December 2013. We have found that the analysis of an exponential smoothing model perform most desirably, especially when the forecast horizon is long.

Literature review

According to Songa et al. (2011), seasonality affects tourism in various different ways and is responsible for difficulties in gaining access to capital, high risks of investment and business failures, the ineffective utilisation of resources and facilities, and difficulties in maintaining a consistent service quality. Seasonality can be defined as “the temporal imbalance in the phenomenon of tourism, which may be expressed in terms of dimensions of such elements as numbers of visitors, expenditure of visitors, traffic on highways and other forms of transportation, employment and admissions to attractions”, (Butler, 1994; Cuccia, Rizzo, 2011). According to Cuccia and Rizzo (2011), the number of tourists is a measure of the quantitative dimension of the demand, while their expenditures measure the economic value of the demand for the tourism destination.

Exponential smoothing methods are forecasting techniques which are used widely for the analysis of univariate time series, due to their simplicity and robustness as automatic forecasting procedures (Valet et al., 2011). They originated in the work of Brown and Holt (Brown, 1959; Holt, 1957), but among the most widely known and used forecasting

techniques for seasonal time series are the methods proposed by Winters (1960), one for additive seasonality (additive Holt–Winters method) and one for multiplicative seasonality (multiplicative Holt–Winters method), (Koehler et al., 2001).

The exponential smoothing models use three parameters in forecasting: parameter α as weighting or smoothing parameter of level, parameter γ as weighting parameter of trend and parameter δ as weighting parameter for seasonal components (Cho, 2003). Winters' additive and multiplicative exponential smoothing models incorporate these three parameters. The former model is appropriate for a series with a linear trend and a seasonal effect that does not depend on the level of the series. The latter model is appropriate for the same type of trend, but when the seasonal effect does depend on the level of the series (Coshall, 2009).

According to Zhi-Peng et al. (2008), the major advantage of exponential smoothing methods is that they are simple, intuitive, and easily understood. Generally, exponential smoothing is regarded as an inexpensive technique that gives good forecast in a wide variety of applications. In addition, data storage and computing requirements are minimal, which makes exponential smoothing suitable for real-time application (Zhi-Peng et al., 2008). The major disadvantage of exponential smoothing methods derives from its basic premise about the model: the level of time series should fluctuate about a constant level or change slowly over time. When the time series takes on an obvious trend, even adaptive exponential smoothing methods will fail to give good forecasting.

Research Methodology

Exponential smoothing models have been shown to generate accurate forecasts of tourism demand. These methods use weighted values of past observations to generate forecasts. The weights decline exponentially over time, since the most recent data are considered to be more influential on forecasts than are older observations (Coshall, Charlesworth, 2011). Exponential smoothing model considers the error, trend and seasonal components in choosing the best model by optimizing initial values and parameters (Hassani et al., 2015).

Exponential smoothing models can be seasonal or nonseasonal. Which of these models would be applied depends on the seasonal or nonseasonal character of the observed data. In this paper is confirmed that the chosen series *Number of tourists* – Novi Sad, Belgrade and Niš have a seasonal character, so that's the reason why the three seasonal exponential smoothing models: simple seasonal, Winters additive and Winters multiplicative models, were applied and the results compared. On that way, the seasonal character of the observed series and trend component are putted at the same place.

Single (or simple) exponential smoothing (SES) is the earliest known exponential smoothing technique. It requires the current level of the series to be estimated, which then forms the forecast of the series (Lim, McAleer, 2001). Exponential smoothing is usually based on the premise that the level of time series should fluctuate about a constant level or change slowly over time. Under such a premise, the travel time series $\mathcal{Y}(t)$ can be described by

$$\gamma(t) = \beta(t) + \varepsilon(t)$$

where $\beta(t)$ takes a constant at time t and may change slowly over time, $\varepsilon(t)$ is a random variable and is used to describe the effect of stochastic fluctuation. Sometimes, it is necessary to change the smoothing parameter α used in exponential smoothing when the rate at which β changes over time changes. This suggests that an adaptive smoothing parameter (AES) would produce improved forecasts.

Models with seasonality present can be additive, where the seasonal effect does not depend on the level of the time series or multiplicative, where such a dependency does exist (Coshall, Charlesworth, 2011). There are many forms of exponential smoothing methods of which the Holt–Winters family of exponential smoothing methods is the one most commonly used. The Winters models are using three parameters, α , δ , and γ for forecasting. The parameter α is weighting or smoothing parameter of level, parameter γ is weighting parameter of trend and parameter δ as weighting parameter for seasonal components. The Winters model is given as follows (Cho, 2003):

$$\hat{Y}_{t+1}(t) = [a(t) + b(t)] \cdot Sn_{n+1}(t + 1 - L) + \varepsilon_t,$$

where

$\hat{Y}_{t+1}(t)$ is the forecast for the next time period, $t + 1$;

$a(t)$ is the smoothed estimated for the level at time period t ;

$b(t)$ is the smoothed estimate for the slope at time period t ;

$Sn_{n+1}(t + 1 - L)$ is the smoothed estimate for the $(t + 1)$ th season made at time period $t + 1 - L$;

L is the periodicity of the seasonality;

ε_t is the forecast error at period t .

All three models were applied to series *Number of tourists* – Novi Sad, Belgrade and Niš. According to BIC and RMSE precision measures, it was concluded that Winters multiplicative model outperforms two others for series Novi Sad and Niš. On the other hand, the Simple Seasonal model has a better performance for series Belgrade.

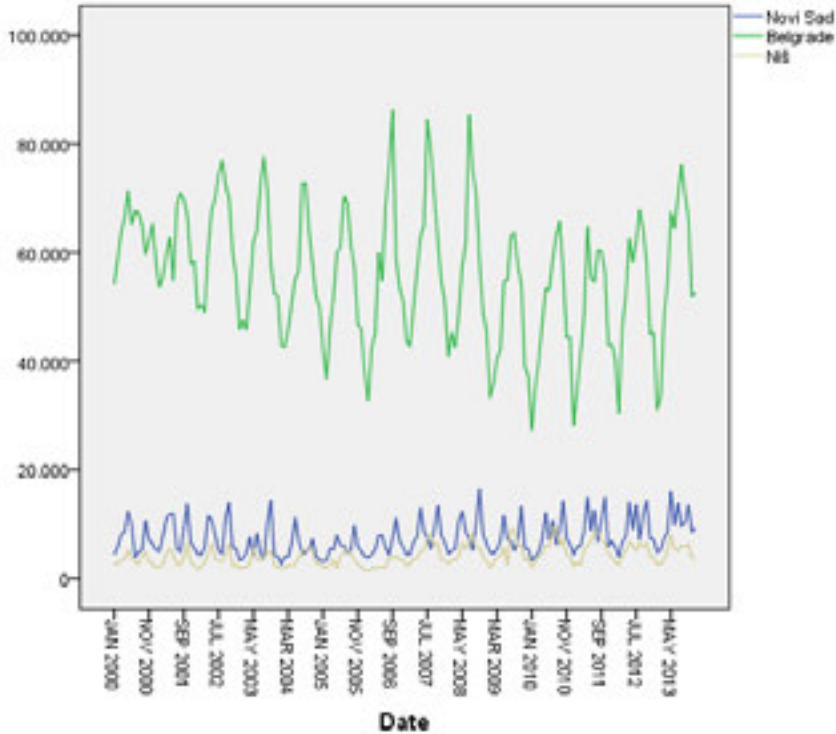
Results and discussion

Most visitor arrivals are affected by the economic environment and seasonal factors such as weather or public holidays. If a seasonal factor exists in a series, one would expect large fluctuations between months. In contrast, the number of visitors may drop during the autumn season when they have fewer holidays (Cho, 2003). The presence of seasonal effects is calculated for observed data and based on that values is concluded that the seasonal factors are higher from April to October for all series.

The series *Number of tourists* – Novi Sad, Belgrade and Niš is shown in the Figure 1. where

it can be seen that the inflow of tourists in Belgrade is significantly higher than the inflow of tourists in Novi Sad and Niš.

Figure 1. Number of tourists in Novi Sad, Belgrade and Niš (January, 2000 – December, 2013)



Source: Authors' research

This observation is also confirmed in the Table 1. by comparison of mean value in these three cities. Precisely, the mean value in Belgrade is few times greater than the mean value in Novi Sad and Niš.

Table 1. Basic statistics

	Novi Sad	Belgrade	Niš
Mean	7,511.71	56,111.06	4,179.55
N	168	168	168
Std. Deviation	3,201.743	12,102.676	1,845.750
Maximum	16,543	86,205	9,352
Minimum	2,747	27,389	1,260
Skewness	0,866	-0,052	0,790
Kurtosis	-0,131	-0,347	0,029
Sum	126,196.7	942,665.8	702,164

Source: Own calculations based on data from Republic Statistical Office

From the Figure 1 it could be seen the presence of seasonal effects on the observed data and the values of seasonal factors further confirm that pattern in Table 2. They are, as usual, expressed in percentage and, based on this values, we can conclude that in all series seasonal factors are higher from April to October.

Table 2. Seasonal Factors

Period	Seasonal Factor (%)		
	Novi Sad	Belgrade	Niš
1	58,5	71,2	52,2
2	60,7	71,7	58,9
3	77,4	82,7	73,9
4	106,5	93,4	93,9
5	154,9	109,2	125,7
6	112,5	109,0	110,2
7	100,0	123,9	123,3
8	71,3	128,7	141,7
9	116,4	121,4	126,4
10	175,7	108,4	139,4
11	87,5	91,5	79,7
12	78,6	88,9	74,8

Source: Own calculations based on data from Republic Statistical Office

It could be also noticed that the seasonal factors for series Novi Sad in May and October are extremely higher than in other periods because its values are 154,9% and 175,7%. That can be explained by the fact that Novi Sad is a frequent destination for school excursions from the country and surroundings, which normally take place in spring or fall, and at the same time it is a period of maintenance different events, which attract both domestic and foreign tourists (Gajić et al., 2015).

Models with seasonality present can be additive, where the seasonal effect does not depend on the level of the time series or multiplicative, where such a dependency does exist (Coshall, Charlesworth, 2011). The results of applied Simple Seasonal and Winters additive and multiplicative models are shown in Table 3.

Table 3. Model statistics

Model	Simple Seasonal	Winters Additive	Winters Multiplicative
Novi Sad-Model_1			
Normalized BIC	14,706	14,742	14,651
RMSE	1,514.134	1,518.351	1,450.376
Belgrade-Model_2			
Normalized BIC	16,897	16,930	17,063
RMSE	4,528.046	4,534.171	4,844.161
Niš-Model_3			
Normalized BIC	13,866	13,904	13,831
RMSE	994,728	998,344	962,642

Source: Own calculations based on data from Republic Statistical Office

Table 3 reports the normalized BIC and RMSE results for all three models. These are very popular precision measures for forecasting accuracy. Based on both criterions, Winters Multiplicative model outperforms Simple Seasonal and Winters Additive model for series Novi Sad and Niš. On the other hand, according to BIC and RMSE criterion, Simple Seasonal model is the best choice for series Belgrade.

Based on the results reported in Table 3, we estimated exponential smoothing model parameters for the models that were the most precise according to BIC and RMSE accuracy measures and the results are shown in Table 4.

Table 4. Exponential smoothing model parameters

Model		Estimate
Novi Sad-Model_1	α (Level)	0,189
	γ (Trend)	0,014
	δ (Season)	0,430
Belgrade-Model_2	α (Level)	0,700
	γ (Trend)	0,000
	δ (Season)	4,814E-005
Niš-Model_3	α (Level)	0,282
	γ (Trend)	0,004
	δ (Season)	0,558

Source: Own calculations based on data from Republic Statistical Office

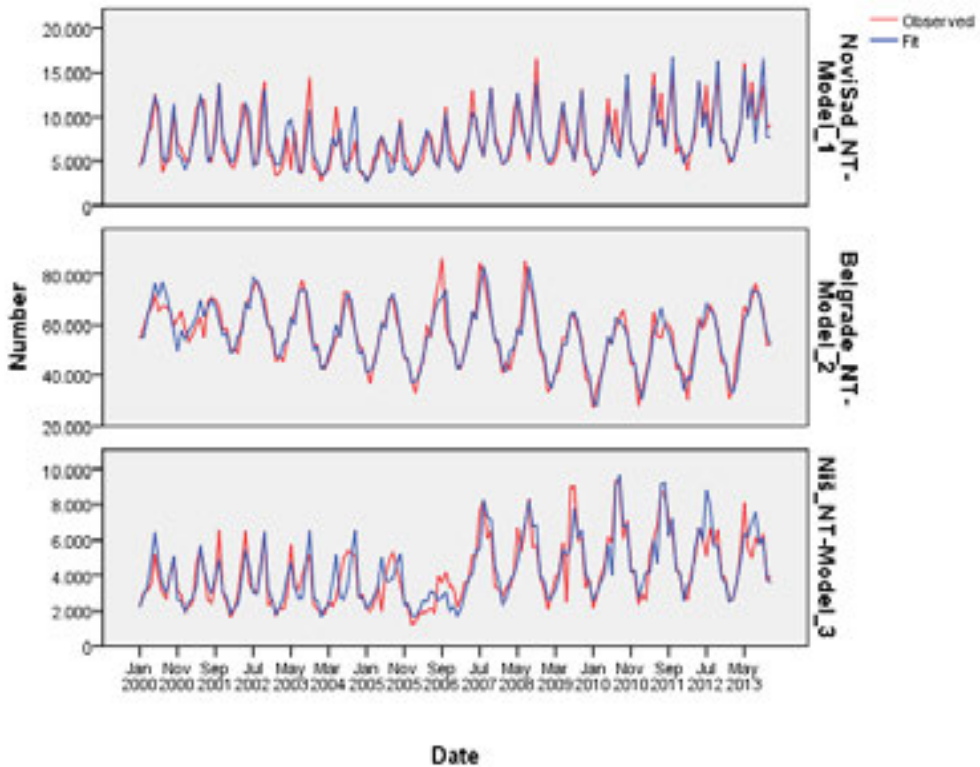
In Table 4 we can see values for all three smoothing parameters, α , γ and δ . For the series Novi Sad, the value of the parameter α is low at 0,189 and it indicates that the observed series is quite stable during the period. Trend value γ is also low and we can conclude that the slope of the trend line is fairly constant. Because the large values for γ give more weight to recent estimates of the trend component and small values giving more weight to historical estimates of the trend component (Coshall, 2009), we can conclude that for all observed series historical values are more important.

Seasonal effects are explained by third parameter δ . Its value of 0,430 indicates that the seasonal effects are more pronounced. Similar explanation we could also give for series Niš, because the value of parameter level is quite low and the value of seasonal parameter is high. Actually, large values of δ give most weight to the most recent estimates of the seasonal component and small values give more weight to historical estimates of this component (Coshall, 2009). Table 4 reports higher values of parameter δ for series Novi Sad and Niš and lower value for series Belgrade.

The series Belgrade differences from other two series because its value of level parameter α is high (0,700). High value indicates the fluctuation of arrivals is large (Cho, 2003) and also, if α is close to one, the new forecast would equal the previous forecast and a substantial proportion of the most recent forecast error; if α is close to zero, the new forecast would equal the previous forecast with little influence from the most recent forecast error (Lim, McAleer,

2001). Based on the selected models, Winters multiplicative for series Novi Sad and Niš and Simple Seasonal for series Belgrade, forecasting was made. The results are shown in the Figure 2, where we can conclude that the chosen models fit well to the observed data.

Figure 2. Observed and fit values for the series *Number of tourists* in Novi Sad, Belgrade and Niš (January, 2000 – December, 2013)



Source: author research

Conclusion

Positive economic effects of tourism development are reflected in many ways (de Oliveira, 2003). The money spent by foreign tourists in the country has a multiple effect, thus generating multiple effects on national income and employment. Spending by foreign tourists causes the initial impetus that begins the multiplier sequence (Vujko, Gajić, 2014).

The validity of forecasting rests on the assumption that the pattern that has been identified will continue in the future. A forecasting technique cannot be expected to give good predictions unless this assumption is valid. If the data pattern that has been identified does not persist in the future, this indicates that the forecasting technique being used is likely to produce inaccurate predictions (Zhi-Peng et al., 2008).

This paper deals with linear innovations state space models only, as exponential smoothing models with multiplicative seasonal indexes need an alternative Bayesian analysis. The

results obtained from the prediction of real correlated time series are encouraging. With the use of the exponential smoothing model proposed in this paper, it is possible to improve the forecast accuracy with respect to the homogeneous multivariate model when the assumption of a common structure for the univariate models is inappropriate.

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UPOREDNA ANALIZA MODELA PREDVIĐANJA TURISTIČKOG PROMETA U SRBIJI

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Rezime

Sezonalnost predstavlja jedan od važnijih aspekata turizma, koji vrši direktan uticaj na tu privrednu delatnost. S obzirom na povećanje međunarodnih turističkih tokova u poslednjim decenijama, predviđanje budućih turističkih tokova i prevazilaženje sezonalnosti predstavlja prioritet privrede i Države. U radu je analizirana sezonalnost turističkog prometa u gradovima Srbije, a kao metoda korišten je model predviđanja primenjen na podatke sakupljene iz Republičkog zavoda za statistiku. Rezultati su prikazani analizom mesečnih podataka turističkog prometa u Beogradu, Novom Sadu i Nišu, u periodu od januara 2000. godine do decembra 2013. godine. Preciznost predviđanja određena je upoređivanjem RMSE i BIC instrumenata za merenje predviđanja. Na osnovu izabranih podataka urađeno je predviđanje turističkog prometa u pomenutim gradovima, a istraživanje je dovelo do zaključka da je odabrani model veoma primenjiv u praksi.

Ključne reči: predviđanje vremenskim serijama, eksponencijalni modeli, promet turista, Srbija

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MEDICINAL HERBS AS PART OF THE DEVELOPMENT OF SUSTAINABLE TOURISM IN NATURE PARK "STARA PLANINA"

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Summary

Implementation of the concept of sustainable exploitation of medicinal plant resources facilitates the development of tourism offering and the related activities that would enhance the development of rural areas in this region. When managed in a sustainable manner, tourism can bring many advantages to protected areas, tourism industry and a local community. By using high-resolution satellite images and application of GIS technology, a method is developed for monitoring periodic changes in eco-systems. The collected data enable design of models that incorporate in themselves dynamics of changes taking place in natural ecosystems. By means of periodic imaging of characteristic areas, the spatial representation of eco-systems will be monitored, along with the changes in their composition and structure, which may seriously endanger the development of tourism potential in the region. The integral approach to the management of medicinal herb resources in the region of Mt. Stara Planina, based on the results of this study, necessitates the integration of these results with the results of the studies investigating views and needs of the local population, whose quality of life depends on sustainability of the process of collection and valorisation of this resource.

Key words: *Nature Park, Mt. Stara Planina, medicinal plants, sustainable tourism, GIS techniques*

JEL: *Q26*

Introduction

Sustainable tourism represents a type of approach that incorporates within itself preservation and enhancement of natural resources and increase in value of local cultural characteristics and traditions. Sustainable tourism is a responsible tourism, aiming at an increase of employment and revenue derived from natural resources, while exerting little or no impact on environment

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or local culture (Banerji et al., 2011, Annie Abraham, 2012). The tourism developed based on medicinal herb resources is becoming increasingly popular in a number of developed countries, especially as a part of alternative medicine. This results in a growing demand for medicinal herbs, which, in consequence, may lead to an excessive use of this resource in natural habitats and, consequently, to the extinction of some species (Ratknić et al., 2011).

In Serbia, rural development is established as an economic, social and ecological priority. Diversification of rural economy in a socially, economically and ecologically sustainable manner is essential for improvement of quality of life, reduction of poverty level, as well as for combat against social and ecological degradation. Millennium development goals (MDG) are focused on extreme poverty and famine eradication, ensuring environmental sustainability and development of global partnerships (Stankov, 2007).

Sustainable rural development in Serbia depends on practical application of a combination of 'multi-functional agriculture' concepts and an integral approach to an all-encompassing improvement of life conditions and the socio-economic position of the village and rural communities, through an increase of employment opportunities outside agriculture (an increased diversity of economic activities), in keeping with the available resources.

The previous, as well as the present Serbian agricultural policy has been dominated by a ubiquitous fallacy, which identified the agricultural development with the rural development (Đorđević-Milošević, Milovanović, 2012). Tourism was recognised as the key sector capable of giving impetus to the process of rural economy diversification (Stankov et al., 2011).

A special emphasis is laid on environmental protection and conservation in rural areas, aiming at the preservation of specific habitats, plant and animal diversity, genetic resources of autochthonous species and races (Dowling, Fannell, 2003).

LEADER programmes still allocate more funds to agricultural support than to improvement of quality of life in rural areas. This may lead to conflicting situations, particularly in special protection areas (Natura 2000) (Strzelecka et al., 2014). These conflicts, a result of different level of participation of local communities, directly harm the development of rural tourism, rather than contributing to its development (Ćurčić, 2003).

This paper aims to demonstrate the possibilities of using medicinal herb resources in the role of development of tourism potentials of mountain massifs by presenting the case of Knjaževac Municipality, which encompasses parts of as many as three mountain massifs of Eastern Serbia.

Study area and method

The study was conducted at 'Stara Planina' Nature Park, within its part belonging to the territory of Knjaževac Municipality in Eastern Serbia. The territory of Knjaževac Municipality includes 86 settlements with 37,172 inhabitants and covers the area of 1,202 km². It is located in the eastern part of the Republic of Serbia, along the border with the Republic of Bulgaria. Knjaževac Municipality is a hilly-mountainous region, with the altitudes ranging from 176 and 2,169 metres and a prominent plain in the valley of the Timok River, which extends to the

Danube lowland. The territory is isolated from the neighbouring municipalities by mountain ranges. The hilly-mountainous character of the municipality is reflected in the fact that 75% of its territory is located at the altitude of 400m.

The major tourism potential of the municipality is 'Stara Planina' Nature Park. Tourism in this region is still at an emerging stage, with inadequately organized rural tourism development potentials, which are insufficiently connected to other forms of tourism (water, mountain, spa, hunting and fishing tourism, etc.).

The major potentials for tourism development include the region's morphological properties, as 40% of its territory consists of areas located at the altitude of 1,100-2,000 metres, suitable for development of winter-sport tourism. The ranges between 1,000 and 1,500 metres are suitable for recreational purposes and accommodation-catering facilities, while the lowest mountain areas at the altitude of 800-1,200 metres provide opportunity for development of health-recreational tourism. As a bordering area, the region has a large capacity for development of tourism in Serbia and Bulgaria. The Mt. Stara Planina region has at its disposal values in form of remains of old civilisations (numerous fortresses and remains of ancient towns), along with monasteries, churches, liberation war memorials, well-preserved ethnographic artefacts, potentials for development of hunting and fishing tourism, etc. (Dragović et al., 2011; Lazarević, 2015; Mijović, 2001; Miljović, Bugajić, 2004; Milošević, Markićević 2004; Ostojić, 2001). The integral part of 'Stara Planina' Nature Park's tourism offering are the resources of medicinal herbs, forest fruits and mushrooms, which may significantly support the revaluation of this region's tourism potentials, where biodiversity and natural ecosystem protection must be promoted, along with the development of organic agricultural farming.

For the purpose of identifying vegetation units, a method of application of high-resolution satellite images was applied for the assessment of medicinal herb resources and locations. This method enables reducing to a minimum expensive field work on data collection and, at the same time, ensures that a sufficient amount of accurate and practically applicable data is obtained (Ratknić et al., 2002). Remote-control data from satellite images were used concurrently with the conventional map presentations, such as topographic maps, inclination and exposure maps, hydrographic maps, pedological, lithological and geological maps, erosion maps, etc., and incorporated into an integrated geographic information system (GIS) (Ratknić et al., 2009).

In this manner, a multi-disciplinary integration was attained, providing answers to complicated questions related to use of space, environmental protection and development of tourism potentials in the region based on medicinal herb resources. Within the selected homogenous vegetation units, a field evaluation of medicinal herb diversity was performed, from the aspect of potentials for the development of eco-tourism. The Serbian habitat classification system is based on the EUNIS classification system (Davies, Moss, 2002; Lakušić et al., 2005).

Study results

A great abundance and diversity of local flora in Serbia can be illustrated by the total number of medicinal herbs. Over 700 medicinal herb species have been identified, out of which 400

are officially registered and 280 are sold on the market. 152 plant species are legally protected from being used and sold on the market, while their collection is subject to control. That means that 10% of the total species are of medicinal value (Matović et al, 2005; Stevanović, Vasić (eds), 1995; Cooper, Pezold (eds.), 2010). The diversity of edible herbaceous plants and wild fruits is even higher. Homogenous vegetation units on the territory of Knjaževac Municipality, within 'Stara Planina' Nature Park, identified for the purpose of assessment of potentials of medicinal herb resources, are presented in Figure 1.

Figure 1. Vegetation homogenous units in the assessment of potentials of medicinal herb resources



Source: The authors' map obtained on the basis of high resolution satellite image (Ikonos 80-cm Natural Color)

The highest number of medicinal species in the area of Mt. Stara Planina is represented in the altitude zone under 1,000 metres. Medicinal herbs are classified into five categories, depending on their potentials, the domestic and foreign trade and the possibility of regeneration (Ratknić et al., 2011). The groups are dynamic and depend mainly on the level of exploitation in previous years.

The first group includes species with significant resource potentials, however, characterised by an intensified exploitation, on account of a high market demand. These species have the highest economic importance. When collection is performed in a proper manner, population regeneration is regular. When plants are collected, they should be cut off, leaving 30-40% for in-semination, while rotation principle should be applied in selection. Under this type of treatment, population regeneration is regular.

In certain cases medicinal herbs fail to survive after being used, which may result in their gradual or abrupt disappearance (*Euphrasia officinalis*, *Asperula odorata*); therefore, it is necessary to establish a restricted-use regime. Similar problem is experienced by *Hypericum perforatum*, *Mellisa officinalis*, *Thymus sp. diversa*, *Rosa canina*, *Tilia cordata*, *Tilia platyphyllos*, *Tilia tomentosa*, *Matricaria chamomilla*; however, in this case, the restricted use can be avoided by plantation cultivation.

The second group includes broadly-represented species with the modest ecological needs, well tolerating an intensive exploitation and representing a significant resource. This group includes the following plants: *Achillea millefolium*, two Common broom species (*Cytisus sp.*), *Malva sylvestris*, *Teucrium polium*, *Veronica officinalis* and others.

The third group of medicinal herbs is characterised by an increased market demand and limited resources. This group includes the following plants: *Valeriana officinalis*, *Althaea officinalis*, *Adonis vernalis*, *Betonica officinalis*, *Juniperus oxycedrus*, *Asplenium trichomanes*, *Sedum acre*, *Origanum vulgare* and others. It is necessary to establish a regime of restricted use for plants in this group; however, the regime may be avoided by application of plantation cultivation.

The fourth group includes medicinal herbs of limited resources and limited demand. On account of numerous biological and ecological factors, their regeneration is protracted, while plantation cultivation is in most cases impossible. A significant number of plants in this group are included in the list of legally protected plants or plants under a special prohibition-of-use regime. The more important species among the plants in this group are the following: *Ruta graveolens*, *Alchemilla mollis*, *Sideritis syriaca*, *Drosera rotundifolia*, while some of the species under control are *Phyllitis scolopendrium*, *Hellichrysum aranarium*, *Orchis sp. diversa*) and others. Introduction of some of the above-mentioned species into the cultures will facilitate stability of the existing habitats and re-introduction of species.

The fifth group includes species widely known as 'the weeds'. They are of importance for medical purposes, and some of them are sold off in large quantities: *Urtica dioica*, *Centaurea cyanus*, *Cicoirium intybus*, *Arctium lappa*. Under adequate conditions, these species enable fast accumulation of significant quantities of biomass.

The plants collected in the altitude zone between 1,000 and 2,000 metres are difficult for cultivation, while preservation of their gene pool can be attained solely by prohibition of use. Some of the species within this group are the following: *Hieracium pillosella*, *Bistorta major*, *Betula pendula*, *Vaccinium myrtyllis*, *Vaccinium vitis idaea*. Certain poisonous medicinal herbs, of limited resources and included into the list of protected species, are also widespread in this altitude zone. Other species are under a special regime, on account of danger of resource depletion resulting from an intensive demand. The plants of significant economic importance in this zone are *Hypericum perforatum*, *Betonica officinalis*, *Thymus sp.*, *Tussilago farfara*, *Solidago virgaurea* and others. Ruderal species, such as *Urtica dioica*, *Rumex alpinus*, *Chenopodium bonus-henricus*, *Verbascum thapsiforme*, *Veratrum album* also have good resource potentials in this zone.

Both the taxa critically endangered globally and the taxa critically endangered in Serbia have been identified in the study area (Stevanović, (eds.) 1999).

The current disorganised and highly destructive use of medicinal herbs has endangered the survival of some medicinal herb species, which has become rare and may become completely extinct. The taxon critically endangered globally, recorded in the study area is:

Campanula calycialata V. Randelović and Zlatković – bellflower. – It populates rock gaps and grass fields at the altitudes of about 1,700 metres. In the only known site, it creates sub-alpine vegetation in rock gaps, of the *Silenion lerchenfeldianae* alliance. It appears on perm red sandstones, south exposure and a relatively flat terrain. It propagates by seeds and vegetatively. Two populations were found at the ‘Babin Zub’ location. The first population has between 10 and 20 specimens. The plants in the other population are nearly completely destroyed by constant tramping, resulting from the site location on one of the most frequently visited observation points at Mt. Stara Planina. The population figure has decreased by over 80% in last ten years. On account of their attractive appearance, plants are dug out from the soil and removed to private gardens, which additionally contributes to their destruction in natural habitats.

The taxa critically endangered in Serbia, identified in the study area, are the following:

Swertia perennis L – felwort – populates wet or peat-covered places around springs and streams in the mountain and sub-alpine belt. The ‘Arbinje’ site is a sub-association of sphagnum type - *Eriophoro-Caricetum flaviae allietosum sibiricae prov.* It propagates by seeds and vegetatively by lateral meristems from a crawling rhizome. It can be found at the following locations: ‘Kopren’, ‘Tri Čuke’ and ‘Vražja Glava Potoci’. At the ‘Arbinje’ site, six populations have been identified with the total number of 250 specimens. In the broader area of ‘Tri Čuke’ and ‘Kopren’ sites, 5-6 groups have been identified with 100-150 specimens. The species has become endangered as a result of excessive livestock grazing, nutrification and draining, as well as excessive collection of species for pharmacological research. A prohibition or restriction of livestock grazing at peat bogs should be imposed, along with a mowing restriction of peat meadows. Furthermore, it is necessary to impose prohibition of plant collection for medicinal purposes.

Eranthis hyemalis (L.) Salisb – winter aconite – It is recorded at the ‘Vrška Čuka’ site in ‘Stara Planina’ Nature Park, Zaječar, Knjaževac (Novi Han). Plant populations are exceedingly small-numbered. Forest clearing and an excessive plant collection - a result of attractiveness of its decorative flowers - produce a negative impact on the plant population figure.

Tozzia alpina L. *subsp. carpatica* (Wolosyczak) Dostal – Carpathian Tozzia – It can be found on highly wet and peat-covered soils, mainly at the stream springs and along mountain streams in the sub-alpine and alpine belt (at the altitude of 1,550-2,000m). It grows in microhabitats of flattened, terraced peat-bogs, watered from the higher positions, in which the sphagnum peat’s compact layer is broken by a constant outflow. It is recorded at the following locations: the Dojkičačka River basin, ‘Krvave Bare’ and ‘Arabinje’, ‘Gornje Lise’. The Mt. Stara Planina population of this plant covers only several square metres and includes less than 100 specimens. The population is endangered due to a reduction of water inflow from higher

positions, occurring as a result of water spring catchment or terrain drainage for construction of tourism facilities. The spring-adjacent areas are exposed to trampling and nutrification by a large and small livestock, while the uncontrolled use of peat as a vegetable and flower fertiliser, along with extensive picking of plants for herbarium collections, contribute to a further decline in the population figure.

Alnus viridis (Chaix) DC. subsp. *viridis* – green alder – It grows at the altitudes of 1,300-2,100 metres, near mountain streams on siliceous rocks. It was recorded at the following locations: the Dojkinačka River basin, 'Kopren', 'Bratkove strane', 'Arbinje', 'Popova Vunija', 'Propadla Vunija', beneath 'Gocina Kočina', beneath 'Tri Kladenca', the Jelovička River spring, 'Šišine Vunije' (Šošina tumba), the Toplodolska River basin, 'Krvave Bare' (beneath 'Vražja Glava'), 'Popova Livada', the Crnovrška River basin, beneath 'Žarkova Čuka'. The areas are few and show a constant tendency to decrease. The total sub-population covers about five hectares and includes approximately 1,000 specimens. It is exposed to defoliation by domestic animals in the vicinity of pastures. It sporadically grows at pastures, where prevents the growth of grass, for which reason it is being cut and cleared.

Primula halleri Honckeny – long-flowered primrose – It can be found in pastures and stone fields in the alpine and sub-alpine region in the zone of spruce and dwarf mountain pine forests. The endangerment level is low, on account of inaccessible terrain on which it grows. It should be protected within 'alpinetums' (alpine botanic gardens).

Senecio pancicii Degen - (no English common name) – At the Mt. Stara Planina, it is located near 'Kopren', in a habitat with a wet meso-climate, favourable for development of peat vegetation. Other locations are 'Bratkova Strana', 'Supra', 'Topli Do', 'Kopren', 'Krvave Bare', the Dojkinačka River spring, 'Govedarnik', 'Tri Čuke', the Jolovička River spring, 'Džemerovo Lojze'. Mountain peats are endangered by draining, livestock grazing, nutrification and trampling. These negative impacts are intensified as a result of an extension of the main forest road, which connects 'Topli Do' with 'Dojkince', runs across the 'Krvava Bara' mounting pass and represents a potential tourist route. The sub-population is estimated at 1,000 specimens, with a tendency to be further reduced.

Ranunculus lingua L. – great spearwort – it populates wet soils, marsh and mire edges and peats at the altitudes under 1,200 metres (Dimitrovgrad, Smilovci, Odorovačko and Smilovsko Blato). The number of specimens is under 50 within a 10m² area. The species is endangered due to marsh draining, land reclamation works and transformation of habitats into land used for other purposes (agricultural land, fishponds).

Sparganium natans L. – bur-reed – It populates mountain oligotrophic mires, marshes, ponds, canals, sphagnum peats (Knjaževac, Podvis, Svrliški Timok). The species is endangered as a result of mire draining and technical regulation of the watercourse.

Eryngium serbicum Pančić – (no English common name) – It is widespread in the surroundings of the town of Pirot, (Osmakovo, Crnoklišta), in shrubs of continental hilly-mountainous regions, dry thermophilic lowland and hilly grass habitats on limestone, siliceous terrains.

Genista subcapitata Pančić – (no English common name) – It is widespread at 'Vidlič'

and 'Rakoš'. It populates dry thermophilic hilly grass habitats, as well as the habitats above the upper limit of forest vegetation, precipitous cliffs, compact rock blocks and terraced precipices.

Stachys milanii Petrović - (no English common name) – It is recorded in the region of town of Knjaževac (Vratarnica) and Pirot (Staničenje, Sinjevac), in salt marshes and salt-marsh meadows, steppes, agricultural fields and other types of ploughland.

Corallorhiza trifida Chatel- early coralroot – It can be found at several locations at Mt. Stara Planina (Babin zub, Sveti Nikola, Sokolov Kamen). It populates wide-leaf deciduous and natural coniferous forests, high strongly-acidic peat bogs and flat peat bogs, usually in depressions.

Orhis militaris L. – military orchid – It populates shrubs and thickets, natural or slightly ameliorated wet or mired valley meadows, and high-grass communities near streams in hilly-mountainous regions. It can be found in pastures and mowing meadows in lowland, hilly and mountainous and pre-mountainous areas.

Discussion

Numerous researchers have pointed out to the fact that 'there is a need for a new paradigm of rural development...'. (Blamey, 2001). Its main characteristics should be focusing on territories, rather than sectors, and emphasising investments rather than subsidies. Furthermore, goals such as levelling up living conditions in rural and urban regions, an increase of farm revenues, farm competitiveness, should be complemented by competitiveness of rural regions, valorisation of local resources, exploitation of unexploited resources (Björk, 2007; McAreave et al., 2011). The key actors in implementation of such paradigm are not only national governments and farmers, but also all levels of authority (supranational, national, regional and local) and various local actors (public, private, non-governmental organisations) (OECD, 2012).

The development of tourist capacities based on natural resources is a long-term process. Therefore, it is necessary to conduct their rapid evaluation, spatial location and the assessment of the endangerment level (Mišić et al., 1978). High-resolution satellite images, with the application of GIS technology, were used for that purpose.

Based on the existing renewable resources of Mt. Stara Planina (Mišić et al., 1978), it is possible to develop a significant economic activity, including: collection and processing of forest berries and fruits (wild cherry, wild pear, wild apple, rowan berry, whitebeam berry, hazelnut, cornus mas berries, wild rose, sloe berry, bilberry, blackberry, raspberry, strawberry, juniper berry, etc.), collection, processing and final processing of medicinal, aromatic and seasoning herbs, etc.

Renewable natural resources of medicinal herbs, their processing and final processing will enable creating employment opportunities for a large number of workers of different occupations. In addition, it will facilitate dislocation of manufacturing plants from industrial centres and establishing smaller plants in rural areas (Reckoska et al, 2002).

The abundance of medicinal and related species, represented in the diverse flora of Mt. Stara Planina, offers large possibilities for their rational use. However, careless, irresponsible and, most frequently, unskilled collection of wild medicinal herbs in the last few decades has contributed to destruction and excessive reduction of numerous valuable species in their natural habitats. This also may be due to the lack of participation of interested parties in the decision-making process. (Samardžić, 2014).

The local population that collects herbs for sale most commonly receives an inadequate financial compensation for the unprocessed herb material. Most wild species, medicinal species in particular, are still to be collected in wilderness, which means that it is very important to maintain eco-systems in which they live. On the other hand, sustainment of local communities and care for their well-being also represent a priority. Sustainable collection that includes processing at farms or within the community, along with cultivation of specific plants as a form of 'on-the-spot' protection and a source of large amounts of herb material in demand by the market, are increasingly seen as the key factors for the strategy of preservation of species collected in the wilderness and their habitats. This is particularly important given the current and potential contribution of the species to the local economies and their increased value for collectors in a long-term period. The basic idea is to use at the local level the material collected non-destructively from nature, and, in that manner, to support the existence of the local population and the species, as well as the diversity of eco-system. These resources should not be overestimated in that respect, nor should local economies rely solely on them. Hence there is a need to recognise and strengthen the role of local population in the process of herb registration, monitoring and assessment of impact, as well as to integrate the use of wild fruits into the overall management of natural resources.

Cultivation of medicinal herbs will require their wider spread into different (for agriculture) marginal areas, mountains, marshes, sandy and similar terrains. Small local farms will play an important role in that process, as that activity may secure the opportunities for increase of revenue derived from intensive land management. That benefit may also be of indirect nature, as the introduction of extensive cultivation of medicinal herbs may help local population to manage valuable terrains and rural areas in a sustainable manner, and earn money in the process. Maintaining agricultural land of high natural value and semi-natural areas attractive for tourists, along with other products obtained in these areas, may increase the interest for their rural tourism offering. Given the fact that medicinal herbs play one of the central roles in rural customs, these products, being traditional medicaments, with added value may become an important merchandise for sale, if sufficient funds are invested into processing and packaging that adhere to modern standards (Jaramaz, Jaramaz, 2009). Local level cultivation of medicinal herbs is also important for prevention of environmental degradation and loss of genetic diversity, as well as for prevention of undermining incentives for wild population preservation.

Conclusion

A full revitalisation of hilly-mountainous regions can be attained by fulfilling some critical conditions: construction of modern road network, organisation of modern traffic (road, postal,

telephone communications), organisation of health and veterinary services, organisation of cultural, entertainment and sport activities, creating conditions for education of young people. Realisation of the above-mentioned requisites, with the abundance of natural resources, will create preconditions for development of tourism, trade and other activities. That will contribute to the return of the population to these regions. Medicinal herb resources may greatly encourage development of economic and tourist potential of the Mt. Stara Planina broader area.

Work on gaining knowledge and the assessment of medicinal plant potentials is a highly complex task, requiring close and permanent cooperation between scientific, professional and business organisations. Various activities involved in collection, primary and final processing of wild medicinal herbs, including application of the produced preparations, can be accompanied by tourism offering initiated by the rural population of Knjaževac Municipality.

Tourism may change the socio-economic balance of the rural area, if the revenue derived from tourism services is higher than the revenue generated from traditional activities. However, when managed in a sustainable manner, tourism can bring many advantages to protected areas, tourism industry and a local community.

By using high-resolution satellite images and application of GIS technology, a method is developed for monitoring periodic changes in eco-systems. The collected data enable design of models that incorporate within themselves dynamics of changes taking place in natural eco-systems. By means of periodic imaging of characteristic areas, the spatial representation of eco-systems will be monitored, along with the changes in their composition and structure, which may seriously endanger the development of tourism potential in the region. The conducted study created a significant starting point, providing information on diversity, representation, the level of endangerment and resource grouping of medicinal herbs in the area of 'Stara Planina' Natural Park; however, this study should be extended by further research. The integral approach to the management of medicinal herb resources in the region of Mt. Stara Planina, based on the results of this study, necessitates the integration of these results with the results of the studies investigating views and needs of the local population, whose quality of life depends on sustainability of the process of collection and valorisation of this resource.

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LEKOVITO BILJE KAO DEO RAZVOJA ODRŽIVOG TURIZMA U PARKU PRIRODE “STARA PLANINA”

Tatjana Ratknić³, Jelena Milovanović⁴

Sažetak

Na osnovu koncepta održivog korišćenja resursa lekovitog bilja moguće je razviti turističku ponudu koja bi svojim delovanjem unapredila razvoj ruralnih područja na ovom prostoru. Sa druge strane kada se upravlja održivo, turizam može da donese mnoge prednosti zaštićenim područjima, turističkom sektoru i lokalnoj zajednici. Korišćenjem satelitskih snimka visoke rezolucije, a uz primenu GIS tehnologije, razvijen je metod praćenja periodičnih promena u ekosistemima. Prikupljeni podaci omogućavaju izradu modela koji u sebi sadrže dinamiku promena u prirodnim ekosistemima. Periodičnim snimanjem karakterističnih područja pratiće se prostorna zastupljenost ekosistema, kao i promene u njihovom sastavu i strukturi koje mogu u velikoj meri da ugroze razvoj turističkog potencijala na području. Integralni pristup upravljanja resursima lekovitog bilja na području Stare planine, zasnovan na rezultatima ovog istraživanja, zahteva njihovo integrisanje sa rezultatima istraživanja stavova i potreba lokalnog stanovništva, čiji kvalitet života zavisi od održivosti procesa sakupljanja i valorizacije ovog resursa.

Ključne reči: *Park prirode, Stara planina, lekovito bilje, održivi turizam, GIS*

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**ECOLOGICAL IMPORTANCE OF ELECTRICAL DEVICES INNOVATIVE
IN THE PROCESS OF ANTI *AMBROSIA ARTEMISIIFOLIA* L***Miloš Stanković¹, Marija Cvijanović², Vojin Đukić³***Summary**

*Large amounts of aerosols that linger in the atmosphere are becoming carriers of pollen. *Ambrosia artemisiifolia* L has the ability to produce large amounts of pollen. Given the high adaptability of *Ambrosia artemisiifolia* L for the dissemination of the big problem is its suppression. In practice, the most common method of combating *Ambrosia* is the use of different groups of herbicides which adversely affects the environment.*

*Therefore, the aim of the paper is set to investigate the efficacy of the treatment plant *Ambrosia artemisiifolia* L supply via innovative devices in the stage of development of vegetative growth of the plants after harvest of wheat. The first results were visible after only 20 minutes, and the total number of plants in the treatment was destroyed after 5 days.*

Key words: *Ambrosia artemisiifolia* L, electrical voltage, current, resistance of plants

JEL: Q57, Q16

Introduction

The sharp technical-technological development in order to improve the quality of life of people, brought many negative consequences in the environment. One of the main long-term result of climate change caused by increased concentration of carbon dioxide in the air. Climate change is a problem that the world faces today. According to data from the Intergovernmental Panel on Climate Change (IPCC 2007) increase in average annual air temperature by 2100 will be up to 6.4°C, with uneven and unpredictable intensity of rainfall and storms that affect the changing conditions for life. Climate changes affect the survival of certain species of plants, the change in the number of species and subspecies, as well as the extension of the growing of some plant species. In addition to these changes occur intensified bioproduction alergijskih plant species as well as the increased production of their pollen (Dechamp et al., 2002; Rogers et al., 2006). Increased concentration of pollen in the lower parts of the

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atmosphere with the presence of aerosols create complexes that in humans cause major health problems (Wayne et al., 2002). These phenomena are characteristic of urban areas with a high concentration of aerosols, carbon dioxide in the air and increased air temperature. It is estimated that more than 10% of the population sensitive to pollen of plants, and that more than 50% of allergies caused by *Ambrosia* pollen. Allergic reactions caused by *Ambrosia* pollen can be a tragic end, and in a world where the weed mass present allocated large funds for its suppression and measuring the concentration of pollen in the air (HERBAL Society of Serbia 2007). One gram of pollen *Ambrosia artemisiifolia* L. contains up to 35 million pollen grains, and one plant can produce during the year to 1,350 million pollen grains (Fumanal, 2005). Therefore, this type of *Ambrosia* in the list of quarantine harmful organisms (Sl. list SRJ br. 8/99). The Government of the Republic of Serbia passed a Decree on measures for the control and destruction of weed species (Sl. Glasnik br. 69/06).

Ambrosia is an invasive weed plant species that can be counted about 48 different species (Dêchamp i Mëon, 2003). Widespread is throughout the world according to Allard, (1973), occupies an area of 50 parallels the north to the 32 and 35 parallels the south. Seeds of *Ambrosia* was transferred from America to Europe where it spread with incredible speed, and today it is the most represented in the eastern and south-eastern part. In the western part of Europe is less frequent since increased humidity in this part of Europe is a limiting factor for its development. The most represented and distributed species *Ambrosia artemisiifolia* L. popularly known as “pelenasta” ambrosia. In Serbia, was first recorded in 1953 (Slavnić, 1953). The last 60 years ambrosia is spreading throughout the territory of Serbia. The spread of *Ambrosia* and survival, it is possible not only to a slight adaptation, but also the fact that in the process ambrosia loses its natural enemies (Maron et al., 2004). In addition ambrosia no great demand on physical, chemical properties of the soil. Observing the behavior of populations, noted the conquest of new spaces with natural vegetation, semi-closed, usually degraded meadow (Comtois, 1998). Wins habitats such as abandoned and unfinished land and arable land (Bohren at all., 2006). On the arable land is very well developed in the arable crops corn, sunflower, soybean and can reduce the yield of cultivated plants by 25-30% depending on its exuberance. Also, rapidly evolving surfaces after winter wheat.

All these are reasons that indicate that a program to combat *Ambrosia* should focus on reducing the number of plants that can produce seed. Thus, to combat *Ambrosia* was best done in the phase of vegetative growth before flowering.

Literature Overview

When it comes to large areas where ragweed is present, then agrotechnical and mechanical measures are not enough. One of the main ways to combat *Ambrosia* is the application of chemicals, especially herbicides. Herbicides are applied across the land (at the stage of germination *Ambrosia*) over the sheet (before flowering). However, there are big problems in controlling *Ambrosia* herbicides, and in terms of efficiency and in terms of environmental protection. The best results are achieved in the fight against *Ambrosia* is a mixture of different herbicides (Niekamp, Johnson, 2001). The effectiveness of herbicides depends on the stage

of development Ambrosia and stages of development of cultivated crops. On the other hand all the more limited use of chemical agents on surfaces with cultivated plants, because of their specific retention in the ecosystem and the negative impact on the dynamics of the parameters of soil biogeny (Cvijanović et al., 2006).

For this reason, increasingly resorted to other measures in the fight against Ambrosia such as knowledge of biophysical sciences. Over the past few decades increasing number Researchers have tried using that particular voltage and current combat ragweed and other weeds. Research Mattsson (1995) on the use of devices with naponoma of 9 KV to 13 KV, and the power of 50 KW to 110 KW show that they have some limitations but also to be used in the control of weed species.

In the last few decades, a growing number of researchers trying to using a certain voltage and current prevents the development of Ambrosia on arable land. Diprose et al. (1978) used the current effective value of 8.4 kV voltage in the control of Ambrosia in crops of sugar beet. The tractor of 52 kW driven by the generator of 24 kW and 240 V rms who supplied transformer whereby been receiving 8.4 kV rms value of the voltage at the output. The whole machine is able to move at a speed of 1.6 km/h to give the contact a plant-electrode about 2 or 3 seconds. Treatments were repeated twice at an interval of four weeks. Of the 186 annual plants counted on an experimental plot, 51% continued to grow after the treatment but did not produce usable seeds. Of the remainder, 24% were destroyed leaves and stems and it was produced seed. 25% of those surviving plants were crop growth or even less so that the electrode is missed.

Therefore, the aim of the study is set to examine the possibility of suppression Ambrosia's patented device that is in the Department of patents RST/RS20015/000002. Unlike other electrical equipment for controlling weeds, the essence of this innovation makes use of thyristor switches, which is achieved simply putting the device into operation and achieved simpler regulation. The novelty of the device for controlling weeds, consists in the use of thyristor switch, connected via a voltage transformer with synthesizers, while the unit's power can be autonomously (using batteries or aggregate) or using the power grid (single phase or interphase). Novelty is also a use of a reverse link between the high-voltage transformer and voltage multiplier.

The essence of innovation consists in the fact that pressing the button closes the circuit of transformer primary which in his round secondary induced electromotive force is multiplied to the required high voltage using the voltage multiplier. Amplified and rectified voltage supplied by the primary high-voltage transformer, the feedback in the feedback branch of a high voltage induced in the secondary high-voltage transformer via electrodes at its output acts on harmful weed plants or their parts. In the event that the input voltage is unidirectional, then the button to close the circuit connected oscillator certain frequencies.

Methods

The experiment was conducted during 2015 at the Agricultural Institute of Slovenia, the experimental field „Jable“, located in Domažale between Ljubljana and Kranj. In the experimental field, with an area of 50m² was a crop of wheat.

Ambrosia artemisiifolia L. was in the stage of vegetative growth to 30 cm. For the control of Ambrosia using a device which carries a number of patent RST/RS20015/000002.

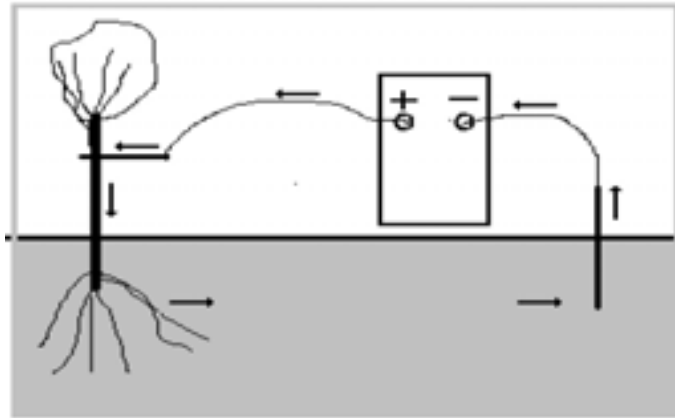
The examination procedure:

- Selected Ambrosia in the fields after the harvest of wheat on an area of 5 m x 10 m (551 plants), a Ambrosia out of it were control;
- Some are the largest and smallest diameters of stem Ambrosia at the contact with the -electrode (i.e. 7 - 20 cm above the ground), and near the root;
- The stem of the plant is pressed horizontal electrode;
- The land is stung second electrode that has the grounding;
- Through the plant (in this case, for a period of 1.5 seconds) has failed current;
- After treatment, continues monitoring the situation for several days.

Results and discussion

Plants that are up to 30 cm in height, trunk diameter, about $5,073 \pm 995 \mu\text{m}$, a central part of the tree-filled parenchymal cells, the experiment is sufficient lower part of the stem of the plant. Therefore, the treatment plant was completed on the stem at the level of 7-20 cm of the soil surface. This part of the plant was exposed to a voltage of 25 kV, and the time ekspozicije 1.5 seconds. An important parameter and a status indicator (and the degree of destruction) of the plant is its electrical resistance. How are from earlier tests can be concluded, as soon as through the plants originate an electric current of sufficient strength, its resistance to doing almost linearly decrease to a certain minimum value. This process is closely related to the degree of destruction of the plant, ie. the lower the resistance, the degree of destruction of the plant is higher. After reaching the minimum, resistance of the plants remain for some time about equal to this value, and then begins to rise, possibly due to fluid loss caused by overheating of the plants above 100°C.

Figure 1. Schematic of galvanic connection



Source: authors, based on research

For complicated structure such as plant stems, specific resistance will be a function of all three spatial coordinates, however, in this case we could only come up to the equivalent specific resistance, tag it with ρ , whose formula:

$$\rho = \frac{1}{4} \pi \frac{a_1 b_2 - a_2 b_1}{h} \frac{1}{\ln \frac{a_1 b_2}{a_2 b_1}} R$$

where is: R- measured the resistance of a piece of the plant; h - a stem length; a_1, b_1, a_2, b_2 - double the length of the large and small axis of this cross section of the stem at its beginning and end.

Going through ambrosia, electricity produced voltages from 25kV, left a visible trail of scorched. This phenomenon is easy to understand since it is about the classic places a short circuit in the electrical circuit, and in them, because of high resistance, releases the most energy per unit time.

Immediately after treatment, the stems of plants were a little heated (could stick your fingers) and retained the green color which, in our judgment, means that is in them, with the possible chemical changes, there was the process of "cooking" and not "roasting". When an electric current passes through the stalks of weeds, the weeds are happening biophysical and biochemical processes, after which the weeds veins (Stankovic, 2012). Immediately after 20-40 minutes were visible operating results of current flow through the plant (Fig. 2, 3).

Based on these results, two days after the treatment was destroyed 63% or 347 plants (Tab. 1). Other plants 204 (37.0%) were partially retained the green color of leaves, while the lower part of the stems was dry. In the next three days preostelih 204 plants were completely dry, so after five days of treatment plants was not a single green plants Ambrosia. On the roof can be used only once (Stanković, 2014).

Table 1. Dynamics of the number of plants at different time intervals after treatment current intensity 25 kV

The total number of plants before treatment	Time after treatment (days)				The total number of plants before treatment		
	2 days		5 days				
551	Number	%	Number	%	Number	%	
		347	62.9	204	37.0	551	100

Source: authors, based on research

Figure 2. Appearance of plants *Ambrosia artemisiifolia* L. 20 minutes after treatment



Source: authors, based on research

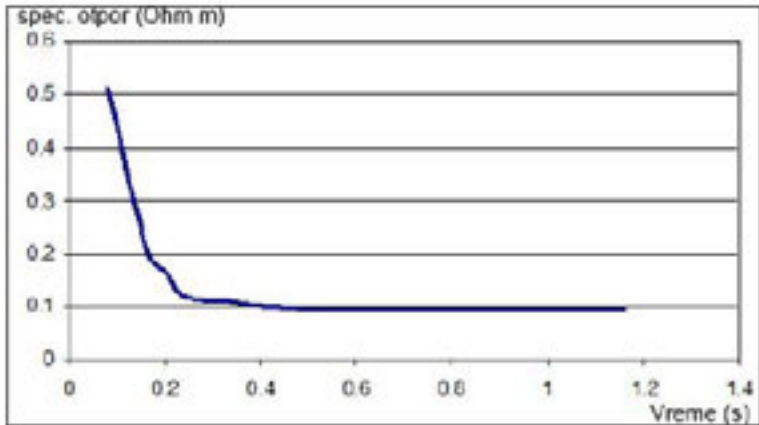
Figure 3. Appearance of plants *Ambrosia artemisiifolia* L. 40 minutes after treatment



Source: authors, based on research

On the stems of plants Ambrosia after treatment was determined by the dependence of the specific resistance of plants from the time of operation voltage of 25 kV (Fig. 4). It is observed that the specific resistance of Ambrosia plants comes very fast to plateau significantly lower value compared to the starting. This phenomenon is favorable because then the electric current passes a more through root hairs/lateral roots than through the soil. In order to avoid problems of higher consumption of energy, must be made a deliberate choice the weather conditions when will be performed treatments, because immediately after the rain resistance of plants grow, and then gradually decreases as the decreasing water content in the soil and therefore the plants.

Figure 4. Diagram of the dependence of the specific resistance from the time of operation voltage 25 kV



Source: authors, based on research

Conclusion

In accordance with the all above stated, innovative device for the destruction of ragweed, as compared to known devices of this kind has many advantages, of which the most important are: ease of solutions, simple the power supply high-voltage devices, its efficiency and cost-effectiveness, stability in operation, the output voltage stability, possibility of higher voltages with great safety when handling the device, monitoring and maintenance. Also, there are constructive possibilities of the different versions of the device, the portable hand-held devices to versions for use on a variety of small and large agricultural machines or others.

The authors suggest further research in order to determine the correct parameters of efficiency, cost effectiveness and productivity of this machine compared to other forms of destruction of ragweed on one side and preservation of the environment on the other.

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EKOLOŠKI ZNAČAJ PRIMENE ELEKTRO-INOVATIVNOG UREĐAJA U PROCESU SUZBIJANJA *AMBROSIA ARTEMISIIFOLIA L*

Miloš Stanković⁴, Marija Cvijanović⁵, Vojin Đukić⁶

Rezime

*Velike količine aerosola koje se zadržavaju u atmosferi postaju nosači polena. *Ambrosia artemisiifolia L* ima sposobnost produkcije velike količine polena. S obzirom na veliku adaptibilnost *Ambrosia artemisiifolia L* pri širenju veliki problem je njeno suzbijanje. U praksi najčešća metoda suzbijanja ambrozije je korišćenje različitih grupa herbicida čime se negativno utiče na životnu sredinu.*

*Zato je za cilj rada postavljeno da se istraži efiksanost tretmana biljaka *Ambrosia artemisiifolia L* naponom preko inovativnog uređaja u fenofazi vegetativnog porasta biljaka posle žetve pšenice. Prvi rezultati su bili vidljivi posle samo 20 minuta, a ukupan broj biljaka u tretmanu bio je uništen posle 5 dana.*

Ključne reči: *Ambrosia artemisiifolia L, električni napon, struja, otpor biljaka*

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CONSUMERS BEHAVIOR ON ORGANIC FOOD: EVIDENCE FROM THE REPUBLIC OF SERBIA

Semir Vehapi¹, Edin Dolićanin²

Summary

In developed countries, the demand for organic food has seen a significant increase in the past decade. However, the organic food market in Serbia is still in its infancy and can be considered an emerging market. By gaining an understanding of consumer behavior on the Serbian market, it is possible to provide a greater consumption of organic food per capita through an appropriate marketing approach, as well as quicker development of the national market. This paper will outline some of the most significant findings obtained from a quantitative study of the population of Serbia in the role of buyers and potential buyers of organic food. How much knowledge respondents have about organic food was also studied and presented here, as was the socio-demographic profile of the consumers as an important determinant of organic food consumption. In addition, we also analyzed consumer behavior when buying organic food from the standpoint of basic instruments of the marketing mix: the product, the price, marketing communication (promotion) and marketing channels (place). The obtained results were explained in relation to the theoretical knowledge obtained from previous studies carried out on various national markets. Based on these findings, a solid foundation for the development of effective marketing strategies was obtained.

Key words: *organic food, the market, consumers, behavior, Serbia*

JEL: *M30, Q13, D12*

Introduction

During the previous decade, the global organic food market developed very quickly from a niche market to a broad market segment (Doorn, Verhoef, 2015). The demand for organic food is growing at an increased rate, which has led to global sales of organic food and drink reaching 80 billion US dollars in 2014. In the same year, the per-capita consumption

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of these products was 11 US dollars, where the highest consumption rate was realized in Switzerland (221 €), Luxemburg (164 €), and Denmark (162 €). However, even in these pioneer countries, organic food only makes up a small market share (Denmark: 7.6%; Switzerland: 7.1% and Luxemburg: 3.4%) (Willer, Lernoud, 2014).

The organic food market in Serbia is still in its infancy, but the number of producers in the last decade has increased significantly. In 2014, there were 1,281 producers cultivating approximately 9,548 ha of organic agricultural land. The organic agricultural land makes up 0.2% of the overall agricultural land. This production capacity meets the current level of organic food consumption on the national market. The overall turnover of the organic food sector in Serbia has been estimated at 40 million US dollars. The average annual expenditures for organic food are 5 US dollars per capita. Based on the aforementioned indicators, it is evident that the Serbian organic food market is lagging behind the markets of more developed countries (*Table 1*), as well as the markets of neighboring countries which are members of the European Union (EU) (*Table 2*). The main reasons for this are low levels of consumption, insufficient access to information on the part of the consumers, an inconsistent offer, a lack of product variety, poorly developed distribution channels and a low average income. (Vlahović et al., 2011; Kalentić et al., 2014).

Table 1. A comparative overview of the indicators of organic food market development in Serbia and in select developed countries 2014.

Country	Area (ha)	Share of all agr. land (%)	Producers (no.)	Retail sales (million €)	€/person
Serbia	9,548	0.2	1,281	35 (2012) (40\$)	4.4 (2012) (5\$)
Austria	525,521	19.4	22,184	1,065	127
Denmark	165,773	6.3	2,565	912	162
Germany	1,047,633	6.3	23,398	7,910	97
Italy	1,387,913	10.8	48,662	2,145	35
France	1,118,845	4.1	26,466	4,830	73
United Kingdom	521,475	3	3,526	2,307	36
Sweden	501,831	16.4	5,406	1,402	145
Netherlands	49,159	2.5	1,706	965	57

Source: Willer, Lernoud, 2014, 2016;

Table 2. A comparative overview of the indicators of organic food market development in Serbia and in neighboring countries 2014.

Country	Area (ha)	Share of all agr. land (%)	Producers (no.)	Retail sales (million €)	€/person
Serbia	9,548	0,2	1.281	35 (2012) (40\$)	4.4 (2012) (5\$)
Romania	289,252	2.1	14,159	80	4

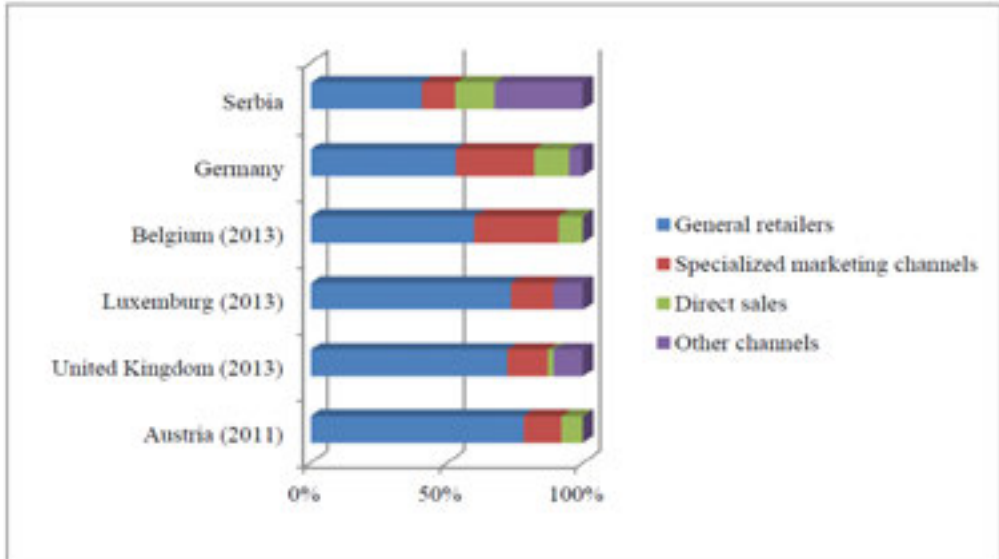
Country	Area (ha)	Share of all agr. land (%)	Producers (no.)	Retail sales (million €)	€/person
Croatia	50,054	3.8	2,194	99	23
Hungary	124,841	2.7	1,672	25	2
Bulgaria	74,351	2.4	3,893	7	1
Montenegro	3,289	0.6	167	0	0
Bosnia and Herzegovina	353	0.02	24	2	0
Macedonia	3,146	0.3	382	-	-
Albania	515	0.04	39	-	-

Source: Willer, Lernoud 2014, 2016;

Numerous studies have focused on individual instruments of the marketing mix in the context of organic food. A certain number of them have dealt with the different aspects of the production mix, including attractive packaging and its role in the purchasing process (Hill, Lynchehaun, 2002; Essoussi, Zahaf, 2008), knowledge of the labels of organic food and certification standards (Padel, Foster, 2005; Wier et al., 2008; Janssen, Hamm, 2011) and the product range (Govindasamy et al., 2006). These findings indicate that packaging is an important means to distinguish organic from conventional food, but that it is still not attractive enough for most organic products. In addition, there is a smaller variety of organic products in comparison to conventional ones. Furthermore, the obtained data also confirm that consumers are manifesting a certain amount of confusion or lack of knowledge in terms of the certification process and organic labels. When it comes to price as the second instrument of the marketing mix, most studies dealt with the consumers' willingness to pay for organic products (Radman, 2005; Tsakiridou et al., 2006; Krystallis et al., 2006; Pellegrini, Farinello, 2009; Aguirre González, 2009; Aryal et al., 2009). What is common to all these studies is the finding that consumers are willing to pay a higher price for organic food in comparison to the price of conventional food. Another very important question is where consumers purchase organic food. Accordingly, numerous studies have analyzed the behavior of consumers in terms of store choice behavior (Lockie et al., 2002; Fotopoulos, Krystallis, 2002; Padel, Foster, 2005; Wier et al., 2008; Crandall et al., 2010; MacKinnon, 2013). Even though the results differ, most of the studies agree that the importance of conventional retailers is increasing, and that supermarkets are becoming the main place where consumers purchase organic food (*Graph 1*). A significantly smaller number of studies have analyzed the instruments of communication on the organic food market (Fotopoulos, Krystallis, 2002; Chinnici et al., 2002; Akbari, Asadi, 2008). On the market of Iran, Greece and Italy, consumers state that they mostly gather information on organic products by means of the electronic and printed media, but also from family members and friends. Another important aspects of research into the organic food market referred to the discovery of the consumer profile. Research has shown that organic food consumers are mostly women, the elderly, as well as married couples with children (Wandel, Bugge, 1997; Fotopoulos, Krystallis, 2002; Roitner-Schobesberger et al., 2008; Dimitri, Dettmann, 2012; Grubor, Djokić, 2016). It has also been determined that a higher education and higher income are related to the greater probability of purchasing

organic products (Dimitri, Dettmann, 2012).

Graph 1. Marketing channels for organic products in selected countries 2014.



Source: Willer, Lernoud, 2016;

While previous studies have dealt with the different aspects of marketing research for organic food, this study encompasses four basic marketing instruments, focusing on organic food consumers, while at the same time discovering the socio-demographic profile of these consumers. In this way, the current study provides opportune way for researchers as well as practitioners to get a complete overview of the most important factors which determine organic food consumption on the Serbian market. Understanding the critical factors which influence consumer behavior towards organic food is of vital importance for the implementation of successful marketing strategies, and consequently the quick development of the national organic food market.

Materials and methods

Sampling procedure and data collection technique

The research presented in this paper is based on the findings obtained from a quantitative study by means of a questionnaire. The target population was made up of the population of the Republic of Serbia, who can find themselves in the role of buyers or potential buyers of organic food. Due to financial and logistic obstacles, this study could not focus on all the subjects of the target population. As a result, the study was carried out on a convenience sample which included 212 participants of different socio-demographic characteristics (Table 3.). The sample from each city was approximately the same in proportion to number of inhabitants. The participants were selected from five regional centers: Belgrade = 104 respondents; Novi Sad = 31 respondent; Niš = 28 respondents; Kragujevac = 26 respondents;

and Novi Pazar = 23 respondents.

Table 3. The socio-demographic characteristics of the respondents

Element	Absolute frequency	Relative frequency (%)	
<i>Gender</i>			
Male	85	40.1	
Female	127	59.9	
<i>Age group</i>			
15-25	92	43.4	
26-35	46	21.7	
36-50	52	24.5	
51-65	12	5.7	
Over 65	10	4.7	
<i>Education</i>			
University	111	52.4	
Community college	17	8.0	
High school	78	36.8	
Elementary	6	2.8	
<i>Work status and job</i>			
Full-time employee/ Part-time employee	Industry	33	15.6
	Health	12	5.7
	Education	29	13.7
	Public institutions	12	5.7
	Other	14	6.6
Unemployed	14	6.6	
Student	88	41.5	
Retired	10	4.7	
<i>Monthly net household income (in RSD)</i>			
Up to 50,000	71	33.5	
50,001-100,000	79	37.3	
100,001-150,000	27	12.7	
150,001-200,000	18	8.5	
Exceeding 200,000	17	8.0	
<i>Number of household members</i>			
Single-member household	17	8.0	
Two-member household	28	13.2	
Three-member household	54	25.5	
Four-member household	75	35.4	
Five-member household	23	10.8	
Six and more members	15	7.1	
<i>Overall</i>	212	100	

Source: The data which the author obtained in his own field work

In order to realize the aims of this study, we used a combination of an online interview and a personal interview. First, the questionnaire was prepared in electronic form and distributed to 350 previously selected e-mail addresses of inhabitants of the selected cities. The response rate of the on-line respondents was 43% and can be considered adequate and satisfactory. In the case of the remaining 63 respondents, the questionnaires were distributed in person, and the testing was conducted at various locations, starting from high schools, colleges to retail facilities. Approximately three weeks were needed for data collection, from May 8, 2014 until June 3, 2014.

Questionnaire design




The basic measuring instrument used in this study was a structured questionnaire which consisted of 21 questions organized into several groups. The first group of questions was meant to measure the level of knowledge and information that the respondents had about organic food, where the first question is a filter question which is used to single out a special group of informed respondents. This group also includes questions regarding awareness of the national organic label meant to determine the extent to which consumers recognize the labels on the products or whether they just purchase products randomly. At the same time, three labels were prepared: the first one is used for organic products which originate from the EU (Label 1), the second one is an imaginary label designed for the purpose of this research³ (Label 2), and the third one represents the national governmental label used in Serbia (Label 3) (*Table 4.*). The questionnaire continues with questions used to identify buying behavior. Another filter question was used here with the intention of separating organic food consumers from non-buyers of these products. The following block of questions attempts to determine which instruments of the marketing mix are most often selected by consumers. This includes their preferences for certain categories of products, price levels, distribution channels and means of communication. The final section of the questionnaire consists of socio-demographic questions.

Most of the questions were of the closed-type, presented in the form of two or multiple answer questions. In addition, scaling techniques were also used.⁴ Prior to formulating the final version of the questionnaire, we carried out a pilot study which included 50 representative respondents. The basic aim behind the pilot study, according to Saunders et al. (2009), was to improve its clarity, reliability and validity.

3 Design of the logo is taken from web research

4 The respondents who had not heard of the organic food were required to rate, on a scale of 1 to 5, their own knowledge of and the amount of information regarding organic food.

Table 4. The recognition test for national organic label

Label 1	Label 2	Label 3
		

Source: Kalentić et al., 2014, Willer, Lernoud, 2014, 2015;

Data analysis

The collected data was processed using SPSS 21 (Statistical Program for Social Science) computer software. In processing the obtained data we used descriptive statistics and analytical statistic methods. Of the descriptive methods, relative values, central tendencies (means and modus) and standard deviations were noted. In order to study the statistical significance of the connection between categories of variables, the Chi-square test was used. The level of statistical significance was set at $p < 0,05$.

Results and discussion

Information and knowledge about organic food

The deciding influence on the demand for organic food is knowledge of the concept of organic food. More information on the organic food market, which leads to greater consumer knowledge of organic food, has a positive effect on consumers' attitudes towards these products. It was proven that attitudes are the main predictor of intentions for purchasing organic food products (de Magistris, Gracia, 2008; Yazdanpanah, Forouzani, 2015). The results of this study have shown that 4.2% of the respondents had not heard of organic food⁵. This indicates that there are still individuals uninformed about the existence of food produced in the system of organic agriculture, but the percentage of these respondents was 8% smaller in comparison to previous studies carried out in Serbia (Vlahović et al., 2010; Vlahović et al., 2011).

The highest percentage of respondents (43.3%) is considered to possess more than a sufficient level of information and knowledge about organic food (*Table 5*). A subjective evaluation of the respondents is not in accordance with the results of the recognition test of the national organic label. The results of this test indicate a low level of familiarity with the label of organic food produced in Serbia, considering that almost 40% of the respondents did not manage to recognize the appropriate label (*Graph 2*). The recognition problem and understanding of

⁵ The respondents who had not heard of organic food were excluded from further research and the final sample consists of only informed participants who are potential buyers of organic food.

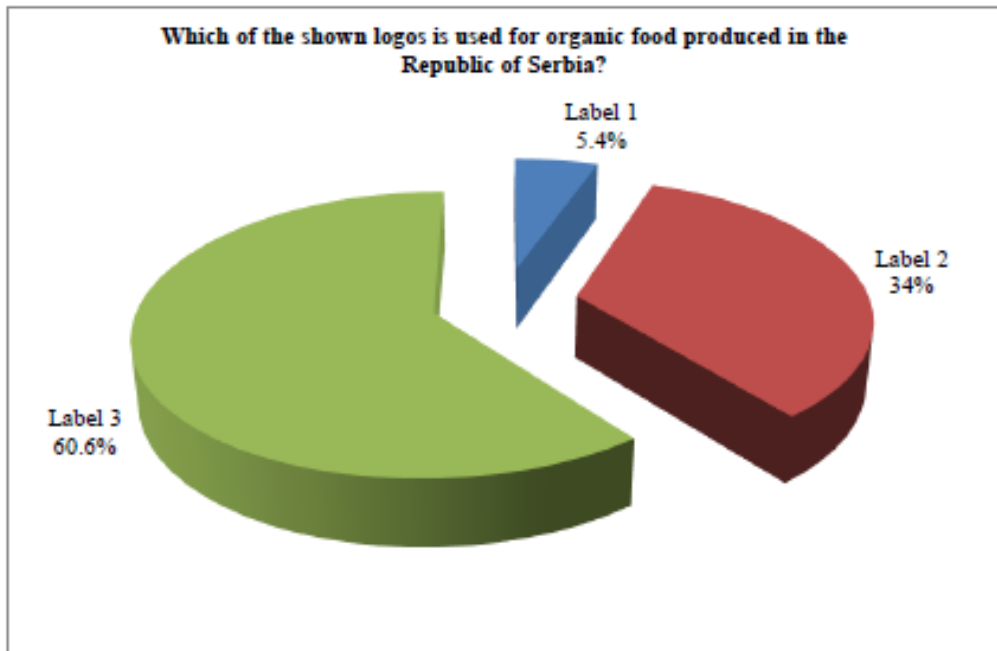
organic labels was identified in other studies (Padel, Foster, 2005; Roitner-Schobesberger et al., 2008; Sekovska, 2010; Vlahović et al., 2011; Mesías Díaz et al., 2012). The findings confirm that in the studied countries (Serbia, Thailand, Macedonia, Spain) more than half of the consumers could not recognize the national organic label or the EU label. Padel and Foster (2005) indicate that most of the respondents from the market of Great Britain are uncertain about the issues regarding inspection and certification and are clearly uninformed or confused about the labeling. The main source of confusion on the labeling of organic food is connected to the existence of a wide variety of competing products marked “safe food”, “healthy food”, “pesticide free”, “chemical free” and “high quality food”. The difficulties in distinguishing between them can be connected to the fact that most supermarkets on their shelves still do not make a proper and clear distinction between health food and organic food (Roitner-Schobesberger et al., 2008). This leads to consumers considering the terms organic food and health food to be more or less synonymous (Lockie, 2006; Gifford, Bernard, 2011).

Table 5. Descriptive indicators of the level of information and knowledge about organic food

N	Min	Max	AS	SD	Modus
203	1	5	2.95	0.937	3

Source: The data which the author obtained in his own field work

Graph 2. Recognition of the national organic label by the consumers



Source: The data which the author obtained in his own field work

Even if the consumers are able to recognize the organic label, this does not mean that they have detailed information on the production process, certification and control. This was confirmed in this study, according to which only 10.8% of the respondents recognized the correct definition of organic food, defining it as food produced using techniques defined by the Law on Organic production (Table 6.). The results of the Chi-square test indicate a statistically significant connection between gender and the definition given of the concept of organic food ($\chi^2=13.743$; $df=5$; $p=0.017$). Namely, of the respondents who correctly defined organic food most were female (72.7%).

Table 6. Defining the concept of organic food

Definition: Organic food	Absolute frequency	Relative frequency (%)
Local food produced on family land using traditional methods	21	10.3
Food produced without the use of pesticides, chemical additives and genetically modified organisms (GMO)	66	32.5
Food produced without GMO	4	2.0
Food produced without the use of pesticides, artificial fertilizers, GMO and chemical additives;	70	34.5
Food produced using techniques defined by the Law on organic production	22	10.8
Food produced using natural methods without the use of artificial fertilizers	20	9.9
Overall	203	100

Source: The data which the author obtained in his own field work

Buying behavior

The development and improvement of a marketing strategy requires detailed information on the habits of consumers and their decision-making process regarding purchasing organic food. Of the overall number of informed respondents, 85.7% have indicated that they purchase organic food, while 14.4% had never purchased these products.⁶ The obtained results indicate that during the previous few years the demand for organic food has undergone an increase on the national market, considering that according to previous studies 46-48% of the participants could not be considered buyers of organic food (Vlahović et al., 2010, Vlahović et al., 2011). When it comes to purchasing frequency, it was determined that the greatest number of respondents (45.3%) occasionally purchase OF, while only the smallest number are regular consumers of these products (13.8%). This is in accordance with other studies which determined that the proportion of consumers purchasing organic food on a regular basis is low, while the greatest number of respondents only occasionally purchase organic products (Grunert, 1993; Wandel, Bugge, 1997; Vlahović et al., 2011, Mesías Díaz et al., 2012; Padilla Bravo et al., 2013). The results of the Chi-square test indicate a

⁶ The category of respondents who did not purchase these products was excluded from further analyses and the obtained sample consisted only of organic food consumers.

statistically significant relation between socio-demographic characteristics and the frequency of purchasing organic food⁷ in three cases:

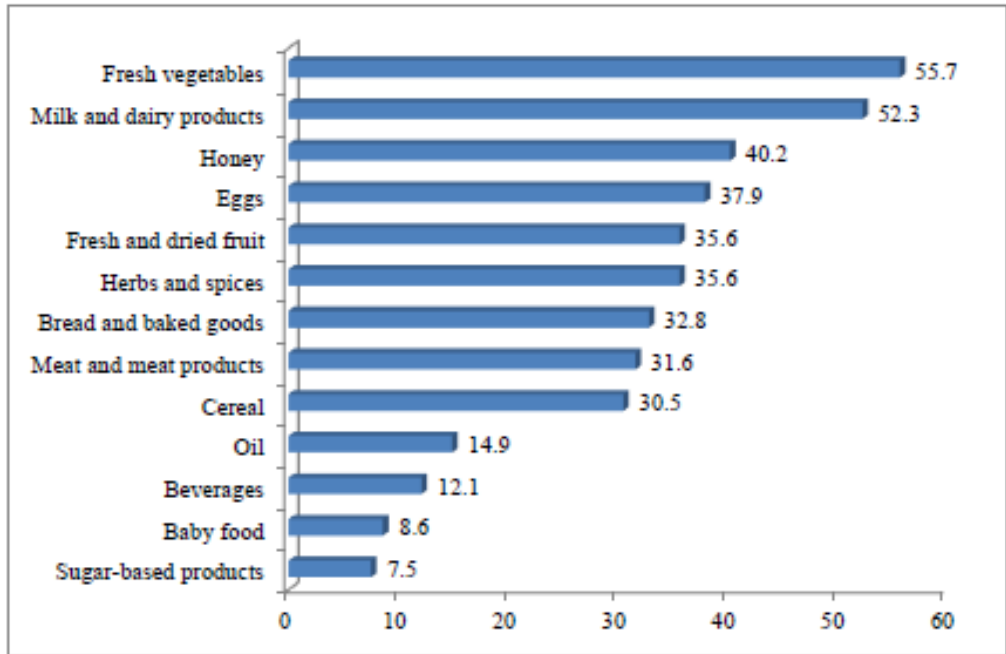
- Between the level of education and the purchasing frequency of organic food ($\chi^2=10.537$; $df=3$; $p=0.015$)
- Between occupation and purchasing frequency of organic food ($\chi^2=4.166$; $df=1$; $p=0.041$)
- Between the monthly net household income and purchasing frequency of organic food ($\chi^2=4.508$, $df=1$; $p=0.034$)

The abovementioned results reveal that respondents with a community college education or higher, respondents whose monthly net household income exceeds 100,000 RSD⁸, as well as those who work in education, health, and public institutions often purchase organic food. This profile is in agreement with the results of other studies which support the fact that the purchasing of organic food is connected to a higher level of education and increased household income (Lockie et al., 2002; Radman, 2005; Aguirre González, 2009; Tung et al., 2012; Dimitri, Dettmann, 2012). Unlike in the case of socio-demographic variables, no statistically significant connection was established between the level of information and knowledge about organic food and the purchasing frequency of these products. This means that knowledge of the methods of organic production and awareness of the organic labels do not necessarily correspond purchase.

Fresh vegetables were the type of food that the respondents claim to purchase most often (55.7%), followed by milk and dairy products (52.3%) and honey (40.2%) (*Graph 3*). These results partly coincide with the results of previous studies, according to which the most frequently purchased categories of organic food include fruit and vegetables (Chinnici et al., 2002; O'Donovan, McCarthy, 2002; Radman, 2005; Roitner-Schobesberger et al., 2008; Vlahović et al., 2011). Based on our results, packaging does not represent an important factor when purchasing organic food, considering that 62.6% of consumers do not take into consideration packaging design when purchasing these types of products.

7 With the aim of proving the existence of a statistically significant relation between the aforementioned variables, we reduced the number of categorical variables, which confirmed in the basic hypothesis on the minimal theoretical frequency of any cell.

8 The dinar is the currency of Serbia.

Graph 3. Most frequently bought organic products (in %)

Source: The data which the author obtained in his own field work

Note: respondents were given the option of selecting more than one response

This study has shown that organic products is mostly purchased in supermarkets and hypermarkets (40.8%) (*Table 7.*). The finding that supermarkets are the dominant place for purchasing organic products is supported by numerous studies (Lockie et al., 2002; Padel, Foster, 2005; Wier et al., 2008; Essoussi, Zahaf, 2008; Pellegrini, Farinello, 2009; MacKinnon, 2013). The results of this study suggest that specialized shops are important for a small percentage of consumers (12.1%). According to previous studies carried out in Serbia, most of the respondents purchased these products in specialized shops, that is, “health food” stores (Vlahović et al., 2010; Vlahović et al., 2011). This would mean that both in Serbia and the West, the role of specialized shops in overall sales is decreasing, while the participation of supermarkets and hypermarkets is increasing.

Table 7. Usual purchase place for organic products

Categories		Absolute frequency	Relative frequency (%)
<i>Where do you usually purchase organic food?</i>	In the supermarket	51	29.3
	In a hypermarket	20	11.5
	In specialized shop	21	12.1
	At the green market	27	15.5
	Directly from the producer	25	14.4
	No rules	30	17.2
Overall		174	100

Source: The data which the author obtained in his own field work

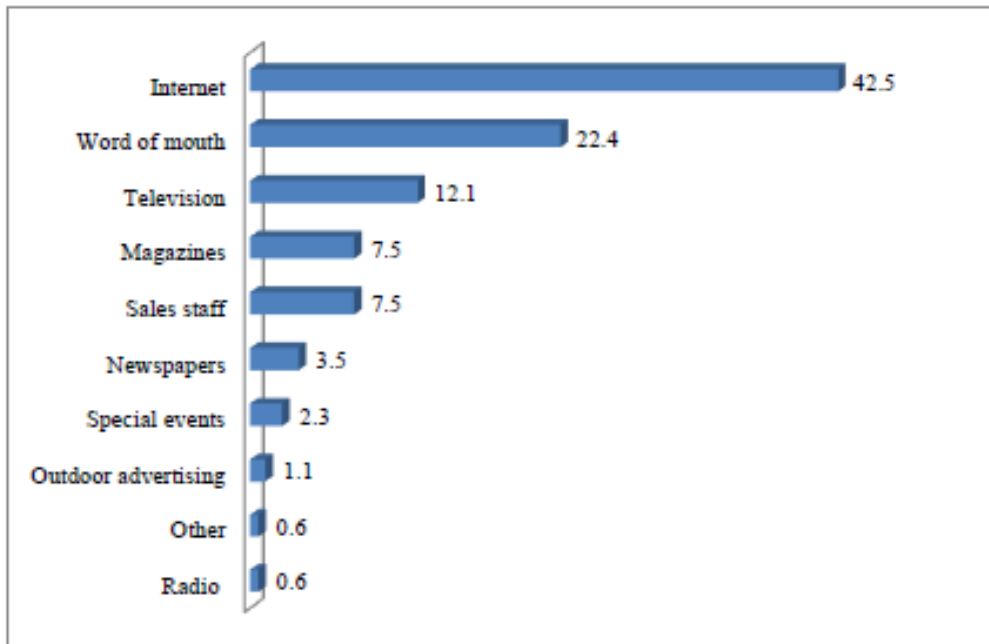
The results of the Chi-square test indicate the influence of the type of food being purchased on the choice of purchasing place. The test results indicate that there is a statistically significant connection between:

- Purchasing fresh vegetables and the place of the purchase ($\chi^2= 18.260$; $df= 6$; $p= 0.006$)
- Purchasing milk and dairy products and the place of the purchase ($\chi^2= 13.771$; $df= 6$; $p= 0.032$)

Namely, the greatest percentage of respondents buy fresh vegetables in supermarkets (33%) and green markets (22.7%), while they purchase milk and dairy products most often in supermarkets (40.7%).

By analyzing the source of the information, it was determined that the greatest percentage of consumers obtained information on organic products on the internet (42.5%) (*Graph 4.*). These results are in agreement with the results of studies of Greek consumers, most of whom stated that they obtained information on agricultural-food products on the internet (Baourakis et al., 2002). Contrary to that, Pellegrini and Farinello (2009) found that the internet is the least credible source of information on organic products, while consumers rely most on information contained in the product labels, followed by the information which they obtain at the location where they purchased the product, or the information they receive from their friends.

Graph 4. Ranking the source of information on organic products according to importance

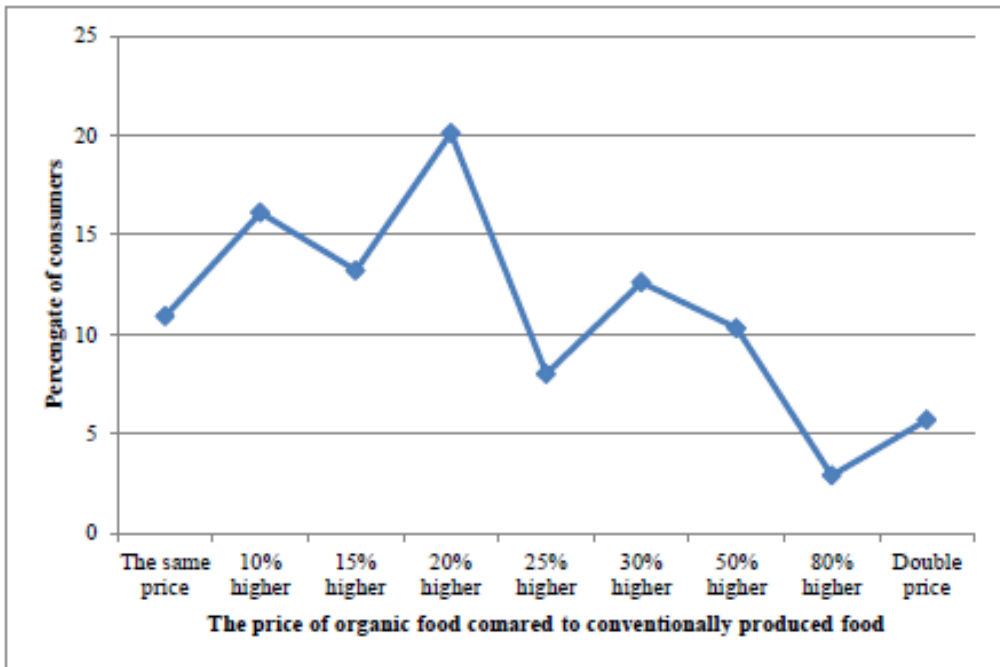


Source: The data which the author obtained in his own field work

Willingness to pay for organic food

Most of the consumers in Serbia (89.1%) show a willingness to pay a higher price for organic food in comparison to the same types of conventionally produced food (Vehapi, 2015). Studies from various parts of the world found that most consumers are willing to pay premium prices for organic food (Wendel, Bugge, 1996; Canavari et al., 2002; O’Donovan, McCarthy, 2002; Aryal et al., 2009; Vlahović et al., 2011). A more detailed analysis indicated that 80.9% of consumers are willing to pay up to 30% higher price, while only 5.7% of consumers are willing to pay 100% higher price for organic products in comparison to the conventionally produced alternatives (*Graph 5*). These results suggest that the intentions to purchase have a tendency to fluctuate, or decrease with the increase in the price of organic food. This would mean that the demand for organic food in Serbia show high price elasticity. Price elasticity of demand for different types of organic products was determined on the national markets of the United States of America and Germany (Jonas, Roosen, 2008; Lopez, Lopez, 2009).

Graph 5. Simulation of price elasticity of demand for organic food



Source: The data which the author obtained in his own field work

Conclusion

Based on the quantitative study carried out in Serbia, it can be concluded that consumer awareness and knowledge regarding organic food are still at a low level. Even among more aware and interested individuals, only a small percentage of them purchase organic food regularly, which means that there is gap between preferences and their actual buying behavior. With the aim of increasing knowledge and awareness about organic food and their benefits, consumer education must become the primary task of organic producers. Considering that it is proven that socio-demographic variables are an important determinant of the purchasing frequency of organic food, the food industry in Serbia can increase its sales by targeting certain segments of consumers. Marketing should be focused on consumers with a greater income, higher education and consumers who work in education, health and the public sector.

The expressed consumer preferences towards certain product categories require the adjustment of the range of organic products available on the national market in terms of greater production of vegetables, milk and dairy products. The studied willingness of consumers to pay for organic food suggests that the strategy of lower prices could be an important means of attracting new buyers and converting occasional into regular consumers. In the long run, more subventions should be allocated to organic producers, which would increase the extent of the offer and consequently cause prices to go down.

In combining instruments of the marketing mix, enough attention should be aimed at selecting the proper marketing channels, as well as the means and ways of marketing communication. Consumers on both the national and global market indicate a shift in their choice of purchase place from small-scale outlets to large-scale corporate retailers. Thus, the placement of organic products through large-scale food retailers, such as supermarkets and hypermarkets, represents an effective distribution strategy. In communication with the end user, producers and traders should focus on using the word of mouth, different advertising tools, and especially the internet, considering that these are the most important sources of information on organic food.

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PONAŠANJE POTROŠAČA U POGLEDU POTROŠNJE ORGANSKE HRANE: DOKAZI IZ REPUBLIKE SRBIJE

Semir Vehapi⁹, Edin Dolićanin¹⁰

Rezime

U razvijenim zemljama tražnja za organskom hranom ostvaruje snažan rast tokom poslednje decenije. Nasuprot tome, tržište organske hrane u Srbiji je u početnoj fazi razvoja i može se smatrati tržištem u nastajanju. Dubljim razumevanjem ponašanja potrošača na tržištu Srbije moguće je kroz adekvatan marketing pristup obezbediti veću per capita potrošnju organske hrane i brži razvoj nacionalnog tržišta. U ovom radu predstavljeni su najvažniji rezultati do kojih se došlo na osnovu kvantitativnog istraživanja stanovnika Srbije u ulozi kupaca i potencijalnih kupaca organske hrane. Istražen je i predočen nivo znanja ispitanika u vezi organskih prehrambenih proizvoda, i otkriven je socio-demografski profil potrošača kao važna determinanta potrošnje datih proizvoda. Pored toga, analizirano je ponašanje potrošača pri kupovini organske hrane sa stanovišta osnovnih instrumenata marketing miksa: proizvoda, cene, marketing komuniciranja i kanala marketinga. Dobijeni rezultati su objašnjeni u odnosu na teorijsko znanje stečeno iz ranijih istraživanja sprovedenih na različitim nacionalnim tržištima. Na osnovu toga obezbeđena je čvrsta osnova za razvoj efikasnih marketing strategija.

Ključne reči: *organska hrana, tržište, potrošači, ponašanje, Srbija*

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HARMONISATION OF SERBIAN NATIONAL LEGAL SYSTEM WITH EUROPEAN UNION ACQUIS – THE CASE OF ENVIRONMENT

Uroš Ćemalović¹

Summary

The transformation of Serbian national legislation in the process of country's accession to the European Union (EU) is a complex phenomenon and its scope and depth can significantly vary in different fields. Moreover, the constant and rapid development of European environmental law makes its reception in the internal law even more difficult. The objective of this paper is to provide, using mainly the comparative legal method, a global analysis of Serbian environmental legislation in the light of its harmonisation with EU acquis, without treating the issues of technical standards and questions related to the negotiation framework within the Chapter 27. It will be argued that the progressive transformation of national legal standards under the influence of EU law is significant, but still remains far from reaching its effective implementation.

Key words: EU law, environmental law, Stabilization and Association Treaty, ecological standards, law harmonisation

JEL: K32, Q58

Introduction

One of the crucial economic objectives of the European Union (EU) is the establishment of an internal market, while the sustainable development of Europe should be based on “balanced economic growth” and “a high level of protection and improvement of the quality of the environment” (Art. 3, para. 3, Treaty on European Union, “Official Journal of the European Union” no. C83/13). In the same vein, the coordination of national legal solutions is always very desirable for any globally effective environmental policy, while, within the EU, numerous instruments “are devoted to approximation as an autonomous goal” (Pereira, 2015). On the other hand, the membership in the EU includes an obligation of a future Member State to put its legal system into line

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with the EU *acquis*². However, this obligation does not end on the day of accession of this state to the EU, given that all Member States are obliged to transpose into their domestic legal systems the provisions of EU law which do not have a direct effect, but require normative intervention of national legislators. Notwithstanding the fact that approximation is “the single legal term suitable to serve as a basis for the study of the Union’s policy whose aim is to eliminate the inconsistent differences in national legislations” (Čemalović, 2015), the notion of harmonisation is more appropriate for the purposes of a study aiming to assess the legal system of a candidate country in the field of environment. Bearing in mind that the normative system of the Union is also in the process of constant mutation, the harmonisation of national legal provisions with EU law is a perpetual obligation, while the process of negotiations ends by the conclusion of an accession agreement. After presenting some basic characteristics of the process of harmonisation of Serbian national legal system with the EU *acquis* (chapter 1) and once the general legal framework of both EU and Serbia in the field of environment is described (chapter 2), this paper will focus on the alignment of domestic legal standards with EU law in three important fields: air quality (chapter 3), water quality (chapter 4) and protection of the environment by penal law (chapter 5). Given that the EU environmental legislation comprises numerous technical standards, this paper will predominantly treat legal aspects of environmental issues; therefore, the notion of “harmonisation” should be understood as “approximation of general legal standards”. Finally, the limited space imposes the focus on comparative analysis of major legal provisions, without entering in a complex issue of forthcoming negotiations³ between the EU and Serbia in the field of environment.

Methodology, legal and data sources used

Given that the overarching objective of this paper is to investigate the overall level and quality of the alignment of Serbian legal framework with the EU *acquis* in the field of environment, the comparative legal method (national and EU legislation) will be used as the main tool, completed with teleological analysis (for the Article

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- 2 In the legal theory, for decades the French expression *acquis communautaire* was used to indicate the entirety of the legal provisions of the European Communities. However, since December 2009, with the entry into force of the Lisbon Treaty, the term “Community” has ceased to exist; from this moment, the theory tends to use more the terms EU *acquis* or simply EU law.
 - 3 The process of harmonisation of national legislation with EU law and the negotiation process between a candidate country and the EU differ in at least three important elements. *Primo*, harmonisation with EU law is, after the ratification of the Stabilization and Association Agreement, an international legal obligation for Serbia. *Secundo*, the process of law harmonisation is essentially legal, while the negotiation process is predominately political. *Tertio*, in the harmonisation process the legislative branch of power is the key stakeholder, while in the negotiation process the executive plays the crucial role; see: Čemalović, „Proces usklađivanja domaćeog pravnog sistema sa pravom Evropske unije – stanje, problemi, moguća rešenja“, *Kultura polisa* XI/2014, p. 39-52.

72 of the Stabilization and Association Agreement). In the chapter dedicated to the protection of the environment by penal law, some basic quantitative data analysis will be performed. Concerning Serbian national legal sources, the systemic Law on the Protection of the Environment, as well as the Law on the Protection of Air, Law on Water Protection and Penal Code will be taken in account, as referenced in respective chapters. Regarding EU legal sources, due to the limited space, the focus of our study will be on Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe and Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Finally, in the chapter dedicated to the protection of the environment by penal law, the statistical data on the offences against the environment is published in Bulletins of the Statistical Office of the Republic of Serbia, over the period 2009-2013.

Basic characteristics of the process of harmonisation of Serbian national legal system with the EU *acquis*

The Republic of Serbia took the obligation to harmonise its legislation with the EU law by Art. 72 of the Stabilization and Association Agreement (SAA), an act “of the utmost importance” (Stančić, 2002) for every potential EU Member State. Even if it is clear that the degree of alignment of domestic legal standards with EU law is an important element in the negotiations with the EU, the processes of harmonisation and negotiation are different in legal, political and methodological terms. Moreover, it is commonly agreed in theory that “the Treaty on the Functioning of the European Union does not foresee legal harmonisation as a task in itself” (Wilhelmsson, 2014), while “the outcome of EU accession negotiations is very important for an aspiring member state” (Bjarnason, 2010).

Without tackling the complex issue of the distinction between the terms harmonisation and approximation and notwithstanding the fact that Article 72 of the SAA uses the latter, in this paper we will use more general and common notion of harmonisation. Concerning the process of harmonisation of Serbian national legal system with the EU *acquis*, its general framework can be defined by three essential characteristics: graduality, need for proper implementation and dual monitoring mechanism.

For various reasons, the harmonisation of Serbian national legal system with EU *acquis* has to be gradual; in colloquial terms, this characteristics can be explained by the expression “not everything and not immediately”. More precisely, the SAA (Art. 72, para. 1) clearly states that “Serbia shall endeavour to ensure that its existing laws and future legislation will be gradually made compatible with the Community *acquis*”, adding that the same party “shall ensure that existing and future legislation will be properly implemented and enforced”. Teleological interpretation of this provision is particularly facilitated by the latter precision, given that there is a strong logical connection between the graduality of harmonisation, on the one hand, and the proper implementation of this harmonised legislation, on the other. The wording of Article 72,

paragraph 1 unambiguously shows that neither the executive branch of power (when it proposes the legislation or when it adopts bylaws) nor the legislative power (the National Assembly) in the Republic of Serbia has the obligation to ensure that each proposed and adopted legal act or bylaw is inevitably, fully and immediately harmonised with the *acquis* of the Union. Compliance of a domestic legal act with EU law can be partial, or even non-existent, if it is justified by 1) need for gradualness, 2) non-transferability of certain provisions before a deadline or 3) a legitimate interest to harmonise it at a later stage, indicating a clear explanation and the time frame in which the complete compliance will be provided. Of course, none of three aforementioned motives for the adoption of national normative solutions that are incompatible with EU law must not be used fraudulently, or in a way that deliberately avoids the commitments taken under the SAA. In addition, it should always be borne in mind that the harmonisation with EU *acquis* in prevailing number of cases is in the interests of domestic economic operators, consumers and all citizens of Serbia in the most general sense.

Secondly, in the process of law harmonisation it is necessary to ensure the proper implementation of the current and future legislation. As it is already indicated, this requirement is in deep organic connection with the gradualness of the harmonisation. As the cited Article 72, paragraph 1 of the SAA clearly shows, the alignment of national legal provisions with EU law is not an end in itself, it does not represent self-sufficient normative performance. The crucial objective of the harmonisation is proper and full application of the legislation in force. One could even go a step further, arguing that the gradual elaboration and adoption of the new legislation is a prerequisite for its proper implementation. Through its regular reports on the progress of Serbia in the European integration process, the European Commission dedicates a special attention to the problems in the implementation of national legislation.

Thirdly, the ways of monitoring of the harmonisation are jointly defined by institutions of Serbia and the European Commission. Alignment of the national legal system with EU *acquis* is a complex process involving numerous Serbian authorities belonging to all three branches of power. Of course, the National Assembly as a legislator has the final say in the adoption of legislative acts; however, the Government usually appears as a proponent of such acts, while the share of the judiciary, as a guarantor of the rule of law, is of undeniable importance in the process of harmonisation. In the beginning of law harmonisation process (from 2008 to 2012) national operational and strategic act which concerned this issue was the National Program for Integration of the Republic of Serbia into the European Union (NPI). In the next stage (from 2012) the title of this document was more adapted to its contents: the National Program for the Adoption of the *Acquis* (NPAA). In any case, the methods “for the monitoring of the implementation of approximation of legislation and law enforcement actions to be taken” which, under Article 72, paragraph 5 of the SAA should be the result of an agreement between Serbia and the European Commission, are taking as a key criterion the success in the implementation of NPI/NPAA.

General legal framework in the field of environment (EU law and Serbian law)

The Constitution of the Republic of Serbia (“Official Journal of the Republic of Serbia” no. 98/2006) declares that a healthy environment is a right, but also an obligation. As it is often underlined in the theory, “a large number of national constitutions contain provisions which can be relevant to the availability of access to environmental justice” (Pain, 2007), while “the influence of EU environmental policy extends beyond the member states” (Selin, Van Deveer, 2015). According to Article 74, paragraph 1 of the Serbian Constitution, “everyone has the right to healthy environment and the right to be informed fully and timely of its condition.” The term “everyone” implies, in principle, any individual (including the foreign citizens during their stay in Serbia). On the other hand, paragraph 2 of the same Article states that “everyone, and especially the Republic of Serbia and its autonomous provinces, is responsible for environmental protection”, while the next paragraph adds that “everyone is obliged to safeguard and improve the environment”. Regardless of the fact that the constitutional provision uses the term “everyone”, its teleological interpretation indicates that the responsibility for environmental protection is particularly weighing on the national and provincial administration, not least because of their ability to organize the monitoring and response in case of environmental danger. In the same vein, “many local authorities have sought to strengthen their representative role, notably through increasing use of neighbourhood fora and similar community-based approaches” (Freeman, 1996).

The right of everyone to be informed on the state of the environment has for its consequence the obligation of national and other authorities to provide the complete and useful information on this subject. As some authors have asserted, in numerous EU member states “local and regional authorities frequently take action in the interests of their residents and in so doing promote environmental protection” (Oliver, 2013), while “detailed implementation measures are generally elaborated by the central administration” (Boiret, 2012). Therefore, it is difficult to understand why, after explicitly invoking the state and its autonomous provinces, the Constitution fails to mention that the municipal authorities are also responsible for the protection of the environment and, consequently, obliged to provide information on its state. This omission is even less understandable if one take into account the fact that, firstly, the principle of subsidiarity and the realities on the ground require the essential involvement of local authorities and, secondly, that the multitude of laws provide that environmental problems must be treated as close to the citizen as possible. The only reason for this undoubted lack of compliance of the Serbian Constitution with EU legislation and best practices might be found in the fact that at the time of the adoption of the supreme act (November 2006) the SAA was not yet signed. Therefore, in terms of environmental protection, the development of Serbian legal system under the influence of EU law concerned only acts of legislative or regulatory nature, while the constitutional reform is expected before the signing of an eventual agreement on the country’s accession to the European Union. Finally, it is important to underline that “reaching compliance with EU environmental legislation is a challenging task, given the complex and dynamic character of EU environmental legislation” (Peeters, Uyenlburg, 2014).

In Serbia, the general law on the environment was adopted in 2004, bringing a series of provisions on the global framework of protection, with the objective of ensuring the right to a healthy environment and provide a balance between existing normative solutions and the needs of further industrial development. Even if it is clear that “balancing industrial development and environmental protection encourages a manager-for-results approach” (Shen, 1999), some studies have also shown that “the economic growth and the resolution of ecological problems can both, in principle, be achieved” (Nilsson, 1999). The first substantial changes to the law on environmental protection were conducted in 2009, bringing certain improvements of the existing provisions and introducing, among others, the considerable changes in the categories of sources of pollution, pollutant limit values, evaluation of the environmental impact, monitoring of the ecological situation and information and participation of the public. It is clear that a number of innovative solutions have been adopted under the influence of EU law, especially if one considers that the SAA was signed in April 2008. However, due to the ratification of the SAA by all Member States’ national parliaments, it took more than 5 years for this agreement to enter into force, on the 1st of September 2013. For this particular reason, Article 72 paragraph 2 of the SAA provided that “harmonisation (of the national legislation with the *acquis*) will begin on the date of signature”, allowing to the Serbian Government to elaborate and submit to the National Assembly the proposition of laws largely based on the EU *acquis*.

Regarding the Union’s secondary legislation which has served as a basis for the development of national environmental legislation in Serbia, the acts related to the following questions should be taken into account: air quality (Directives 96/62/EC, 1999/30/EC, 2000/69/EC and 2002/3/EC, replaced by the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, “Official Journal of the European Union” no. L152); water protection (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, “Official Journal of the European Communities” no. L327); conservation of natural habitats, wild fauna and flora, as well as the protection of wild fauna and flora by regulating trade therein (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, “Official Journal of the European Communities” no. L206, Council Regulation (EC) 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein, “Official Journal of the European Communities” no. L61 and 17 amendments adopted between 26 May 1997 and 29 July 2013); protection against noise (Directive of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise, “Official Journal of the European Communities” no L189); waste (Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste, “Official Journal of the European Union” no. L114 and Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC, “Official Journal of the European Union” no. L 266

and two amendments adopted on March 11, 2008 and November 20, 2013); information and participation of the public (Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC, “Official Journal of the European Union” no. L41 and Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programs relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC, “Official Journal of the European Union” no. L156); prevention and remedying of environmental damage (Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, “Official Journal of the European Union” no. L143); protection of the environment through criminal law (Directive 2008/99/EC of the European Parliament and of the Council of 19 November 2008 on the protection of the environment through criminal law, “Official Journal of the European Union” no. L328) and minimum criteria for environmental inspections (Recommendation of the European Parliament and of the Council of 4 April 2001 providing for minimum criteria for environmental inspections in the Member States, “Official Journal of the European Communities” no. L118). Given the variety and the complexity of aforementioned issues, in the following chapters this paper will focus on the harmonisation of domestic legal standards with EU law in three important fields: air quality, water quality and protection of the environment by penal law. This choice was principally based on legal considerations (number, type and nature of national acts adopted), as well as on the exemplarity of these three issues in terms of implementation (or its absence) of adopted legislation.

Provisions related to air quality

The general provisions dedicated to the protection of air can be found in two Serbian national legal acts. On the one hand, the systemic Law on the Protection of the Environment (“Official Journal of the Republic of Serbia” no. 135/2004) specifies the global pollutant limits, as well as the terms of protection and the control measures; on the another hand, the Law on the Protection of Air (LPA, adopted in 2009, amended and supplemented in 2013, Official Journal of the Republic of Serbia no. 36/2009, 10/2013) introduces some more specific provisions. The changes adopted in 2013 are, in most cases, the result of the harmonisation of national standards with the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. One of the crucial modifications concerned the National Programme for the Progressive Reduction of National Emissions Ceilings: instead of 2000, 1990 was taken as a year of reference for the estimation of the effectiveness of mitigation measures. Furthermore, the provisions of Articles 65 to 67 related to the information of public, already present in the text adopted in 2009, were completed and harmonised with Article 26 of the Directive 2008/50/EC. In some elements, the national provisions even go beyond the requirements of the Directive, demanding that any information made available to the public must be timely, clear, understandable and

easily accessible. However, it is globally observed that “although there is a considerable amount of information on air pollution and its effects on organisms and biological systems, much of the information is fragmented” (Barker, Tingey, 1992), while “air pollution in Europe is still a matter of concern, mainly related with impacts on the human health” (Slezakova, Reis, Pereira, Alvim-Ferraz, 2007).

The 2013 amendments to the Serbian LPA have also concerned the treatment of substances harmful to the ozone layer and control of the emission of greenhouse effect gases, as well as the certification of personnel employed in industry sectors using those substances. In general, the law provides that the air protection is mainly achieved by establishment, maintenance and improvement of a unique national system of air quality management. Regarding the realization of this objective, a number of national legislative provisions concern the issues of monitoring, exchange and analysis of information and data, in order to “incorporate the latest health and scientific developments and the experience of the Member States”, as underlined in recital 3 of the Directive 2008/50/EC. It should also be stressed that the justification for the adoption of the aforementioned EU Directive (act by which four Directives and one Decision adopted between 1996 and 2002 were replaced) is in full compliance with the motivation of national legal solutions, specifically concerning the need to adapt the legislation to the progress of technical sciences and medicine. However, in Serbia the realization of this objective depends to a large extent on governmental decrees, ministerial decisions and, partially, on local authorities, as the law on the protection of air remains largely impracticable without a series of acts bringing enforcement measures of the objectives set by the legislation. In support of this conclusion, it is worth mentioning that one of the recent (2014) European Commission’s (EC) Progress Reports (a document by which EC’s services are assessing achievements of each candidate country in the areas covered by the EU legislation and policies) states that “the annual update of the air quality showed that seven of the Serbia’s eight urban agglomerations fall into air quality category III, exceeding the margin tolerance of several pollutants” and that “air quality plans for Belgrade remain to be adopted and planning for the remaining urban agglomerations needs to be accelerated” (Serbia 2014 Progress Report, European Commission). It must therefore be concluded that the undeniable progress that Serbia has made in the harmonisation of its legislation on air quality with EU’s *acquis* was not followed by its proper and complete application, since the adoption of measures related to enforcement, monitoring and planning was largely absent.

Concerning the issues related to the information on air quality and their availability to the public, the provisions of Articles 65 to 67 of the national Law on air protection regarding the public information have been brought in line with Article 26 of the Directive 2008/50/EC. The provisions of Serbian law have gone beyond the EU requirements in two aspects, but, however, have failed to transpose some key provisions. Firstly, the directive merely specifies that “States shall ensure that the public as well as appropriate organisations (...) are informed, adequately and in good time” (Art. 26, para. 1), while Article 78 of the general national law on protection of the environment

provides that any information made available to the public by any administrative body should be “regular, given in good time, detailed and impartial.” Secondly, even if Serbian legal provisions often repeat the formulations of the Directive (in the case of information on the quality of ambient air and on the plans for this quality, Art. 26, para. 1 pts a and d, of the Directive), the national provisions sometimes add some supplementary requirements (for example, the accurate information on “the area where the exceedances occurred” and their “beginning and duration”, Art. 66, para. 2, of the Law on air protection). However, national legal solutions in some significant fields have failed to transpose certain important requirements provided by the Directive, as it is the case of regrettable lack of any reference to “environmental organisations, consumer organisations, organisations representing the interests of sensitive populations, other relevant health-care bodies and (...) relevant industrial federations” (Art. 26, para. 1 of the Directive 2008/50/EC).

Provisions related to water quality

As it is the case concerning air quality, Serbian general national legal framework on water protection is set in the Law on the Protection of the Environment (LPE), in its part dedicated to the conservation of natural assets. In this context, the Law prescribes the appropriate treatment of the waters, which should neither represent the danger to natural processes of qualitative and quantitative water renewal nor reduce the possibility of its multiple use. As for the principles of protection and use of surface and ground waters and reserves, Articles 24 and 107 LPE refer to the comprehensive management and ongoing monitoring of quality, while Article 94 LPE provides for measures to reduce pollution and sewage system. However, following the principle that represents the keystone of the entire Serbian ecological law, the provisions of LPE were completed and detailed by a special Law on Water Protection (LWP, adopted in 2010, amended and supplemented in 2012, “Official Journal of the Republic of Serbia” no. 30/2010, 93/2012). On the basis of this special law, the Government adopted a series of decrees, only some of which transpose the provisions of Articles 16 and 17 of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, as it is, for example, the case of the Decree of 28 February 2014 on uniform emission limit values for surface waters. Those values are particularly important, notwithstanding the fact that the definition of ‘good’ ecological status is “an ongoing process at EU and state level” (Hendry, 2015).

The other provisions of the LWP transposing Directive 2000/60/EC concerned the protection of the aquatic environment, the prevention of further degradation and the promotion of sustainable water use. While some other Central-European countries were in the preparatory phase for their EU accession, it has been pertinently observed that “meeting the EU water quality legislation is likely to be the most important issue” (Slovak Republic – A Strategy for Growth and European Integration, World Bank Country Study, 1998). Moreover, some authors pointed out that “improvements in water

use efficiency in Europe could effectively reduce overall water use by approximately 40% and agricultural water use by 43%” (Ellison, 2010). The 2012 amendments to the Serbian LWP have also treated the funding issues, expanding the supported actions and creating some new budgetary sources. Nevertheless, the important number of the national standards for water protection still remain generally non-compliant with European legislation. Given the highly technical nature of the measures to be adopted and taking into consideration the legal provisions conferring competence, it is primarily to the governmental authorities to harmonise national provisions with the *acquis* of the Union. Furthermore, the absence of a national strategy for the protection of water and a low level of development of environmental monitoring mechanisms importantly limit the effectiveness of the action of central and local authorities. It must therefore be concluded that, in Serbia, even if the LWP have provided a good normative framework, the Directive 2000/60/EC has been transposed only partially (as it is, for example, the case of emission limit values for surface waters), while in numerous other fields (groundwater, protected areas, economic analysis of water use, environmental impact of human activity) the full implementation of EU legislation will require an intense normative activity.

Protection of the environment by penal law

Considerable modifications of the Serbian Penal Code (SPC) adopted in 2005 have brought some substantial changes in the protection of the environment. On the one hand, the criminal offences in environmental matters previously provided by numerous specific laws have been incorporated in the SPC, in a single chapter (XXIV). On the other hand, those criminal offences are defined in a more precise manner, but also taking into consideration that “if too narrow a view is taken of environmental damage (...) then many cases of significant harm to the environment may not come to be seen as offences” (Megret, 2013). The 2005 modifications of the SPC have brought greater visibility to the intentions to prevent and limit the activities prejudicial to the environment. Although the Directive 2008/99/EC of the European Parliament and of the Council of 19 November 2008 on the protection of the environment through criminal law was adopted three years after the reform of the Serbian Criminal Code, there are no significant inconsistencies of national legislation with the requirements of Article 3 of the Directive. However, the most important part of Serbian criminal legislation that still remains generally non-compliant with the provisions of Directive 2008/99/EC concerns the liability of legal persons. Some recent studies have shown that “the structure, contents and underlying rationale for environmental liability in the EU has profoundly changed” (Orlando, 2016), while some EU member states apply a general criminal liability of legal persons “as long as the material and moral element are proven” (Vermeulen, De Bondt, Ryckman, 2012).

All offences under Title XXIV of SPC can be grouped into four categories: 1) general offences against the environment; 2) offences relating to hazardous materials; 3) offences against the flora and fauna and 4) offenses relating to illegal hunting and

fishing. In principle, the penalties for these criminal offences range from six months to five years of imprisonment (from one to eight years for all offenses and up to one, two or three years for negligence), with the possibility to pronounce a fine. Moreover, the total number (18) of offences from all the above four categories is quite high, especially given that the offences against the environment are, by their number, sixth in the Penal Code. It must therefore be concluded that the Serbian criminal law globally meets the requirement of Article 5 of Directive 2008/99/EC to “take the necessary measures to ensure that the offences (...) are punishable by effective, proportionate and dissuasive criminal penalties”. However, in the period 2006-2012, the percentage of persons charged by Serbian authorities for offences against the environment in relation to the number of persons subject to criminal prosecution is about 54%, while the percentage of those convicted in relation to the number of persons charged is about 69% (“Bulletin of the Statistical Office of the Republic of Serbia”, no 502/2009, 514/2010, 529/2010, 546/2011, 558/2012, 576/2013). Additionally, the effectiveness (or rather, lack thereof) of the penal and administrative measures to protect the environment becomes more evident if one observe the percentage (37%) of persons convicted in relation to the number of persons who have been prosecuted. Since the protection of the environment through penal law is doubly dependent on the effectiveness of preventive and repressive actions, statistical data allows the conclusion that, in this field, the satisfactory protection in Serbia is still far from being reached.

Conclusion

After the adoption, in 2004, of the general Law on the Protection of the Environment, the ecological legislation in Serbia has undergone important and profound changes. The two major characteristics of this transformation were, on the one hand, the adoption of numerous special laws and, on the other, the progressive harmonisation of national legislations with EU law. The analysis of the general and special legal provisions on air quality, water quality and protection of the environment by penal law has shown that a global legal framework is generally satisfactory. However, in many areas, the EU law is only partially transposed, especially when the application of legal provisions depends on governmental decrees and/or ministerial decisions. Given the technicity of numerous ecological standards, national legislation often remains practically inapplicable without a series of acts implementing standards globally defined by provisions of general and special legislation. The perspective becomes even more unpromising if one take in consideration the effectiveness of penal and administrative measures aimed at environmental protection: the deterrent effect of criminal sanctions is relatively low, while the number of contraventions uncovered by the inspection is in free fall since 2009. It must, therefore, be concluded that the undeniable evolution of environmental legislation in Serbia is incomplete, while the progressive transformation of national legal standards under the influence of EU law is far from reaching its effective implementation.

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USKLAĐIVANJE PRAVNOG SISTEMA SRBIJE SA PRAVNIM TEKOVINAMA EVROPSKE UNIJE – SLUČAJ ŽIVOTNE SREDINE

Uroš Čemalović⁴

Sažetak

Transformacija nacionalnog zakonodavstva Republike Srbije u procesu njenog približavanja Evropskoj uniji (EU) je složen fenomen, čiji se obim i dubina mogu značajno razlikovati u zavisnosti od oblasti. Pored toga, stalni i brz razvoj evropskog zakonodavstva o životnoj sredini dodatno usložnjava njegovo prenošenje u unutrašnji pravni sistem. Namera ovog članka je da pruži, koristeći pre svega komparativno-pravni metod, globalnu ocenu srpskog ekološkog zakonodavstva u svetlu njegovog usklađivanja sa pravnim tekovinama EU, bez zalaženja u problematiku pregovaračkog okvira za poglavlje 27. Osnovni zaključak članka je da je progresivna transformacija domaćih pravnih standarda pod uticajem prava EU bila značajna, ali da je i dalje daleko od dostizanja pune primene.

Ključne reči: *pravo Evropske unije, pravo životne sredine, Sporazum o stabilizaciji i pridruživanju, ekološki standardi, usklađivanje prava*

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BASIC CHARACTERISTICS OF LIVESTOCK INSURANCE IN SERBIA - WITH REFERENCE TO THE SOME ELEMENTS OF THIS TYPE OF INSURANCE IN SOME NON-EUROPEAN AND EUROPEAN COUNTRIES

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Summary

The livestock insurance is a part of agricultural insurance. This type of insurance is also part of a non-life insurance. The livestock insurance is undeveloped in Serbia. In general, a very small number of farms (5% of total) decided for the conclusion of livestock insurance contracts. This paper analyzes the basic characteristics of this type of insurance, and the authors pay attention to the implementation of this type of insurance in other countries. Special attention is paid to the livestock insurance in Mongolia, India, Mexico and Ireland who are defined livestock insurance programs that have contributed to a greater number of contracts concluded in this field. Also, the authors speaking about livestock insurance in some European countries. Finally, the authors criticize the way in which is regulated livestock insurance in Serbia, by proposing a series of measures that should be implemented by the insurance companies and state.

Key words: *agricultural insurance, livestock insurance, risks, insurance premium, general insurance conditions.*

JEL: *K12, Q10*

Introduction

Around two million inhabitants of the Republic of Serbia earn a living by farming. It is estimated that there are 450,000 farms in the country, but a rather small number of them opts for insuring their land, crops, products, livestock, etc. Only 5 to 10% of the farms have entered into any of the aforesaid forms of insurance in the field of agriculture. On the other hand, insurers emphasize that big agricultural companies are being insured every year, but not always and not against all the risks, which poses a problem.

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Livestock insurance is provided by insurance companies which are registered for non-life insurance, which also includes agricultural insurance, and within it livestock insurance (Kopf, 1928). Generally speaking, agricultural insurance comprises two sectors, one for the insurance of crops and products, and the other for the insurance of livestock. Livestock insurance is applied according to the general and particular conditions for this kind of insurance, and we shall analyze some of the key provisions of these conditions (*Opšti i posebni uslovi za osiguranje životinja*, DDOR Novi Sad) established by one of the biggest insurance companies in Serbia. We shall also touch upon livestock insurance in other countries. We shall see that the situation in this respect varies and that more livestock insurance schemes are found in poor countries. On the other hand, in many developed countries, all risk (or multiple peril) livestock insurance are offered together with many domestic support programs (Smith, Glauber, 2012). This primarily relates to the subsidies of insurance premium by the state.

Methodology and data sources

Livestock insurance is a type of insurance where the risks are very high. The main problem of this study is, precisely, in definition of those risks. On the one hand, there is a need for greater insurance coverage, and on the other hand, the problem is in high insurance premiums, as well as, in the relationship between these premiums and sum insurance. When we talk about insurance premiums, they are high in relation to income generated in this area, but they are not high relative to the risks.

The subject of this research consists in choosing a model that would be the best for the livestock insurance not only in Serbia, but in the region. These models are defined in the systems of insurance in other countries, outside of Europe, as well as, in Europe. However, the most important thing is to adapt the conditions of livestock insurance to the livestock production and to the needs of farmers and agricultural enterprises.

The purpose of this article is to show that the livestock insurance is undeveloped compared to other types of insurance of agriculture, as a form of property insurance.

The basic hypothesis which we will try to define in this paper refers to the determination of the role of the state in livestock insurance, which applies to the subsidies of insurance premiums, as well as, to the control of the insurance companies and the farmers (agricultural companies) and execution of their obligation to implement this type of insurance. The main obligation of the insurance companies is to create favorable conditions for insurance and the main obligation of the farmers consisting in the obligatory conclusion of contracts of livestock insurance. In this regard, state authorities and insurance companies should use some of the solutions defined in other countries, which are listed in this article. The auxiliary hypothesis is refer to the clearly definition the conditions of insurance by taking into account all the specifics related to livestock production.

Livestock insurance in Serbia – historical development

It is of interest to consider how this kind of insurance has functioned in Serbia in the last 120-130 years. Insurance in general was undeveloped in the 19th, and at the beginning of the 20th

century, and is mainly associated with the work of foreign insurance companies in Serbia.

The development of livestock insurance in Serbia began around the end of the 19th century. There appeared in many villages certain forms of organizations for mutual livestock insurance which, mostly left to their own devices, regularly ended in failure. The agricultural and veterinary experts at the time stressed the importance of establishing a central livestock insurance institute, since institutes of the kind already existed in most European countries. With that in mind, the Livestock Insurance Act ("The Serbian Magazine of the Kingdom of Serbia", No. 252/1905) was passed around the end of 1905. The result was the establishment of a Fund with the Ministry of People's Economy, which served to cover the damage suffered by livestock owners (Petrović et al., 2013). The Fund's initial capital amounted to RSD 200,000, and each year tax was collected from livestock owners, amounting to damages from the previous year. Municipal courts, which inventoried the number of cattle and horses, were also involved in organizing insurance. The lists were delivered to the Ministry of People's Economy, which determined the payment amount (Marković, 2007).

Around the end of 1937, the Kingdom of Yugoslavia saw the passage of the Act on Commercial Cooperatives ("The Official Gazette of the Kingdom of Yugoslavia", no. 217-LXII/37) which created the conditions for livestock insurance. This required of the Minister of Agriculture to establish, in agreement with the Minister of Trade and Industry, the rules to define the conditions under which cooperative agricultural insurance was to be applied, which also involves livestock insurance. Of the private insurance companies, the "Yugoslavia" Stock Company of Belgrade held the biggest share in livestock insurance. However, it insured a relatively small number of cattle and horses compared to the number of heads of cattle in the Kingdom of Yugoslavia (Marković, 2007).

After the Second World War, the State Insurance Institute of the time attributed great importance to livestock insurance. In 1946 insurance of porkers was introduced, and in 1947 insurance started being applied to breeding pigs, hoofed animals, cattle, goats and sheep, etc. From 1957 the development of livestock insurance evidently forged ahead, in conjunction with intensified livestock production. At the beginning of 1958 the Order was passed on determining the risks against which the commercial organization was obligated to insure capital and current assets, and joint expenditure assets (Official Gazette of the Federal People's Republic of Yugoslavia, no. 14/58). This Order required cattle to be insured against death and emergency slaughter due to disease or accident (Marković, 2007).

A revision of this kind of insurance occurred in 1964. Horses, mules and donkeys were now insured at 4 months up to 15 years of age, cattle from 1 month to 12 years, sheep and goats from 2 months upwards, and swine from the weight of 15 kg upwards. The Basic Law on Insurance and Insurance Organizations was passed at the beginning of 1967 (Official Gazette of the SFR Yugoslavia, no. 7/67). This Law revoked the livestock insurance obligation in the social sector. Every insurance company was individually forced by the law to establish livestock insurance conditions and premium tariffs. They were harmonized at the level of the Association of Insurance Organizations and this period was marked by no significant differences between insurance institutes (Marković, 2007). Changes to the rules of livestock

insurance were introduced in 1972, as well as in 1977. The new insurance conditions introduced discounts on the number of insured heads of cattle and for entering into long-term insurance contracts (Marković, 2007).

During the nineties of the 20th century, this kind of insurance suffers one of the most difficult periods in history, until the situation improved in the last few years. With a view to encouraging insurance in agriculture in general, the Republic of Serbia government passed in 2005 the Decree on the conditions and manner of using assets for refunding the insurance of livestock, crops and products in 2006 ("Official Gazette of the Republic of Serbia, No. 106/2005), whereby registered farms were given the opportunity to get a refund for part of the funds used to pay premiums to insurance companies.

Within the last decade only around ten insurance companies have been offering livestock insurance in Serbia. The insurance applies to all the species of reared animals and some wild animals. The principal risk is death, emergency killing or slaughter of animals due to disease or accident, with options of insurance against many additional risks as well (Marković 2007; Osiguranje poljoprivrede, 2012).

Regulation of livestock insurance in Serbia - analysis of insurance conditions

Livestock insurance in Serbia is regulated by the general and special conditions (Počuča et al., 2013). With regard to livestock insurance, as part of insurance in agriculture, the content of the general conditions regulating this kind of insurance is an important factor. Besides, the country's policy in this area is also extremely important. With that in mind, we shall focus on the basic elements of the general conditions of livestock insurance established by one of the most important insurance companies in Serbia, and discuss the method of regulating the subsidizing of insurance premiums by the state in this kind of insurance. The aforesaid General Conditions of Livestock Insurance stipulate that this kind of insurance can apply to healthy domestic animals, as follows: cattle, pigs, sheep, goats, horses, poultry, fish, dogs, bees, minks, pheasants on pheasant farms, as well as exotic animals kept as domestic ones. It should be noted that the object of insurance is the animal, but not its products. It follows from the aforesaid that this kind of insurance cannot cover diseased animals or animals suspected of being diseased; exhausted, emaciated, blind animals and animals in bad shape, then animals kept in bad hygienic conditions and other kinds of animals, except those assigned to be insured under special conditions (Počuča et al., 2013). On the other hand, the insurer is obliged to pay coverage for damage resulting from the death of an insured animal, due to accident, emergency slaughter due to disease or accident (the so-called emergency slaughter out of necessity). However, the insurer is not obliged to cover the damage incurred through emergency slaughter for economic reasons if the diseases resulted from long-term, excessive and unreasonable exploitation of animals or from not treating the animals in due time or not at all.

Risks covered by livestock insurance

All the risks covered by livestock insurance can be divided into the primary and supplementary risks, as with other insurance types. The primary risks are the following: death, emergency

slaughter and killing due to disease or accident, while supplementary risks can be the loss of breeding ability in male breeding heads, the loss of breeding ability in heifers and cows, etc. In addition, insurance of animals during quarantine, insurance against the risk of castration and ovariectomy while in exhibitions and fairs can be contracted as other supplementary insurances. The same general rule applies to livestock insurance and to insurance in general, i.e. that insurance against supplementary risks can be contracted only if the primary risks have previously been covered (Mrkšić et al., 2014). It should also be noted that treatment expenses can be covered by insurance, provided that they are separately agreed upon. Speaking of risks, we must add that livestock insurance also includes the withholding period which signifies the period during which the insurer is not obliged to cover damages, even if an insurance contract does exist. Namely, the insurer can be obligated to cover damages due to death or emergency slaughter of an insured animal, but only after 14 days as of the moment of signing the contract. In livestock insurance we can speak of primary coverages against the risks of accident and disease that animals can be covered against individually or on floating basis (Manić, 2012).

Characteristics of determining of insurance premium and sum insurance in livestock insurance

Livestock insurance premium amounts depend on the species and use of animals. This must be borne in mind before applying insurance tariffs. If breeding animals are to be covered, the length of breeding will matter in determining the insurance premium. The premium amount will also depend on the conditions in which the animals are kept, their nutrition, as well as the availability and quality of veterinary care. In all the tariffs, livestock insurance premiums are calculated by applying a stipulated percentage to a specified insurance amount. It is therefore essential to point out the generally accepted basic rules of the trade that the livestock insurance amount is based on. The livestock insurance premium is calculated in line with the tariff of the premium rate which is expressed in percentages of the established insurance amount. As livestock insurance is characterized by decrease and increase of risk during the insurance period, a corresponding reduction or rise of the premium is also possible, but always relating only to the remaining part of the insurance period, and it can be initiated either by the insured or the insurer. Even though in developed countries the premium is usually paid on annual basis, in Serbia it is normally paid each month.

The livestock insurance tariff also includes granting discounts on the premium, if the insured has realized the predicted massive, broad-scale insurance, but only on condition that the premium is paid in advance. It also includes certain surcharges, the most important being a special surcharge for the annulment of withholding period provisions.

In determining the premium amount the group of dangers that the covered animals are susceptible to is also an important factor. A danger group is defined as a group of animals on which the effect of harmful factors is observed and noted as equally prominent on average for a relatively long period of time, so that in terms of danger they pose a single risk. As a result the first danger group, which is in turn characterized by a lower premium rate, includes animals located in places with excellent organization and production technology, with fully

functioning prevention, while the fifth danger group, with a considerably higher premium rate, includes animals located in places where the conditions of keeping, accommodation, and feeding of animals are less satisfactory.

The insurance sum is determined per covered animal. The insurance sum with breeding animals is defined as the value of a head, and with feeders it is defined as the product of the price per 1 kg of “live weight” and the so-called “animal’s output weight”. The insured is entitled to request of the insurer during the insurance term to decrease or increase the insurance sum, which the insurer, naturally, has to agree to. On the other hand, in line with a general rule relating to insurance, the insurer is entitled to control the risk during the insurance term and in turn to propose to the insured any reduction or rise of the insurance amount, and automatically of the insurance premium, which the insured has to agree to as well.

Insured case and damage assessment

In livestock insurance as in any other type, the insured is obliged to take all the stipulated, agreed upon and other measures, to prevent the occurrence of any insured case (Žarković, 2008). If an insured case takes place, the insured is obliged to take all measures to minimize any adverse effects. Besides, the insurer is obliged to indemnify the insured for any costs of loss, or other damage caused by a reasonable effort to eliminate the imminent threat of occurrence of a covered case. Should the insured fail to fulfil their obligation to prevent the occurrence of the covered case, the insurer’s obligation shall be reduced by as much as, due to the non-fulfillment, the damage has grown in scale. One of the rules applied in order to avoid risk selection, i.e. the selection of animals to be insured, is that if the insured has multiple heads of cattle of the same species, they shall be obliged to insure all the animals of that same species they possess, regardless of ownership, if the animals belong to a species that can be insured. It is also possible to insure part of an animal species, but only if the insurer consents to that. In such a way even uninsured heads of cattle are entered into the documentation required for insurance coverage with all the elements required to identify them.

In damage assessment, general rules governing insurance shall apply, but it is essential that the insured, immediately upon occurrence of a covered case, informs the insurer, who will send a veterinary to assess the damage (Katrinka, Brkanić, 1996). In the previous period, big insurance companies had permanently employed veterinaries, but recently, due to rationalization, Serbian insurers have not paid much attention to their veterinary service. This has affected the development of livestock insurance in Serbia. In that regard, we should probably consider the possibility of licencing veterinaries who are to do this job. Relating to that, we should also consider continuous education of veterinaries assessing the risks on entering into an insurance contract and the damage upon occurrence of an insured case.

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We shall touch upon some other important characteristics of livestock insurance. First, it is essential to exactly establish the place where the insurance object, i.e. the animal, is located. The animal is insured only while located at the defined place of insurance, which must also be

stated in the policy. The place of insurance also includes the insured's landed property, and an animal is also insured while driven or transported to or from such places. On the other hand, if the animal is transported to an exhibition or fair, this requires entering into an additional insurance contract.

Insurance terminates after alienation of the insured animal, at the moment when the insured stops keeping the animal. However, if ownership of insured animals is, on any basis except for sale, transferred to a third party, the insurance contract shall remain in force, but between the insurer and the insured's legal successor, but only on condition that the premium is paid. There is also the possibility of introducing another animal as the insurance object in place of the alienated animal, on condition that it satisfies the insurance conditions.

Subsidizing of premiums in livestock insurance

In insurance in agriculture in general, and livestock insurance in particular, the subsidizing of premiums is very important. The Republic of Serbia Government has for years been implementing a subsidizing scheme for insurance premiums for crops and products. RSD 400 million from the Republic of Serbia budget is earmarked for insurance refund (data from 2014). 40% of the paid insurance premiums is subsidized (refunded) excluding the tax amount. The right to refund is granted to legal entities, entrepreneurs and natural persons, i.e. persons running commercial family farms. According to this scheme, we can insure the following: crops and products against the risk of yield reduction, nurseries and young perennial plantations before yield, and animals. The right to premium refund is acquired by filing to the competent Ministry and the Treasury a request for granting the right to a refund. This request can be filed on annual basis. In order to obtain the right to insurance premium refund, a copy should be filed of the policy issued by the insurance company with which the insurance contract was entered into, as well as the insurance premium payment certificate. As regards natural persons who run commercial family farms, they shall submit a certificate issued by the insurance company and the certificate on effected payment of the total insurance premium amount (Subvencionisanje osiguranja životinja). This is only an illustration of the way in which the subsidizing of premiums functions in technical terms. Having stated, at the beginning, the number of people earning their living by farming in Serbia, we can conclude that the amount earmarked for subsidizing premiums is not high. Moreover, when filing requests for premium refunds, some reservations emerge relating to filing proofs of premium payment in full. First, it could happen that the farmer does not have sufficient funds to enter into an insurance contract, and the subsidizing would never take place. Second, the method of paying the premium to the insurer is also relevant, since subsidizing depends on it too.

Livestock insurance in Croatia – some elements of general conditions of insurance

We shall briefly focus on the conditions of livestock insurance in neighbouring Croatia. These conditions apply to insurance by „Croatia osiguranje“ Company. According to these conditions, the objects of insurance can be hoofed animals up to 15 years of age, cattle up to 10 years of age, sheep and goats from 6 months to 6 years old, swine from one month old with 5 kg minimum weight to full 7 years of age, rabbits, domestic poultry, feathered game

(intensive breeding). It is of interest that these conditions also provide for insurance of dogs and cats, bees, decorative exotic animals, freshwater fish, etc. Special insurance conditions apply to animals in quarantine, during castration and ovariectomy. Insured risks cover cases of death of insured animals due to disease or accident, emergency slaughter, euthanasia of animals due to disease or accident. A disease is defined as any change in the normal health condition which occurs suddenly, against the will of the insured, and can result in death, emergency slaughter or killing of livestock. Uninsured risks, when the insurer is not obliged to cover the damage, include the insurance of livestock that ought not to have been insured, when the insurance term has not started, the existence of a disease prior to insurance (whereof the insurer was not informed), non-compliance with the animal age limit, unreasonable long-term exploitation of animals, cases when an animal has not been examined by a veterinary, as well as failure to follow the veterinary's instructions, partial loss of sight, nutrition with insufficient quantities or unsuitable and harmful food, deceiving the insurer, earthquake, radioactive contamination, theft and disappearance of the animal, animal slaughter or euthanasia for no justified reason, transport of the animal over a distance exceeding 10 km, etc. The insurer is not obligated to cover the damage when it results from cattle infertility, unless otherwise agreed. The insurance amount cannot exceed the animal's actual value, while for certain animals the insurer can establish the lowest and highest insurance amounts (Severin et al., 2015). In 2012, „Croatia osiguranje“ started insuring pets with treatment risk (Severin et al., 2015).

Livestock insurance in other countries

The importance attributed to livestock insurance varies from one country to another. What can be identified as a shared characteristic, regarding this kind of insurance in all the countries observed, is that the insurer's principal task is to define the conditions in such a way as to attract as many livestock owners as possible to enter into livestock insurance contracts. In some countries, insurance is also dictated by frequent weather changes (Mongolia). On the other hand, even highly developed countries face some problems when it comes to insuring livestock. One of the features common to all the countries is that, speaking of percentages, the number of livestock insurance contracts is immeasurably smaller than those relating to other kinds of insurance in agriculture. Similarly, in a vast majority of countries, the state is expected to create a scheme which would enable a broad-scale protection of livestock through insurance. Even when speaking of the mandatory or voluntary nature of this kind of insurance, the situation varies from one country to another. For example, livestock insurance is voluntary in Japan. On the other hand, this insurance is mandatory for epidemics in the Netherlands and Switzerland. Livestock insurance is mandatory in China with regard to swine epidemics, more specifically sows. In countries such as Equador, Morocco, India and the Philippines this kind of insurance is voluntary (Mahul and Stutley, 2010).

When it comes to the most highly developed country in the world, the United States, we cannot say that this kind of insurance is at an enviable level. The United States have been constantly working on expanding the livestock insurance market. There is a disparity between the consumption of livestock products and livestock insurance. In other words, in 2011 the

United States realized over USD 160 billion from the sale of livestock products. However, the total value of covered livestock amounts to somewhat over USD 1 billion. Private insurance available to stock farmers covers risks such as fire and thunder, natural disasters such as hurricane, then the risks of choking, attack by wild dogs, collapse of the structures where the livestock is located, etc. The covering of the risk of mortality due to disease is limited to individual animal species (Collins, 2011).

We shall quote several interesting examples relating to livestock market expansion in individual countries, which differ both in terms of the continents they belong to, and the economic capacity, as well as the scope of livestock production.

Livestock insurance in some non-European countries

Mongolia

We shall also mention Mongolia, due to its sharp winters that destroy livestock. In 2005 the Mongolia Government filed a request to the World Bank for technical aid in designing and implementing a pilot livestock insurance scheme (Luxbacher and Goodland). The request stated that animal mortality was high and that the issue of insurance should be resolved at the level of households, i.e. individual livestock owners. This pilot scheme also takes into account situations when livestock mortality rate is up to 6%, and when it is over 30%, when, practically speaking, we are dealing with catastrophic situations. According to this scheme, insurance premium amounts are determined based on assessment of mortality rates in the period from January to May. This is the first time an insurance index is used in Mongolia, bearing in mind that until then insurance practice in this country was unsustainable. Livestock insurance is offered through the scheme of indemnity insurance pool, which relates to insuring unified risk through a public-private arrangement, involving more than one insurance company. This pool is protected by means of the so-called stop-loss reinsurance contract signed by the Government with the support of World Bank. This scheme has several advantages: - it is completely isolated from other kinds of insurance, which is very important considering the limited capital resources of insurance industry in Mongolia; - it fully guarantees compensation payment, thus eliminating any risk of non-payment; - it enables insurance companies to integrate their livestock insurance portfolio in different regions of Mongolia; - it enables capacity building of insurers taking part in financing this risk (Agricultural Insurance in Asia and Pacific region, 2011).

It is expected that international reinsurers will provide capacity for the first risk layers, while the Government will cover only catastrophic layers of risk. In 2009 this scheme was implemented in four Mongolian provinces (Bayankhongor, Khentii, Uvs and Sukhbaatar) with the participation of four insurance companies (Agricultural Insurance in Asia and Pacific region, 2011).

India

We shall present some elements of the India insurance scheme applied to dairy cows and bison. The scheme provides aid to families having dairy cattle, in case of death of animals.

The insurance amount is calculated based on the annual premium amounting to 4% of animal value, estimated by a veterinary surgeon. Insurance can be renewed for another year, but the value of the covered animal is reduced by 20% (Iturrioz, 2009). Should an insured case take place, the request for indemnity is sent to the local organization, i.e. the village organization which accepts or rejects the request. The insurance scheme in India which is organized locally has been successful so far. Namely, the number of covered animals has risen from 3,500 in 2005 to 25,500 in 2008. The insurance premium rose from USD 3,7 million in 2005 to USD 8 million in 2008. This scheme is sustainable, as labour expenses make up 12% of the premium. Those expenses are operational and include insurance expenses, the expenses of loss assessment and those of processing requests for damages. Supervision of these operations is also provided (Iturrioz, 2009).

Mexico

Mexico has 25 years of experience as regards the insurance of crops and livestock by small farmers and stock breeders, through the “Fondos de Aseguramiento”, i.e. a self-insurance scheme reinsured by Agroasemex, the national reinsurance in agriculture. In 2005 there were 176 self-insurance funds in 24 Mexican states, whereof 159 covered the insurance of crops, and 17 livestock insurance. In 2007 over one million hectares of crops and over 4 million heads of livestock were insured through this scheme. USD 60 million worth of insurance premiums was realized. A big part in the insurance of crops and cattle is also played by Agroasemex, which implements the „Stop Loss“ Reinsurance scheme (Iturrioz, 2009).

Livestock insurance in some European countries

In Ireland, two thirds of agricultural production are the production of livestock, i.e. beef and dairy products. This situation has contributed to the development of support mechanisms which have been reflected in direct payments in recent years. This support isolates the negative effect of the market and price instability. The principal risk in stock farming in Ireland is livestock disease. As a result, the key risk management measures in Ireland are concerned with defining different schemes for control of animal diseases and their eradication. The major schemes relate to control of diseases such as tuberculosis and brucellosis of cattle. The schemes include a large number of components, including research, supervision, control of wild animals, administration, testing, elimination of infected animals, indemnity payment to livestock owners, veterinary necropsy, inspection in slaughter-houses, etc. The expenditures of the aforesaid schemes have been reduced recently, owing to their efficiency and effect in reducing disease incidence. For example, the scheme expenses in 2008 amounted to over EUR 60 million, and they were financed by public funds and the agricultural community. These schemes have also reduced the demand for entering into this kind of insurance contracts in Ireland. Organizing and maintaining these schemes is essential for the meat and other products coming from livestock bred in Ireland to be available in the EU market (Agricultural Insurance).

Speaking of livestock insurance in Spain, it is only available as a comprehensive package, i.e. all the animals have to be covered by insurance against specific risks. New insurance

schemes also provide insurance against the risks of foot-and-mouth disease, blue tongue, classical swine fever, etc. Each region in Spain has to decide on financing livestock insurance. In some regions, the state pays up to 80% of insurance expenses. Spain is promoting the idea of one policy covering all the risks, such as accidents, diseases, fire, theft, etc. (Agricultural Insurance).

In Great Britain, the Government provides compensation for emergency slaughter of livestock due to particular contagious diseases. The private insurance sector also provides insurance against particular diseases and indemnity for slaughter of livestock, where no compensation is available (Agricultural Insurance).

In Greece are both public and private insurance available for farmers (Lorant, Farkas, 2015). An independent state organization – ELGA (Greek Agricultural Insurance Organization) – provides the compulsory insurance and possibility of insuring livestock against multiple risks, thus fully covering possible damages suffered in livestock production (Lorant, Farkas, 2015; Agricultural Insurance). Besides the risks of natural disasters, animals can also be insured against the risks of anthrax, viral diarrhea, mastitis-induced gangrene, etc. We shall also mention private insurance in Greece, even though it is not so well developed in this area (Agricultural Insurance).

It is assumed that the main risks relating to livestock insurance will still be animal diseases, in particular exotic diseases the most prominent of which is the “blue tongue” epidemic. In the last decade this disease has been widespread across European countries (Agricultural Insurance).

Conclusion

Livestock insurance covers numerous unpredictable risks. It is therefore normal to carefully weigh up those risks in drawing up insurance conditions. We have seen that the livestock insurance markets vary globally. Even individual countries display discrepancies when it comes to covering particular risks in this kind of insurance. In view of the aforesaid, livestock insurance does not have the status it should have within insurance in agriculture. Livestock insurance on a global scale constitutes a relatively small segment of agricultural insurance in general, amounting to 4% according to the premiums paid in 2008. The premium primarily covers the risks of death, injury, loss of functions as the cause of accident, natural causes, as well as the risk of emergency slaughter of livestock for reasons of humanity. As regards the insurance amount, it is based on the animal’s market value, and can be reduced due to its old age. The premium rate ranges from 1.5% to 10% of the insurance amount based on animal species, age, location, and the function it performs (Iturrioz, 2009). We have seen that individual countries implement special insurance schemes, as well as reinsurance schemes, with a view to raising premiums in this kind of insurance.

As regards livestock insurance in Serbia, we must say that it is undeveloped. This applies both to the policy of insurance companies in this area, and to the schemes to be defined by the state, which would not only include premium subsidizing, in the manner described above. Livestock insurance premiums are not high compared to the assumed risks. However, the

situation in stock farming in Serbia is very difficult, so that despite the low premium amounts the insured in Serbia rarely choose to enter into this kind of insurance contracts.

For increasing the number of contracts in this kind of insurance, it is essential to: 1) create new Conditions and Tariffs by insurers for this kind of insurance, which would have to be more flexible, cost-effective and attractive for the insured; 2) create new insurance products in this kind of insurance, following the example of countries with developed livestock insurance; 3) grant new benefits on the part of insurers, or discounts on entering into livestock insurance contracts. In this context the premium payment method should be made more flexible (defining participation in the positive technical result), and insurance packages created in such a way as to include livestock insurance, thus also including premium discounts; 4) make underwriting, as well as damage assessment, more professional, which requires the companies to have their own professional veterinary staff or enter into the corresponding contracts with competent veterinary services. In that regard, continuous training of veterinaries and other professionals is also essential; 5) paying special attention to defining prevention, or preventive schemes which should be jointly drawn up by professionals (veterinaries) in insurance companies and the insured; 6) given that non-life insurance premiums, including livestock insurance premiums, are subject to taxation, it is necessary to assess the possibility of reducing or abolishing the tax relating to this kind of insurance; 7) it is essential to define and realize schemes for educating all the potential insured, including all the legal entities and natural persons dealing with stock farming, to acquaint them with the significance and advantages of this kind of insurance; and 8) livestock insurance promotion schemes should be defined by the competent ministry, and the Association of Insurers of Serbia.

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OSNOVNE KARAKTERISTIKE OSIGURANJA STOKE U SRBIJI – SA OSVRTOM NA SPECIFIČNIM ELEMENTIMA OVE VRSTE OSIGURANJA U ODREĐENIM ZEMLJAMA U EVROPI I VAN NJE

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Rezime

Osiguranje stoke spada u osiguranje poljoprivrede. Ovu vrstu osiguranja sprovode osiguravajuća društva koja se bave neživotnim osiguranjima. U Srbiji je osiguranje stoke nerazvijeno. Uopšte, veoma mali broj poljoprivrednih gazdinstava (5-10% od ukupnog broja) se odlučuje na zaključenje ugovora o osiguranju stoke. U radu se analiziraju osnovne karakteristike ove vrste osiguranja, a autori posvećuju pažnju i sprovođenju ove vrste osiguranja u drugim zemljama. Kad je u pitanju osiguranje stoke u Srbiji, analiziraju se opšti uslovi osiguranja stoke donetih od strane jednog uspešnijeg osiguravajućeg društva, a posvećuju se pažnja i načinu na koji se subvencionišu premije osiguranja poljoprivrede, pa i osiguranja stoke, što je podržano od strane Vlade Srbije. Sa druge strane, značajna pažnja se posvećuje osiguranju stoke u Mongoliji, Indiji, Meksiku i Irskoj koji su definisali programe osiguranja stoke koji su doprineli većem broju zaključenih ugovora u ovoj oblasti. U Mongoliji se navedeni program sprovodi kroz osiguranje objedinjenog rizika, u Indiji se ovo osiguranje sprovodi na nivou lokalne zajednice (sela), u Meksiku preko fondova samoosiguranja i tzv. „stop-loss“ reosiguranja, a u Irskoj se definišu različiti programi za kontrolu bolesti životinja i njihovo iskorenjivanje. Isto tako, autori govore i o osiguranju stoke u pojedinim evropskim zemljama. Na kraju, u radu se kritikuje način na koji se sprovodi osiguranje stoke u Srbiji, tako što se predlaže niz mera koje bi trebalo da sprovedu kako osiguravajuća društva, tako i država, od kojih treba izdvojiti povlastice, koje se ne tiču samo premije osiguranja, a koje treba dati vlasnicima stoke kako bi se odlučili na osiguranje. Osim toga, potrebno je kreirati nove proizvode osiguranja kod ove vrste osiguranja, edukovati poseban tim veterinarara koji vrše procenu stoke prilikom zaključenja ugovora i štete kod nastanka osiguramog slučaja, definisati programe prevencije, kao i definisati programe edukacije za buduće osiguranike, vlasnike domaćih životinja. Moramo reći da osiguranje stoke nema ono mesto koje bi trebalo da ima u okviru osiguranja poljoprivrede. I u svetu, osiguranje stoke predstavlja relativno mali segment ukupnog osiguranja poljoprivrede, čak i u veoma razvijenim zemljama.

Ključne reči: *osiguranje poljoprivrede, osiguranje stoke, rizici, premija osiguranja, opšti uslovi osiguranja.*

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SUPPLY CHAIN PERFORMANCE WITHIN AGRI FOOD SECTOR

Magdalena Daniela Dinu¹

Summary

By setting the goals of this scientific paper has been outlined the research methodology. Thus were developed conclusion, and by using the methods, procedures, techniques, rules and tools and know-how has been demonstrated the central hypothesis: "Inside the agri-food supply chain is created value through operations and logistics activities." The value created leads to competitive advantages in order to identify companies within market, gaining loyal consumers.

The article presents the components of agri-food supply chain, the main Key Performance Indicators measuring its performance, the difference between a traditional supply chain and sustainable supply chain by analyzing the waste management component. In order to get professional expertise referring to Key Performance Indicators a quantitative research has been organized.

In closing the article present the development strategies of agri-food supply chain.

Key words: *agri-food supply chain, logistics activities and operations, performance, sustainability, development strategies*

JEL: *Q18*

Introduction

The development of the feed and food industry is facing new logistical challenges, like the supply and delivery routes, dynamic of the demand or investments. Therefore, the necessity of the logistics has been revised in this important industry. Because of the evolution of social, economic and political trends, the food industry continuously innovates in properly and efficiently managing actual demand, but taking into account sustainability and food sources. While the supply chain components will be continuously analyzed due to population growth, comparing with the available resources, the management of the agri-food supply chain manages, through its activities and processes, the entire flow of food products from "farm" to "fork".

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Agri-food supply chain

The concept of logistics was exposed over time in various forms and terminologies, as part of the supply chain and sales standalone or as part of a business. Oliver and Webber (1982) analyzed for the first time the activities and logistic operations as belonging to a stream through which a company can increase the efficiency of their own stocks but also those of their partner companies'.

Subsequently, the logistics were seen by Ramsay (1990), New and Payne (1995), Ellram and Edis (1996) as a partnership between buyer and supplier, while Lamming (1997) and Hines (1995) forth as a commercial relationship which a company develops with its suppliers. Lee and Billington (1993), Jones et al. (1997) deal with logistics as a stream where it creates value, while Wisner et al., (2011) comes with a new approach to activities and logistics operations by including them in redesigning business processes, thereby reducing the quantities of waste, reducing or eliminating losses and increasing performance of economic activity.

Lee and Dale (1998), Lambert (2008) include logistics in the refurbishment processes and Harland (1997) in management of the internal operations of a company.

The impact of integrated logistics in the quality management process and in the purchasing management of auxiliary materials and raw materials was reviewed by Chen and Paulraj (2004) and Jonsson (2008). Wisner et al. (2011) wrote about logistics from outside the company, and Cooper et al. (1997) and Lambert (2008) characterized the activities and operations of logistics as a way to provide either products or services of better quality the all customers, while Mangini and Vlachos (2012) expose the competitive advantage possible to be obtained within supply chain.

The analysis of logistics in terms of sustainability emerged in the last 15 years. Thus, Murphy and Poist (2000) emphasize the effect of sustainable transport, Chen (2005) exposes the importance of purchasing "green", Foerstl et al. (2010), have shown the importance of the support in the logistic operations and activities provided by suppliers and their role in the sustainable development of a business.

Through activities and logistics operations, as part of the agri-food supply chain and distribution, added value can be created by competitiveness and a more effective flow of information. There are basic logistic activities such as: procurement, transport management and inventory management, order processing and distribution, providing quality standards and offering services to the end customers and and support activities, such as storage, handling packaging, information flows related activities (Istudor, 2011).

The difference of the analyzed results between the two supply chains belonging to different companies, but with the same activity and manufacturing of the same item with the same technical characteristics may arise from the instability of the company's environment (Wu, 2006), information technology, communication and planning tools used (Flynn et al., 2010), the way in which they built and managed strategic relations with suppliers and customers (Reuter et al., 2010), added value in the manufacturing process, the performance of supply chain management and distribution, type of management and customer care satisfaction (Shin et al., 2000; Lehtinen, Ahola, 2010).

The performance of any agri-food supply chain is determined by its own efficiency. Chain efficiency can be achieved throughout the entire chain, and each of its components, activities or processes or operations as quality control, packaging and labelling, traceability, using information technologies and communication or purchase and use cold storage facilities etc. (Hyde, 2000). Each activity of agri-food supply chain can be realized differently compared to the same activity of existing competitors on the market, resulting from the fact that its effectiveness can be achieved for less or be better. Thus, it's possible to say that there is no competition between companies, but there is competition among purchasing and retail supply chains of the companies, including logistic activities and operations (Shin et al., 2000). Chain efficiency can be achieved throughout the chain, and each of its components

Sustainable agri-food supply chain

A sustainable agri-food supply chain has the same components as a traditional agri-food supply chain, namely: transport, storage, warehousing, handling, information flow (Istudor, 2011), the difference between the two supply chains being the waste management, the reduction or elimination thereof. Besides the component "waste management" throughout the value chain, it is worth mentioning, the specific activities for each component, activities that reduce environmental impact, such as management of rational and efficient use of land, reducing deforestation, pollution reduction (Sungchul Choi et al., 2011), better hygiene throughout the production, education and continuous information of employees and consumers (Colby et al., 1995), green label of the finished product (Clarke, 1994), using a safe and sustainable pack, reduction of non-compliances in the product delivery, increasing the consumer's confidence in the final product, its preferences and choice in selecting products etc.

Correct and efficient waste management requires activities, both at the start of the supply chain and retail, for example: use in farming of biological nutrients as fertilizer, but also nutrients that come from recycling, as well activities at the end of the chain: biological degradation including waste separation (organic and non-organic) and making compost for fertilizing (Beachy Roger N., 2010). To analyze the life cycle of the agri-food product from the point of view of sustainability means the possibility of measuring the environmental impact of the manufacturing of the product, and the possibility of improving the activities and processes in all phases of the production cycle, such as: raw material extraction, processing of raw materials, manufacturing, assembly, product usage, management and administration of End-of-Life (EOL) for each item.

While the strategy of investment in agriculture and food industry is focused on emissions, food safety inputs (raw materials, packaging materials, auxiliary materials), outputs (finished goods), and tangible components within technological flows, the strategy for sustainable development of the agri-food chain aims availability of finished products through activities and processes with low or zero impact on natural conditions. Thus, the performance of sustainable economic activity will be measured by the company's ability to meet the needs of consumers by decreasing or eliminating risk (Hartmann et al., 2010).

A sustainable agri-food supply chain implies accepting the innovation and not denying its importance, by adopting innovative technologies (Marquer, 2010). Thus, innovation will provide companies, farmers or livestock farmers, an effective long-term economic activity.

Key Performance Indicators used to measure the agri-food supply chain performance

Performance of the agri-food supply chain indicates the potential of the entire chain to meet the needs of end customers, the availability of products on the shelves, on time delivery, maintain permanently under control the limits of minimum and maximum inventory of the manufacturing company (Bowersox et al., 2007).

In order to quantify the performance of agri-food supply chain is needed to permanently update information regarding the performance of suppliers and customers (Burgess et al., 2006), knowledge of their market, and continuous analysis and updating component costs logistics, such as domestic and international transport, customs, storage, packaging or repackaging and special physical distribution of finished products (Istudor, 2011).

In order to identify the Key Performance Indicators (KPIs) which are able to quantify the performance of the agri-food supply chain it has been organized a quantitative research by addressing a questionnaire on line to two groups of professionals belonging to LinkedIn network: "Agri Jobs - Agricultural Professionals Group - Dairy Foods - Milk Production - Crops" (Above 57 900 members) and "Food & Beverage Industry Professionals Group" (Above 41 700 members). By interviewing tool it has been obtained 750 responses in a period of 3 months. The questionnaire included only open-ended questions, namely: *Mention at least three Key Performance Indicators used to quantify performance of your supply chain components: transport, storage and default inventory management, purchasing.*

After analyzing the responses, the following specific KPI's Key Performance Indicators were identified:

- referring to ***the transport of raw materials, packaging and finished products*** can be used the indicator "Charging time" (On Time Loading, OTL), meaning how many purchase orders were loaded on time compared to total deliveries made or one or more of the following: "on-time delivery" (On time Delivery, OTD)," truckload "by measuring the ability of loaded truck versus total capacity," distance empty "indicator that measures the distance that a vehicle runs empty, not transporting goods," time of use " indicator that reflects the period in which a truck is idle, maintenance, repair etc, "deviation from a truck schedule", "fuel consumption", etc.

- with regards to ***the storage space and thus the inventory management***, in addition to establishing minimum and maximum levels of stock in accordance with the technical characteristics of article managed and the actual production plan and forecast, both indicators are used "days in stock" (Days on stock, DOS) meaning covering the stock in days, and the indicator "breaking stock" (Out of stock, OOS), meaning whenever broke the stock of an item within the analyzed time. It can also be used: "the speed of inventory turnover", "value products damaged ", " number of damaged goods ", " quantitative and

value differences referring to warehouse inventory “ indicator which reflects the inventory accuracy. Also, the storage space or the warehouse is quantified by using the following indicators: total cost of storage, processing time of orders, the value of damaged goods, the percentage of space dedicated to handling the total space utilization of the deposit, the annual percentage of accidents, quantity or possible delivery units moved in an hour by a person and so on. All categories stored in the reception point are using the indicator “accurate invoice” (Invoice Accuracy, IA), calculated as the number of invoices issued correctly reported to the total number of invoices issued;

- **for purchasing** it is used the indicator “reduced costs for each category of product” (Cost saving per each category, CS), indicating how much is reduced the acquisition cost per each category, discounts that can be recorded by the purchase price renegotiated, function volume times by streamlining transportation (truckload ordered truckload roundtrip) or new items cheaper which can substitute the old one, with the same technical characteristics etc., “the performance of suppliers” in terms of price delivered products, quality of services that accompany a product supplied, deliveries made in a certain period of time, “supplier management” indicator which seeks to ensure that 80% of the amount spent to correspond to maximum 20% of the total portfolio of suppliers, “ variation of price purchased” or” contracted price change “,” total amount of purchases “,” procurement portfolio structure “etc. The synthetic indicator “performance per each provider” shall be calculated according to other analytical indicators, such as the annual percentage of orders outstanding in total orders, the annual percentage of complaints quantitative and qualitative total orders delivered , variation deadline versus delivery time agreed by contract , the percentage of deliveries made on due time, accuracy of commercial documents as a share of total issued documents, delivery rate within total contracted deliveries, etc.

The agri-food Supply Chain’s development strategies

Practice shows that the strategy chosen by agri-food companies expresses the desire of financial involvement of the holders of business into customer satisfaction (Clifton, Amran, 2011; Freeman, 2005), and the adaptability of the business and the strategy chosen to market developments.

Strategies refer to the evolution of companies on long term (Grayson, Ambler, 1999) and due to the time horizon it may be argued that the change of direction of the strategy is requested by the owners of the business, given the large number of factors which influence direct day by day activity of the company.

Analysing the real possibilities of organising the agri-food companies could be adopted as development strategies one of the below development strategies presented:

Negotiating with several suppliers when it comes to fungible goods as commodities for which demand has a qualitative market (eg cereals), their purchase based on price (Guinipiero et al., 1999). Greater competition between providers it empowers them on the technology used, accumulated expertise, planning, accomplished cost, goods quality produced and delivered, delivery services offered to the client referring to Business to

Business trades or to the final customer referring to Business to Consumer trades;

A long-term partnership with a small number of suppliers which create value through economies of scale, suppliers delivering on time using JIT, Just in Time method and thus minimizing inventories. A strategic relationship with suppliers (Li et al., 2005) implies transparency into the whole supply chain and sales, and up to date information (Carter and Jennings, 2004). Besides the minimum commercial information stipulated within commercial contract, such as: delivery time, payment terms, different ways or instruments of payment agreed, transport conditions, who assumes the risk during transportation, minimum order quantity, minimum quantity delivered, security stocks to vendor, unit price discounts quantitative (Carter, Stevens, 2007), or value thresholds of profitability, the negotiating process with supplier will involve specific technical information given very specific activity technological flow, it contributes to design of new products or product approved to be shipped with its own technical and technological expertise. In such a strategy, strategic change of provider cost will be high. For example, when a recipe for a sausage is established using a particular type of spices, this means determining a stationary source of an approved supplier;

Vertical integration. A model of vertical integration may be: agriculture - livestock or livestock - factory meat processing (Green, 2004), a model which, in addition to benefits through continuous improvement of quality, streamline inventory and cost effective management requires capital fixed and mobile organizational and managerial skills, and permanent application. A vertical integration can be carried downstream or upstream production capacity, to customers or to suppliers, and is not recommended in industries with rapid technological change. Activity optimization and streamlining inventory results will be pursued only after a process of continuous monitoring and analysis of stocks required by current plant capacity or used in analysis. In this regard are commonly used mainly two modern methods of tracking and analysing the current situation and movement of stocks: the “max – min” which sets maximum and minimum stock for each product supplied, any oversize or under dimension of stocks representing a common response of purchasing, warehouse, manufacturing departments and “ABC method” by which stock required production is divided into three categories A, B and C depending on the weight that has the value of stock of each item purchased in the total value of stocks total required production . Group A comprising 15% of the stock structure and 70% of their total value will control and optimize daily or several times a month. Group B comprising approximately 25% of total reserves and 20% of the total amount of them has a frequency of monthly analysis, while stocks in Group C with approximately 60% of total reserves and 10% of their value requires quarterly or annual analysis (Ilieş and Crisan, 2008; Voicu and Radulescu, 2003).

Integrated agri-food supply chain, which means standardization, collaborative planning, forecasting, management contracts or orders, long-term (Buckley, Mithie, 1996). This strategy is consistent with the method of production “lean” (lean manufacturing) that add value, while minimizing or eliminating losses in each component of the business process, production (Benetto, Becker, Welfring, 2009). This strategy is consistent with

those companies that develop sustainable because they require the same quality standards throughout the value chain, flows of energy, materials, waste, emissions process of production intended to be reduced or eliminated and environmental impacts Standing quantified and reduced (Murray et al., 2010).

Regardless of the chosen strategy, the future belongs to those who keep pace with the social, economic and natural prerequisite for business developing in a sustainable way (Rozar et al., 2014), adapting to technological developments by investing into hardware and software, which can bring huge benefits for safety and food security, energy security, environmental management (González-Benito, González-Benito, 2008), community welfare, nutrition (Defee et al., 2009; Lindgreen, Hingley, 2003).

Conclusion

An efficient agri-food supply chain calls for the involvement of all participants: suppliers of raw materials and packaging, transporters, warehouses, clients. There are specific standards referring to feed and food quality through the status of “fit for sale”. Therefore, correct communication in the supply chain between chain partners, but also within the participating companies and the accuracy of the information circulating on both the vertical and the horizontal line are key factors with major influence in the performance of this flow information, goods and services.

The aim of any agri-food supply chain is to achieve a full and effective flow of goods, services and information, transferring capital to create and provide maximum customer value.

An agri-food supply chain is considered efficient if the activities, operations and its processes reduce overproduction, removes stocks that are no longer needed, minimizing stocks operational, it streamlines the movement of the chain, eliminating downtime or detours are reduce waiting time, reducing till eliminating waste and non-compliant items.

Regardless of the organizational form each agri-food supply chain the companies could choose one of the following way as a developing strategy: strategic planning of acquisitions, labour productivity growth, increased financial result, improving the efficiency of distribution.

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SUSTAINABLE INTENSIFICATION IN AGRICULTURE AS A FACTOR OF ACHIEVING FOOD SECURITY

Katarina Đurić¹, Zoran Njegovan²

Summary

Ending hunger, achieving food security and promoting sustainable development are at the top of the list of United Nations sustainable global development priorities after 2015. In addition to many positive effects, efforts of mankind regarding the reduction of rural poverty realized through the Green Revolution have had many negative effects, primarily related to natural resources. Irreversible devastation of land, air and water quality deterioration and jeopardizing biodiversity have been recognized as key elements of unsustainability of existing agricultural development concept. Consequently, there is a need for the adoption of a new concept of agricultural development, which will lie between intensive conventional and organic farming.

The concept which has already been applied in some regions of the world and whose basic goal is to find a way to increase production with a negligible negative impact on the environment is sustainable agricultural intensification. The aim of this paper is to look at both positive and negative aspects of biotechnology development so far and point out the place and role the sustainable intensification concept should have in relation to conservation of natural resources and achievement of food security.

Key words: food security, biodiversity, land, green revolution, sustainable intensification

JEL: Q15, Q18

Introduction

Food security is high on the list of global development priorities. As a result of the global population growth, there is an increase in food demand, competition for the use of land, water, energy and other agricultural inputs. Climate changes present another challenge for agriculture, especially in developing countries which are faced with food insecurity.

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According to the global development not only the regions affected by food crisis should confront this problem. Namely, the problem of one region spreads very quickly raising both economic and political issues around the world.

The resolution to this problem requires finding new solutions in the field of food production that is, in the so-called food system. One of the solutions, supported by certain countries and international institutions, is the concept of “sustainable intensification”. Taking into account limitations of farmland, the goal of sustainable intensification is to increase food production from existing available farmland while minimizing the pressure on the soil and without jeopardizing food production capacities in the future. Although the concept of sustainable agricultural intensification has been accepted by a certain number of countries, it came under strong criticism, both for its sole focus on production and for certain controversies associated with it.

Research Method and Objectives

Having in mind the subject and aim of the research, qualitative research methods common for social sciences have been used in this research. Descriptive and historical analysis has been mostly applied in the paper. These methods are based on studying impact of biotechnology achievements on the food and environmental circumstances. Comparative analysis has also been used to a great extent, since it is necessary to review and compare positive and negative impacts on implementation of biotechnology achievements on the conservation of natural resources and biodiversity, on one side and food security, on the other.

The aim of the research is to analyze the possibility for the concept of sustainable intensification of agriculture to influence the decrease of rural poverty in developing countries and improvement of the world food situation. The significance of this concept in present and future developing agendas, both on national and global level is assessed by reviewing the scope and aspect of sustainable agricultural intensification.

Current food situation

In the year 2000, the United Nations adopted a document called “The Millennium Declaration” which defined eight millennium development goals. The first goal is optimistically defined as “eradication of extreme poverty and hunger by 2015”. Three more realistic sub-goals are defined within this general goal:

- Halve the proportion of people who live in the extreme poverty and whose income and/or consumption is less than USD 1 per day,
- Achieve full and productive employment for all working age population, especially women and young people, and
- Halve the proportion of undernourished people compared to 1990. (www.un.org/millenniumgoals/).

Regardless of numerous limitations embodied in unfavourable, both climate and economic conditions, certain countries have managed to achieve significant improvements related to the realization of the millennium goal. According to official UN data, the sub-goal 1 was realized during 2010. That year, as compared to 1990, the number of the poor was reduced by around 700 million. Owing to commitment of Governments of certain countries, as well as active support of relevant international institutions and organizations, certain results were achieved in the second and third sub-goal. However, despite these developments, the number of undernourished population in the world remains unacceptably high. Namely, on the global level, in 2014 there were still 1.2 billion people living in extreme poverty; out of this number, 842 million people, 99 million of who are children up to 5 years of age, cannot meet basic nutritional needs (UN, 2014).

In order to reach as realistic conclusions as possible, the world food state should be observed not only from the aspect of the number of undernourished people, but also from the aspect of food quality. Looking at the latter, it can be noticed that available calories per capita has increased, but the intake of microelements still falls behind as compared to the realistic needs. Owing to the Green Revolution, whose idea was to reduce poverty and hunger in the world, the production and availability of food has increased in some developing countries. It is because of the Green Revolution that in the period between 1960 and 1990 the participation of undernourished people in the total world population significantly decreased (Đurić, 2015). Improvements made regarding the food availability, which was the result of price drops, contributed to the increase of energy intake in the nutrition of the poor. For example: the drop in the price of rice in Bangladesh made it possible for people to spend money on other sorts of food (UN, 2013). However, positive effects of the Green Revolution on the quality of nutrition of the population are not equal in all regions and countries. Although, due to the growth of yield and productivity in the agricultural production, the consumption by the number of calories per capita per day increased, the majority of the poor have not seen the improvements in the quality of food, measured by the intake of the most important microelements. As a result, despite the growth in the calorie intake, the problem of malnutrition is still present in many countries.

One of the factors which greatly determines the world food state is the population trend. The current world population is 7.2 billion. The United Nations projections anticipate that the world population will increase by more than a billion people over the next 12 years, thus reaching the figure of 9.6 billion people by 2050 (UN, 2013). Moreover, the projections estimate that the most dynamic growth is to be expected in countries most vulnerable to food security. Namely, more than a half of the anticipated population growth will be on the African continent.

Traditionally, the population in developed countries has a significantly slower growth trend compared to developing countries. According to the “World Population Prospects” report, the population of developed countries is expected to grow slowly from now until 2050. In contrast, 49 developing countries are projected to double in size from around 900 million in 2013 to 1.8 billion in 2050.

The report also states that India is expected to become the world's largest country, passing China, when both countries will have population of 1.45 billion by 2028. After that, it is expected that India's population will continue to grow, while China's is expected to start decreasing. Furthermore, according to the UN projections, Nigeria's population is expected to surpass that of the United States by 2050.

In contrast to developing countries, Europe is facing growing aging population. Namely, Europe's population is projected to decline by 14% by 2050. Similarly to the situation in previous decades, the most dynamic population growth is projected and expected in regions most vulnerable to food security.

The expected growth of the world population, together with the intention to eradicate hunger and poverty in the most jeopardized regions of the world, prove the need for the global growth of agricultural production. However, increasing pressure on the environment, seen through growing land degradation, pollution of water resources, more prominent climate change and other adverse effects, are the reasons why agricultural production should be based solely on a sustainability principle. Therefore, the sustainable development concept should become a new philosophy of development, including not only economic, but also, moral, social and health aspects (Pejanović, 2015).

Production growth and yield increase should be some of the responses to a growing demand, but not the only ones (Goldfray, Garnett, 2014). Following the sustainability principle, in addition to the yield increase, it is important to achieve the following:

- change the model of demand in terms of demand growth for so-called: resource-intensive food produces such as meat and dairy products,
- rationality in the consumption in terms of food waste reduction,
- establish the measures of food (agrarian) policy which would facilitate the improvement of food system efficiency and ensure availability of food for everyone (Tilman et al., 2011).

Nonetheless, it is unlikely that there is any other solution, apart from the increase in yield and production, which could solve the problem of food insecurity in the world. The increase in yield is the key factor for elimination of hunger and poverty, especially from the aspect of developing countries. Nowadays, the increase in yield is a number one requirement in almost all low-income countries. However, in the long-run, temporary growth of yield and production should not be the main goal, but creating conditions for continuous improvement of production potentials in order to meet food demand in the future. Furthermore, every option offered as a solution should be environmentally acceptable, that is, sustainable.

Green revolution – advantages and limitations

Although the Green Revolution, as an attempt to reduce hunger and poverty in the world, was put into practice during the 1950s, extensive research whose goal was to improve the agricultural production, yield growth and resistance of plants and animals, had been carried

out much earlier. Some scientists, such as Justus von Liebig (1803-1873) and Nikolai Ivanovich Vavilov (1887-1943) contributed to the improvement in agricultural technology a lot before the idea of Green Revolution was even born, although their research had the same goal: provide food security in the world.

American agronomist and 1970 Nobel Peace Prize laureate, Norman Ernest Borlaug (1914-2009), is considered to be the inventor of the Green Revolution. However, an invaluable contribution to the implementation of new technologies and improvement of agricultural production, especially in India, was made by a famous geneticist Monkombu Sambasivan Swaminathan. Owing to the enthusiasm of this scientist, the Green Revolution enabled the increase in the production of wheat in India from 12 million tons in 1965 to over 20 million tons annually during the 1970s. By applying achievements of the Green Revolution, in 1974, India produced sufficient quantities of wheat to meet the needs of its population (Fresco, 2015).

In the past half century, the Green Revolution had an important role in the improvement of agriculture production and provision of food security in the world. Wheat, rice and corn yield in developing countries have increased by 100 to 200% from the 1960 until today (Davis et al., 2002). The increase in yield was a primary mission of the Green Revolution. The selection and creation of new varieties also meant more intensified application of mineral fertilizers, pesticides and irrigation. Goals of the Green Revolution were achieved with a great support of advisory systems, as well as national and international companies which contributed to the transfer of new technologies from scientific and research centres to practice.

However, during the 1980s, after the initial euphoria about the significant increase in yield faded, a considerable disappointment over the Green Revolution surged through West Europe and North America. The book “Silent Spring” by American zoologist and biologist, Rachel Carson (1907-1964), which describes in detail adverse effects of DDT and similar pesticides on people’s health and the environment, is just one of the many accusations brought against the Green Revolution and its achievements. While this book is considered to be one of the key drivers of the modern environmental movement in the West Europe and America, in countries of so-called third world it is seen as the culprit for the spread of malaria and other diseases.

Twenty years after the beginning of the Green Revolution, natural resources and biodiversity were seriously harmed. In addition to a series of positive effects it had in terms of yield growth and production, the Green Revolution considerably contributed to the devastation of the nature, which calls into question the justification of its name. Intensive and often irrational use of modern agro-technical measures led to the reduction of quality of soil, water and air.

Actual achievements of the Green Revolution are also limited in terms of the range of products, the yield and production of which were increased. Namely, according to achieved results, the Green Revolution has significantly contributed to the increase of yield to only a few basic agricultural products. Other products, especially the ones which constitute the basis of nutrition in poor areas of Sub-Saharan Africa were excluded from the Green Revolution effects.

From the social and economic aspect, the Green Revolution did not have sufficiently balanced solutions. Focused exclusively on the farmers who can provide inputs and modern agro-technical measures, the Green Revolution bypassed small farm households which not only have insufficient financial resources but also do not have access to loans. The fact that, despite the Green Revolution, the number of the poor and hungry is still unacceptably high, supports the fact that achievements of biotechnology development have not been accessible to most of the world population. The most significant reasons of slow introduction of modern technologies to poor farmers are:

- unequal distribution of farming land and unregulated land ownership rights,
- poor or difficult access to loans and other sources of financing;
- no market access,
- discrimination of small households through subsidies which favor large holdings,
- discrimination of women in terms of their inability to become owners of land and farm households,
- lack of agricultural advisory services, etc. (Marković, 2011).

Unintended consequences which occurred as a result of irrational use of water, degradation of land and overuse of chemicals which occurred as a result of application of agro-technical measures applied within Green Revolution, have not contaminated only the area with agricultural production, but also surrounding land, thus jeopardizing ecosystem and biodiversity. A slowdown in dynamic growth of yield during the 1980s could be partly ascribed to the need for reducing environmental degradation, primarily limited land resources. Even then, negative impacts on cropland areas were recognized as an important drawback of long-term application and sustainability of Green Revolution.

The negative effect of the Green Revolution on the environment should not be seen only as a consequence of application of intensification production concept and agro-technical measures which include agricultural machinery and agrochemicals. In many cases, the agrarian policy of developing countries, was promoting the excessive use of agrochemicals together with the Green Revolution. That was accomplished by applying protective prices of finished products, as well as the system of subsidies for the purchase of: fertilizers, pesticides, irrigation system etc. In cases where the agrarian policy was based on sustainable development, producers followed that example by limiting the excessive use of pesticides. The best example is Indonesia where the Government removed subsidies for the purchase of agrochemicals at the beginning of 1990s. As a result, the application of insecticides which were jeopardizing the ecosystem reduced significantly (Pingali, 2012).

One of the achievements of biotechnology, genetic engineering and its product, genetically modified food, was marked by great controversy. Abuses and the fight for profit of some multinational companies have created the environment in which genetic engineering has a negative connotation. Neglecting positive effects achieved by the implementation of genetic engineering in food production, public opinion created mostly negative attitude towards the research carried out in this field of biotechnology.

It can often be heard, not only by general public and non-governmental organizations, but by government officials as well, that genetically modified food is a priori considered negative and harmful for human health (Fresco, 2015). Moreover, benefits of these technologies as compared to their potential drawbacks are almost never precisely defined. Due to the growing gap between agricultural science and public opinion, it is necessary to develop a bridge which will enable further development of science with a full support of the society.

The change in the attitude of the society towards biotechnology should take a direction in which, through active participation and contribution of all relevant subjects, the importance of science and knowledge should be confirmed, both through the survival and food security provided for present generations and the prosperity of future generations. Moreover, an important aspect, which should not be neglected in the development of agriculture, is the conservation of natural resources and biodiversity. The sustainability of agricultural development, achieved by rational exploitation of natural resources together with meeting growing food demand of the world population, represents the basis of the sustainable intensification concept, whose application has already started in some regions of the world.

The concept of sustainable intensification in agriculture

According to the FAO data, in Sub-Saharan Africa, 230 million people and 40% of children under the age of five are physically and mentally stunted as a result of malnutrition (FAO, 2015). The agreement reached in September 2015 between 193 countries was defined as a new sustainable development global goal and it means wiping out hunger by 2030. The four key challenges which need to be addressed in order to fulfill this goal are:

- food market integration on regional, national and global level,
- intensification of agricultural production to the extent which does not jeopardize the environment,
- development of science in the field of agriculture and agricultural advisory, and
- economic empowerment of small family farms (Kharas et al., 2015).

Therefore, in order to win the fight against hunger, malnutrition and poverty, and at the same time to preserve and improve environment, it is necessary to globally promote the concept of sustainable intensification of agriculture. The sustainable intensification of agricultural production is a concept which, in the long run, means that by applying innovations and with rational approach to inputs more food will be produced and adverse impacts on the environment will be reduced (Jumma et al., 2013). The sustainable intensification is nothing more than a pursuit for the way to increase production with minimal environmental impacts. In accordance with the key idea of this concept, it is frequently described as a sustainable increase of yield or ecological intensification (Godfray, Garnett, 2014). The concept of sustainable intensification in agriculture could present a function of profit maximization with minimal losses despite its four limitations: (1) the need for the increase in yield, (2) limitation of resources, (3) the need for environmental protection and (4) the issue of food insecurity.

This approach to the agricultural development is primarily focused on the preservation of natural resources and maintenance of balance. However, it has other dimensions as well. Five questions which are directly related to the application of the concept of sustainable intensification of agriculture are as follow:

- the welfare of farm animals;
- food consumption;
- rural economy, and
- sustainable development.

Conservation of biodiversity and the use of land. By engaging land and water resources, agricultural production threatens biodiversity. In that sense, agriculture presents more serious threat to biodiversity than any other human activity. One of the ways to reduce the negative effect of agriculture is its integration with activities related to environmental protection through practice, the so-called land sharing. In order to maintain production on a reasonable level, when lower yield is caused by sustainable agriculture, the engagement of more farmland is required. In such conditions, the concept of sustainable intensification suggests an alternative solution, that is, sharing of land between agriculture production and conservation. Consequently, the food production growth is enabled on cultivated farmland, while, at the same time, a part of the land on the other location is left for the needs of so called, conservation.

Animal welfare. The word “intensification” and animal welfare can hardly be used together. Namely, it has been proved that intensive conventional production has extremely negative effect on the health and welfare of animals. The successful application of sustainable intensification concept in livestock production means:

- establishing ethical framework which would, in the context of animal welfare, abolish some breeding options,
- identifying areas with greatest potential for the implementation of the sustainable intensification concept, achieving, at the same time, satisfactory results related to animal growth and development, and
- recognizing limitations to respond to future growing demand for livestock products, having in mind animal welfare. It is also a signal which indicates the need to carry out urgent activities in order to reduce overconsumption and souring demand in certain countries.

Human nutrition. In addition to adequate energetic values and protein content, food security also refers to meeting the needs of the population for various microelements through food intake. The key determinant to the quality of human nutrition is variety. The development of agricultural technology has so far been, to a great extent, focused on the yield increase and not on the improvement of quality and variety of agricultural-food products. The key principle of the sustainable intensification concept is, in addition to yield increase, to take care of the

quality and variety of food in agriculture.

Rural economy. In many countries, the agricultural policy is inextricably linked with the economic support to the rural economy development. The key and measures of support could be radically improved through the application of sustainable intensification concept. Therefore, it is necessary to:

- identify the areas in which existing mechanisms of support could be reoriented to encourage the implementation of sustainable intensification concept,
- innovate the work of agricultural advisory services in order to provide support in the implementation of the new concept of sustainable agricultural intensification, and
- encourage the use of modern information and communication technologies and appropriate financial instruments which would enable the rural population to apply the sustainable intensification concept according to market demands.

Sustainable development. The increase in yield and income are priorities for low income farmers in newly developed countries. Achieving these priorities is, however, often impossible due to limitations related to economic, physical and human capital as well as institutional drawbacks. As a result of stated priority goals and numerous limitations which stand in the way of their achievement, it is very important to assess the ability of this group of countries to direct their agricultural investments to production technologies which will enable sustainable development in the long-run. Therefore, it is necessary to introduce sustainable agricultural intensification, as a new approach to food production, in all strategies and sustainable development plans. In order to achieve this, it is necessary:

- for the society and creators of agricultural and rural policy to recognize the sustainable intensification concept as an approach which may influence positively on the strengthening of rural communities, improvement of small family households and employment, avoiding at the same time negative social and cultural impacts, such as loss of fertile agricultural land and migrations of rural population,
- to invest in social, financial, natural and physical capital in order to provide successful implementation of sustainable intensification concept, and
- in cases where sustainable development goals (such as preventing migrations or biodiversity conservation) demand highly expensive activities, it is necessary to develop mechanisms which will provide appropriate measures to economically weak producers through a system of subsidies.

The success of implementation of sustainable intensification concept in terms of reduction of poverty and hunger, that is, provision of food security, depends on a number of factors. International and national research centres in the field of agriculture present subjects whose activities greatly determine the success of sustainable intensification concept. In addition, all other relevant participants in the food chain, from producers and consumers to non-government organizations and universities, give valuable contributions to ending poverty in rural areas. Also, the success of sustainable intensification is determined by choosing

an appropriate approach to agricultural development. There are three key approaches: agroecological, genetic and social-economic. Agroecological approach means the implementation of ecological principles in agricultural practice. Genetic approach is the application of modern achievements of molecular biology. Social-economic approach means the use of social, economic and institutional measures. Each of the three principles makes its own specific contribution, in terms of sustainable development, biodiversity conservation or reduction of greenhouse gas emissions. Although the benefits of these three approaches vary, their combination can lead to minimizing adverse effects and maximizing environmental and economic benefits.

Social-economic approach of sustainable intensification is often unjustly neglected. Its importance is crucial for the successful application of the concept of sustainable agricultural intensification. Social, economic and institutional measures provide favourable setting for successful implementation of innovations. The development of efficient market, of both input and finished products, proved to be an important condition for successful intensification. This primarily refers to an unhindered access of farmers to the market of seed and plant material, fertilizers and other inputs, loans, funds and other financial resources, warehouses as well as high quality consulting services. The development of stable and long term agricultural policy provides necessary security to agricultural producers. Moreover, the key idea behind the implementation of the sustainable intensification concept is not imposing a certain system or production technology by agricultural and rural development policy developers, but letting farmers choose optimal technology according to the region in which they produce (Pretty, 1997).

Table 1. Aspects and accesses to the concept of sustainable agricultural intensification

Multiple benefits	<ul style="list-style-type: none"> - Rational use of inputs - Reducing degradation of land - Reducing greenhouse gas emission - Strengthening the so-called natural capital
Involving more subjects	<ul style="list-style-type: none"> - Agricultural producers - Consumers - Private sector - Civil society organizations - Non-governmental organizations - International and national research centres - Universities
Implementing various approaches	<ul style="list-style-type: none"> - Ecological intensification - Genetic intensification - Social and economic intensification
Working on more levels	<ul style="list-style-type: none"> - Macroeconomic level - acting on the level of society as a whole - Microeconomic level - acting on the level of farm households

Source: Jumma et al., 2013.

Given numerous uncertainties and open questions accompanying the concept of sustainable agricultural intensification, the implementation of this concept has stirred up much controversy. One of the greatest challenges is gaining public acceptance. However, despite some resistance to sustainable intensification, it has been widely accepted that the most important priority, on the global level, is the production of sufficient amount of food while preserving the so-called natural capital (UN, 2014). Prevention of further land and water degradation, together with the prevention of climate changes which are accepted worldwide, are another proof that innovations in agricultural practices are inevitable in the near future.

Conclusion

In the past few decades, advancements in the field of biotechnology in synergy with other relevant facts, has led to some improvements regarding the world food situation. According to the official data, however, rural poverty and hunger on a global level is still unacceptably high. The reduction of population who live in extreme poverty imposes the need for the food production increase. Furthermore, the expansion of agricultural production in future is conditioned by projected growth of the world population, which, by rule, is most rapid in the food-wise most vulnerable regions. Due to the fact that the pressure on the environment caused by agriculture is rapidly increasing, the issue of global food security should not be treated as one-dimensional. Consequently, the idea of new agricultural production concept developed. It lies between conventional and organic agriculture and its aim is to conserve natural resources and biodiversity.

A sustainable intensification, as a concept of agricultural development and an element of achieving food security is still categorized as an innovation. Similarly to other innovations, sustainable intensification concept has to accept some compromises. Advantages which are expected and the ones which should be achieved in the short term are frequently off balance. Bringing these two poles closer together, calls for a higher degree of flexibility, that is, adapting to specific conditions of regions and countries when applying sustainable intensification concept. A holistic approach, which means the combination of conservation agriculture and cultivation of high yielding varieties, while applying the principle of integrated pesticide management, should minimize adverse environmental impacts of agriculture, maximizing at the same time positive effects.

Speaking of sustainable intensification concept in terms of a new agricultural development concept, it is important to point out that there are still more open questions than responses. In order for the concept of sustainable agricultural intensification to improve the world food state, it should be recognized as an opportunity and accepted by: scientific and research organizations and institutions, markets, and educational and advisory systems. Food security and responses to challenges regarding the conservation of limited natural resources, primarily the soil, depend on the pace of the development of new technologies. Agricultural and rural policies in developing countries should primarily enable establishing of institutions and creating “favourable climates” in which an innovation, such as sustainable agricultural intensification, will be adopted.

Despite being a new concept whose goals are already subject of numerous discussions and debates, sustainable intensification should not be observed as a single step, but as one of the important steps which should be carried out in order to improve the so-called food system and provide sustainable development and food security on the global level.

It is necessary to create room for such innovative approach to modern agriculture since “the science of the past will not meet demands of the future.” (Bertini, Glickman, 2013).

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ODRŽIVA INTENZIFIKACIJA POLJOPRIVREDE KAO FAKTOR OSTVARIVANJA PREHRAMBENE SIGURNOSTI

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Rezime

Na vrhu liste prioriteta održivog globalnog razvoja posle 2015. godine, definisanog od strane Ujedinjenih Nacija, nalazi se eliminisanje gladi, ostvarivanje prehrambene sigurnosti i promovisanje održivog razvoja. Dosadašnji naponi čovečanstva na planu redukcije ruralnog siromaštva, realizovani kroz Zelenu revoluciju, pored pozitivnih, ostvarili su i niz negativnih efekata, pre svega, na prirodne resurse. Bespovratna devastacija zemljišta, narušavanje kvaliteta vode i vazduha, kao i ugrožavanje biodiverziteta, prepoznati su kao ključni elementi neodrživosti postojećeg razvojnog koncepta poljoprivrede. U skladu sa tim, javlja se potreba za primenom novog koncepta agrarnog razvoja, koji će se suštinski nalaziti između intenzivne konvencionalne i organske poljoprivrede.

Koncept koji se već uveliko primenjuje u pojedinim regionima sveta, a čiji je osnovni cilj da pronađe način da se poveća proizvodnja uz istovremeno što manje negativne uticaje na životnu sredinu je održiva intenzifikacija poljoprivrede. Cilj ovog rada je da sagleda sve, kako pozitivne, tako i negativne aspekte dosadašnjeg razvoja biotehnologije i ukaže na mesto i ulogu koju bi koncept održive intenzifikacije trebalo da ima u očuvanju prirodnih resursa i ostvarivanju prehrambene sigurnosti.

Ključne reči: prehrambena sigurnost, biodivezitet, zemljište, zelena revolucija, održiva intenzifikacija

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BUSINESS PERFORMANCE OF 15 LARGEST EXPORTERS IN FOOD-PROCESSING INDUSTRY IN THE PERIOD 2008-2014

Zoran Jeremić¹, Marko Milojević², Ivica Terzić³

Summary

Agricultural export in Serbia is dominated by primary agricultural products with highly processed products having only 20% share in total exports. Low share of the processed agricultural products in total exports provides an opportunity to increase export and change its structure towards higher value-added products. In order for it to happen, the food-processing industry focused on processing domestic agricultural products needs further development. In this paper, we have analysed business performance of 15 largest exporters in the food-processing industry with the aim to get insight into their export competitiveness. The paper concludes that these companies are large net exporters that provide high added value to the country's economy. However, business performance of the exporters under analysis are not satisfactory and their export competitiveness needs the improving. According to projections, the upcoming period will bring the most difficult challenges for the sugar-producing companies while the fruit-processing sector has the best long-term potential for export growth.

Key words: *food-processing industry, export, competitiveness*

JEL: *G32, Q14*

Introduction

After a minor setback in 2009, Serbian export continued to increase, recording a slight change of its structure towards higher share of processed and higher-value products. In this respect, we may observe that export is one of rare bright sides in this country's

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economy but nevertheless, this change is rather negligible compared to the export level which would be able to turn the negative economic trends into positive. (Milojević, Terzić, 2015). The areas in which Serbia has a chance for significant improvement are primarily food-processing industry, car and car parts industry, electrical appliances industry and informatics. The agriculture is the single most underutilized resource since primary agricultural products are still predominant in export structure (Pejanović, 2009). Therefore, it is vitally important to develop a strong food-processing industry which relies on domestic agricultural raw materials. About the problems of agriculture financing, measures to overcome the economic crisis, wrote most prominent authors in the field of agriculture (Pejanović et al., 2009; Jolović et al., 2014). They concluded that the state provides incentives but that in times of economic crisis they are inadequate. A certain improvement has been achieved, as noted by the World Bank: “Serbia is in a good position in **food-processing**; its exports of such goods have grown at least as much as those of Bulgaria, Croatia, Romania, and Slovakia, though not as much as those of Hungary or the Czech Republic” (World Bank, 2012).

In respect of export, the food-processing industry has several potential advantages over other industries (Miletić et al 2012; Ljunović et al, 2015). Its growth potential is enormous since similar-sized countries have multiple times higher exports than Serbia. As opposed to industries which rely heavily on imported components (like largest exporters: Fiat and Zelezara), the use of imported products is relatively low in the food-processing industry. Therefore, the food-processing companies should also be large net exporters which would be very important for the country's balance of trade and balance of payment (Simeunović, Milošević 2013). Also, there is the issue of often minimum higher value added to the products manufactured by large food exporters (Stevanović et al, 2013). Therefore, this paper aims to test these hypotheses regarding the significance of food-processing industry by analysing business performance of 15 largest exporters from this industry in the period 2008-2014, which also made it into top 100 largest exporters in 2014. When it comes to export competitiveness, numerous researches have shown that, in today's globalized world, large companies more easily enter an export market which is characterized by the strong competition. It is easier for large companies to recruit personnel, to develop and ensure standardization of the products and obtain necessary certificates which are a precondition for entering foreign markets. Therefore, 15 largest exporters can also be a representative sample for analysis of export performance and competitiveness of this entire sector. One should bear in mind that those 15 companies which are classified as large companies in Serbia would fall in the category of small or mid-size companies in the global market. On the other hand, food-processing companies classified as small and mid-sized companies are not competitive in export and make only 4.3% of exporters in total. These companies operate in low technology areas, making products of small added value and diversity which results in poor market position, low prices and income margins (Strategy for development of small and mid-sized companies, entrepreneurship and competitiveness in the period 2015-2020).

Methodology

This paper analyzes business performance of 15 companies from the sectors of food processing industries which by their exports belong to the 100 largest exporters in the Republic of Serbia. Data on exports has been collected from Customs Administration and the data on business operations from the website of the Agency for Business Registers. Out of 100 largest exporters 15 of them belong to the the processing industry and they are classified as large companies.

The methods that were used in the scientific paper are description, comparison, analysis and synthesis. In order to answer on the question of research Du Pont formula was applied. Du Pont formula explains how the effect of profitability, leverage and turnaround assets speed affect on the company's business operations.

What companies are largest exporters in food-processing industry?

Large exporters, namely, have better chances of conquering a foreign market and may significantly contribute to the integration of small producers involved in the making of the final product intended for export. For this reason, we examined 15 exporters in the food-processing industry that are also among the top 100 largest exporters. The aim of this paper is to analyse their business performances based on their operating results in the period 2008-2014 in order to determine their growth potential in regard to export depending on the agricultural products they process. Table 1 displays 15 food-processing exporting companies which ranked among top 100 exporters in Serbia in 2014 based on export achieved.

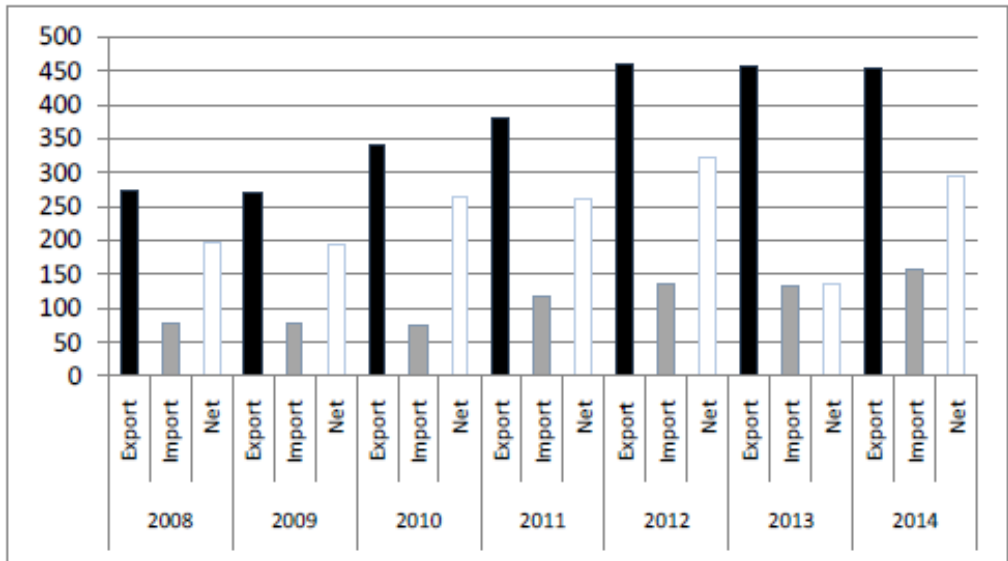
Table 1. Fifteen Largest Exporters in the Agricultural Products Processing Industry (in Millions of Euro)

Rank	Company name	2014			2013			2012			2011			2010			2009			2008		
		Export	Import	Net	Export	Import	Net	Export	Import	Net	Export	Import	Net	Export	Import	Net	Export	Import	Net	Export	Import	Net
23	SOJAPROTEIN Bečej	64	2	61	63	3	0	57	2	55	45	17	27	30	6	24	17	6	12	16	1	15
26	V.OIL, Šid	52	3	49	72	3	0	81	12	69	74	10	64	66	9	56	42	9	32	51	2	49
27	SUNOKO, N. Sad	50	8	42	76	15	0	69	7	62	59	10	49	86	3	83	44	2	42	48	2	46
36	SWISSLION, BEOGRAD	38	47	-9	32	39	-2	34	21	12	15	6	9	0	1	0	20	13	7	6	2	4
42	DIJAMANT, Zrenjanin	35	23	12	30	16	13	31	13	17	21	13	8	21	12	9	23	16	7	24	19	5
46	TE-TO, Senta	33	3	30	25	3	22	32	2	30	27	3	24	23	3	21	26	0	26	20	2	18
64	KONZUL N. Sad	23	14	9	20	12	8	25	12	13	19	13	6	11	3	8	7	2	5	5	12	-7
68	RAUCH SERBIA	22	11	11	17	8	9	18	15	4	12	8	3	9	9	0	7	8	-1	6	10	-3
70	NECTAR B. Palanka	22	19	4	21	11	11	22	13	9	23	10	14	19	8	10	14	6	8	15	10	5
71	ŠEĆERANA CRVENKA	22	1	20	28	2	26	24	6	18	28	2	25	22	3	19	20	1	19	23	2	21
84	IMLEK Bgd	20	10	10	15	9	5	20	21	-1	18	13	5	19	10	9	21	9	12	19	9	10
89	GEBI Čantavir	19	10	9	17	4	13	13	6	8	12	5	6	6	4	1	5	4	1	3	4	-1
93	CARNEX Vrbas	18	5	12	11	6	5	10	3	8	10	5	5	11	3	7	11	1	11	13	1	12
94	F-KA ŠEĆ. Žabalj	17	1	16	17	1	15	17	1	16	17	1	16	17	1	15	12	0	12	24	1	23
97	ELDIR, Šabac	17	1	16	13	1	12	6	1	5	0	0	0	1	0	1	0	0	0	0	0	0
	UKUPNO	453	159	294	456	133	137	459	135	324	380	119	261	339	76	264	271	78	193	273	77	196

Source: Data obtained from Customs Administration; Authors' calculations

In the group observed, majority of companies increased their export compared to 2008. This is a major success having in mind that global economic crisis had a very strong impact on Serbian economy as well. However, it may be that such circumstances forced these companies to shift their focus to export at the time when domestic market deteriorated and many companies became illiquid and insolvent, which seriously aggravated the situation in respect of collection of receivables. In such circumstances, only the exporting companies could count on more stable sources of income and survival on the market.

Chart 1. Export and Import of Top 15 Largest Exporters in the Food-Processing Industry



Source: Data obtained from Customs Administration; Authors' calculations

If the total export of this group is viewed in aggregate, we notice a stable growing trend up to 2012, while the same achieved level was maintained in the period afterward. Net export is constantly high, though certain decline is observed in 2014 (net export of this group in 2013 had a 71% share in total export, and 65% in 2014). Having in mind that Serbia's import exceeded export, that the group of 100 largest exporters had a 3.5% share in total export in 2013 and 7.4% in 2014, it is clear that 15 largest exporters have a superior position among net exporters.

Table 2. Total Net Export, NetExport of Top 100 Exporters and Net Export of Top 15 Largest Food-Processing Exporting Companies (in Millions of Euro).

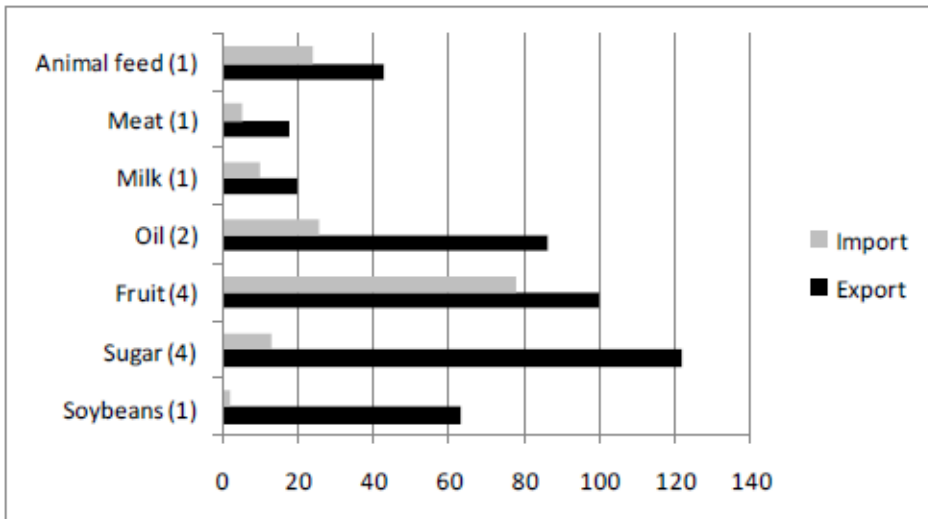
	2013	2014
Total Export	13,937	14,451
Total Import	17,782	18,096
Net Export	-3845	-3,645
Top 100 Export	5,789	6,240
Top 100 Import	5,586	6,701
Top 100 net export	203	-461
Top 100: Export share	3.5%	-7.4%
Top 15 food processing, export	456	453
Top 15 food processing, import	133	159
Top 15 food processing exporters, net	323	294

	2013	2014
Top 15 food processing, export share	71%	65%

Source: Data obtained from Customs Administration; Authors' calculations

This result is particularly important when its impact on the country's economy is taken into consideration in respect of added value products, as well as the impact it has on the large number of commodity producers whose jobs and stable income is ensured through purchase of their primary agricultural products for processing purposes.

Chart 2. Classification of Exporters in Groups per Raw Material Processed (Number of Companies, Export and Import, in Millions of Euro)



Source: Data obtained from Customs Administration; Authors' calculations

The representation of individual food processing companies according to agricultural product they process (Chart 2) indicated that the largest exporters included 4 sugar and fruit-processing companies, two vegetable oil manufacturers and two animal feed manufacturers along with three companies processing soya, milk and meat. The largest exporters were 4 sugar-producing companies' i.e. largest net exporters, which makes them all the more important⁴.

4 At the same time, this is identified is the greatest threat to further growth of export for this group for reasons which will be further explained in the section dealing with financial analysis of the companies' activities. The risk is increased also because significant changes are expected to occur in the sugar market due to decisions reached in the EU which will affect the competitive strength of domestic sugar-producing companies particularly from 2017 onward when the measures prescribed will take full effect.

Soya processing companies will also experience certain risks in the future period and for several reasons. However, the analysis of this market and competitiveness of domestic products requires detailed examination. Processing of this primary material (soya) could prove an excellent example for processing of other primary agricultural products as well but also proves that associated risks in the area of business are difficult to avoid in current unfavourable circumstances in terms of business activity, financing and management.

Fruit processing is a great opportunity for Serbian food-processing companies and a potential comparative advantage to be used. However, here we also come across the issue of organization, association and enlargement of companies along with expensive financing. The fruit is mainly exported unprocessed and the quality of raw material is very good⁵. The food processing subsector i.e. production of juices is one with the best perspective on a global level. According to data of European Fruit Juices Association (EFJA), the production of fruit juices on a global scale reached 38.653 million litres in 2014 with about 10,000 million litres produced a year in EU alone. In Serbia, the share of fruit juices manufacturers in GDP has recorded a stable increasing trend in the last 15 years, with minimum variations. Serbia is one of the leaders in the fruit juice manufacturing industry in the region with annual production of about 230 million litres. The share which the fruit and vegetable industry has in total export varies from year to year, but its average ranges from 5% to 10%, while the import of fruit juices is below 2%. This means that net export is exceptionally high and this in itself is an enormous potential for improving the country's balance of trade and balance of payment. All the more since there is high quality raw material available and fruit processing is one of rare potential comparative advantages Serbia has in the global market.

Low share which meat- and milk-processing companies have in total exports is indicative of the poor conditions in agriculture and unused opportunities.

Business performance of 15 largest exporters in the food-processing industry

The group of 15 companies under analysis, from a cumulative perspective, recorded the growth of operating income of 34% in 2014 compared to 34% in 2008. However, the mean exchange rate of dinar depreciated against euro by approx. 36% in the same period when comparing end of 2008 to the end of 2014, and average mean exchange rate of dinar against euro (which is more relevant for comparison of income statement items) depreciated by 44%. Therefore, no realistic increase in operating income was observed in the entire group. Individually though, 9 companies recorded growth even

5 According to data available at Serbia's Statistical Office, the value of fruit exported in 2012 reached 197 million euros and 229 million euros in 2013, and 267 million euros in 2014. According to data available at the Serbian Chamber of Commerce, the export of maize, raspberries, cigarettes, sugar and apple in the first 11 months of 2015 were among the five most significant agricultural products which generated about 800 million dollars worth of income.

if compared in terms of euro, while 6 of those companies recorded declining operating income, 2 of which recorded lower operating income in absolute value in dinars.

Table 3. Ranking per Growth of Operating Income (in Millions of RSD)

Company name	Assets	Capital	Operating Income	Operating Profit	Net profit	No. of employ.	Growt of empl.	Operating Income Growt
							2008-2014	2008-2014
2014								
ELIXIR FOOD DOO, ŠABAC	3,654	2,987	2,580	57	39	125	205%	302%
SWISSLION DOO, BEOGRAD	10,226	8,024	8,991	602	697	873	203%	183%
GEBI DOO, CANTAVIR	5,705	1,676	7,274	669	147	214	59%	144%
DOO KONZUL NOVI SAD	1,555	383	5,517	100	32	61	49%	136%
RAUCH SERBIA	2,771	1,998	3,859	357	284	147	31%	113%
SUNOKO DOO, NOVI SAD	37,353	16,149	18,312	1,418	699	469	769%	84%
TE-TO, SENTA	8,310	1,837	6,731	0	0	174	-14%	57%
NECTAR DOO, B. PALANKA	13,168	5,581	7,795	558	180	638	0%	49%
VICTORIAOIL AD, ŠID	18,243	4,469	12,473	912	0	282	31%	48%
AD IMLEK, BEOGRAD	27,447	10,747	22,890	3,518	2,209	768	-42%	29%
CARNEX DOO, VRBAS	12,555	9,048	7,199	1,094	683	950	-50%	23%
AD F-KA ŠEĆERA, ŽABALJ	4,524	1,041	3,693	0	0	189	-22%	15%
DIAMANT AD, ZRENJANIN	20,741	9,691	12,768	1,432	869	721	-17%	12%
ŠEĆERANA CRVENKA AD	8,803	2,140	5,969	0	0	207	-28%	-5%
SOJAPROTEIN AD, BEČEJ	25,658	10,865	11,218	767	252	387	-3%	-42%
Ukupno	450,409	247,696	161,071	23,802	12,318	6,228	-8%	34%

Source: Serbian Business Registers Agency; Authors' calculations

In analysing business results achieved by food-processing companies, one must bear in mind that their operation is largely affected by factors beyond their control. Main extreme factors are changes in stock exchange prices and fluctuations of foreign exchange rates. Both these factors are characterized by high volatility in the market over the observed period and, according to projections, this trend will continue in the upcoming years. The second factor affecting their operating income is of internal nature and refers to successful business management.

Out of fifteen companies from the food-processing industry under observation, four recognized net loss in 2014 and three of them are sugar-producing companies (TE-TO Senta, Šećerana Crvenka, AD Fabrika šećera Žabalj), the fourth being Victoria Oil. First, we tested if the recognized net loss was the consequence of financial and extraordinary expenses or the consequence of company's lack of ability to achieve adequate difference between operating income and operating expense (margin). This information is of vital importance as it provides the answer to the question whether the companies under observation are capable of covering all their operating expenses, which had a share in generating income, according to total expenses method. Out of four net loss-generating companies, three recognized operating loss (all sugar-producing companies) and only one recorded operating profit (Victoria Oil). Having in mind that sugar production requires significant investments in production and equipment modernisation, we examined the trend of the operating profit during the entire observation period. Data

show that sugar-producing companies recognized operating loss only in 2014. In all previous years, these companies recorded operating profit. Key reasons behind this change lie in unfavourable price of sugar in the international market and high price of gas used as fuel in processing. For this reason, these analysed companies could not cover their operating loss with their operating profit and thus partial profitability indicators are negative for 2014.

The main external problem regarding sugar export is, however, high volatility of its price in European markets along with announced cancellation of EU sugar quotas, with subventions remaining at the same level, which will lead to increased supply. Consequently, this leads to the market instability which in turn reflects on sugar-producing companies' operating results. Sugar prices have a downward trend and thus make it all the more difficult for these companies to fight off the competition from other EU countries which are far better supported by the national subvention system and state-of-the-art technology, so that significant drop in sugar price could force the those less efficient sugar producing companies into loss. Therefore, adequate solutions for sustaining sugar producing industry, which is very significant for exports, must be found within the economic policy as a whole. The perspective of sugar export growth in the future would otherwise be doomed to failure.

Since the companies which recognized operating loss produce stock exchange goods, they do not have any influence on the pricing policy. Their operation is much more influenced by the factor which determines their operating profit which enables them to cover their operating expense, i.e. the issue of reducing operating expenses. For this reason, the first factor we analysed was the structure of operating expenses per year. We may conclude that companies which recognized operating loss had an increased share of depreciation costs in the structure of operating expenses (Victoria Oil, Šid and Sugar Factory Crvenka) and one of the reasons why these companies were unable to achieve positive operating results is the fact that depreciation costs were fixed costs. Due to reduced operating profit and stable trend of these expenses, these 2 companies consequently records negative operating results. Likewise, by examining the share of material costs in the structure of expenses and in relation to operating income we may conclude that the difference (margin) between the cost of material and operating income generated is reduced while the share of these costs increases in the structure of overall expenses (Vukoje, 2009). This situation is only possible due to the fact that the cost of wages is reduced in total structure of expenses in relation to operating income.

Table 4. The Share of Wages and Amortization in Operating Expenses

COMPANY	costs in operating expenses		The share of amortiz in operating expenses		Operating expenses
	2014	2009	2014	2009	
SOJAPROTEIN, AD BEČEJ	5%	2%	4%	1%	-30%
VICTORIA OIL AD, ŠID	3%	1%	3%	2%	16%
SUNOKO DOO, NOVI SAD	5%	2%	4%	1%	84%
SWISSLION DOO, BEOGRAD	8%	4%	5%	6%	41%
DIJAMANT AD, ZRENJANIN	8%	8%	3%	3%	30%
TE-TO, SENTA	5%	6%	3%	4%	54%
DOO KONZUL, NOVI SAD	1%	2%	0%	0%	198%
RAUCH SERBIA	7%	8%	5%	7%	73%
NECTAR DOO, BAČKA PALANKA	10%	11%	4%	6%	59%
ŠEĆERANA CRVENKA, AD CRVENKA	7%	10%	4%	3%	5%
AD IMLEK, BEOGRAD	7%	11%	4%	5%	33%
GEBI DOO, PO ČANTA VIR	2%	2%	2%	2%	136%
CARNEX DOO, VRBAS	18%	29%	6%	3%	17%
AD FABRIKA ŠEĆERA, ŽABALJ	8%	12%	1%	3%	36%
ELIXIR FOOD DOO, ŠABAC	8%	3%	4%	2%	114%

Source: Serbian Business Registers Agency; Authors' calculations

The explanation for negative financial results of Victoria Oil Company can be found in sudden growth of financial expenses. Financial expenses in 2014 increased by 528 million RSD since 2013 and by 38.7% compared to initial year under observation. It is interesting to examine the movement of financial expenses position. In the period 2009–2013, the company recognized relatively constant financial expenses (cyclic trend characterized by mild growth followed by mild decline) only to increase in 2014 by a record 88%. For this reason, we examine the financial expenses item. In addition to significant growth due to interest expense towards third parties which recorded an increase of 200 million RSD, negative foreign exchange rates and negative trends of foreign currency clauses in transactions with third parties were also observed. This increase is the result of accounting regulations applicable in 2014 which prescribe that all negative foreign exchange differences from the previous periods, which have not been recognized so far, must be recognized in income statements and the balance sheets.

The leverage shows the actions taken as well as the capacity of the company to increase owner's capital by borrowing. The purpose of using leverage is enabling the company's management to borrow at low interest rates and to place and invest such funds in lucrative projects. The trend recorded by the capital multiplier, observed as the ratio of total average assets and total average capital, makes it clear whether the observed companies were in the process of expansion, stagnation or relaxation, as viewed through the prism of utilization of borrowed funds for development purposes. By comparing the value of capital multiplier from 2014 with its value in 2009, we may conclude that two of those

loss-generating companies (Victoria Oil and TE-TO) significantly lowered the share of borrowings in total financing sources (Žabalj, Crvenka) to the level of 77-109%. Based on obtained data, we cannot claim with certainty that the capital multiplier is the factor which significantly affected the recognition of net operating loss.

The next factor whose effect we examined was fixed-assets turnover rate. This is a financial ratio which shows how many times average engaged fixed-assets are turned over i.e. the number of days in a year is divided with a turnover rate resulting in an average number of days needed to achieve the turnover. The value of this ratio is different for different business activities and even companies in the same industry have different ratios.

Table 5. Turnover Rate for Average Fixed Assets for the Period 2009-2014

COMPANY	Turnover rate (operating income/average assets)							
	Year	2014	2013	2012	2011	2010	2009	2014/2009
SOJAPROTEIN AD BEČEJ		0.46	0.52	0.78	0.71	0.78	0.82	-44%
VICTORIA OIL AD ŠID		0.71	0.81	1.39	1.18	1.08	0.92	-23%
SUNOKO DOO NOVI SAD		0.54	0.83	0.86	1.06	0.95	0.75	-27%
SWISSLION DOO BEOGRAD		0.90	1.03	0.96	0.95	0.94	1.28	-29%
DIJAMANT AD ZRENJANIN		0.58	0.60	0.86	0.77	0.83	0.65	-10%
TE-TO		0.85	1.27	1.36	1.51	1.19	0.97	-12%
DOO KONZULNOVI SAD		4.11	4.37	4.93	4.24	2.77	2.35	74%
RAUCH SERBIA		1.43	1.29	1.67	1.41	1.32	1.10	30%
NECTAR DOO BAČKA PALANKA		0.59	0.58	0.61	0.68	0.67	0.65	-10%
ŠEĆERANA CRVENKA AD CRVENKA		0.70	0.94	0.87	0.94	1.07	1.15	-39%
AD IMLEK BEOGRAD-PADINSKA SKELA		0.84	0.86	1.06	1.13	1.07	1.04	-19%
GEBI DOO PO ČANTAVIR		1.54	1.64	1.44	1.47	1.66	1.75	-12%
CARNEX DOO VRBAS		0.59	0.60	0.83	0.78	0.83	0.92	-36%
AD FABRIKA ŠEĆERA ŠAJKAŠKA ŽABALJ		0.76	0.96	0.94	1.15	1.14	0.97	-22%
ELIXIR FOOD DOO		0.66	0.37	0.69	1.06	0.91	0.94	-30%

Source: Serbian Business Registers Agency; Authors' calculations

The turnover rate is precisely the factor which may yield the conclusion on the method used by the management to invest assets in certain forms of business property in order to improve profitability. Higher ratios are expected in more successful companies. By analysing loss-generating companies, we saw that regularity with which companies which recognized loss also experienced significant slow-down in fixed-asset turnover rate in 2014 compared to initial year of the period under observation. What all of these companies share in common is that in 2009, all of them had this ratio above 1 which means that operating income in the course of the year exceeded the average fixed-assets' value. In 2014, the turnover rate declined so that this ratio was below one for all analysed loss-generating companies in food-processing industry. It is interesting to note the regularity of this decline as well. All four companies which recorded net loss also experienced the slowing down of fixed-asset turnover ratio between 28% and 35% in 2014 when compared to 2009. Detection of this factor is of vital importance because it shows that fixed-asset turnover ratio is a highly important factor for company's operating results.

By analysing the key elements of Du Pont formula, we may conclude that the decline of profitability and slowing down of turnover rate are factors which determine and promote negative operating results.

Conclusion

Our investigation confirmed basic hypothesis that Serbian food-processing industry, which relies on processing of domestic agricultural raw materials, is a great chance for increasing export and that it has additional value for the country's economy and significant multiplying effect on other aspects of great importance for the country's future growth. The top 15 exporting companies analysed have very high net export as they use domestic raw material and are not import-dependent. If we have in mind the Serbian import exceeds export and that the group of 100 largest exporters had only 3.5% share in total export in 2013 and that import of top 100 exporters exceeded their import by 7.4%, the group of 15 largest exporters, with their net export being 70% of the total export, is superior among net exporters. This means that such companies are extremely important for the country's balance of trade and balance of payment.

Agriculture will not remain the most unused resource only if export based on primary agricultural product is transformed towards developing strong food-processing industry. Food-processing industry has several significant advantages over other industries in respect of export. This industry has a huge potential for growth because countries of similar size have multiple times higher export than Serbia. As opposed to industry which heavily relies on imported components (the example being largest exporters such as Fiat and Zelezara Smederevo), food-processing industry has a relative low share of imported components which makes the food-processing companies, in addition to being large net exporters, also the top quality part of the Serbia's industry as it contributes the most to its added value. For illustration purposes, the contribution of Železara Smederevo may be high from the standpoint of increasing gross domestic product but its net export and added-value contribution would be relatively low due to high dependency on import. It is justifiable to question the effects which could have been achieved if 100 million euros of subventions a year invested in its operation had been invested instead into the growth of food-processing industry in order to change the export structure and achieve lower share of primary agricultural products in export, characterised by low profit margins and low added-value, and increase the export of companies which process these agricultural products.

Business performances of analysed exporters are not satisfactory and export competitiveness of such companies needs to be enhanced. Global market is characterised by high volatility of prices for stock exchange goods which are also the basic raw material used by processing industry. The competition is stronger and consolidation is occurring on the large scale. As higher market turbulences can be expected in the future, it is unclear whether currently relatively successful processing companies can maintain their position in the market or if they should consider forming strategic partnerships with large companies. The sugar-producing companies will face the greatest challenges

whereas fruit processing has the best long-term potential for increasing export. In the face of such upcoming changes, it is most important, however, to improve current business environment in Serbia and to ensure adequate participation of processed agricultural products in export within the implementation of the strategy for strengthening export as this would in effect imply the use one of Serbia's rare comparative advantages.

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POSLOVNE PERFORMANSE 15 NAJVEĆIH IZVOZNIKA IZ PREHRAMBENO-PRERAĐIVAČKE INDUSTRIJEU PERIODU 2008- 2014. GODINA

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Sažetak

U strukturi izvoza poljoprivrede Srbije dominiraju proizvodi primarne poljoprivredne proizvodnje, dok proizvodi višeg stepena prerade čine tek oko petine ostvarenog izvoza. Tako nizak procenat izvoza proizvoda više faze prerade ujedno je i šansa za veliko povećanje izvoza i promenu njegove strukture ka proizvodima veće dodajne vrednosti. Da bi se to dogodilo, potrebno je razviti prerađivačku industriju zasnovanu na preradi domaćih poljoprivrednih proizvoda. U radu se analiziraju poslovne performanse 15 najvećih izvoznika iz sektora prerađivačko prehrambene industrije s ciljem da se sagleda njihova izvozna konkurentnost. Zaključak je da su ova preduzeća veliki neto izvoznici gde postoji visoka dodata vrednost za ekonomiju zemlje. Poslovne performanse analiziranih izvoznika nisu, međutim, zadovoljavajuće, pa je neophodno da unaprede svoju izvozna konkurentnost. Predviđa se da će u narednom periodu pred najvećim izazovima biti poslovanje šećerana, a da prerada voća ima najveći dugoročni potencijal za rast izvoza.

Ključne reči: *prehrambena industrija, izvoz, konkurentnost*

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REDUCATION OF VOLATILITY YIELD AND PRICES IN CORN PRODUCTION USING REVENUE INSURANCE¹

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Summary

Revenue insurance represents a new risk management tool in agriculture, based on the difference between the guaranteed and actual revenue of the entire farm or some production. Most commonly, crops that have a significant share in the structure of planting or significant yield are insured with the application of this tool. Mercantile corn is the most important field crop in Serbia, and climatic conditions and price changes have a huge impact on its production. As one of the aspects of struggle with volatility of revenues there is a possibility to insure the corn revenue, by concluding the insurance agreement. However, the revenue insurance is very slightly applied in the world, while in our country in recent years is in its infancy. This paper analyzes the economic and legal aspects of the insurance model in order to determine the basic mechanisms of its functioning, as well as the conditions that must be fulfilled so that conclusion of the agreement would have an economic justification for both parties (farmers and financial institutions). It also examines the normative framework for the conclusion of this agreement and stresses the differences relative to the classic insurance contract.

Key words: *corn, insurance, price, volatility, yield.*

JEL: *Q12*

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Introduction

It is significant to comprehend the nature of the risk, such as its origins, distribution and connection with other risks, as well as the ability of certain instruments to reduce it, in order to develop sound risk management strategies (Hardaker et al., 1997). Before they spend money on the payment of insurance premiums, farmers will do everything they can to reduce their economic risk by using some of the internal methods for risk management (risk avoidance, diversification or forming reserves) (Marković, Jovanović, 2011). If none of these methods do not bring adequate results, farmers have to resort to external instruments for risk management (transfer risk or insurance), and one of the dominant ways is to insure their production.

Generally speaking, all types of the insurances can be offered by the principle of specialization and universality. Risk insurance (mostly hail) is a typical example of the first principle, while the principle of universality includes protection from a number of risks and appropriate coverage level, so there is the guaranteed yield insurance, revenue insurance, net income insurance, etc. (Weidenfeld, 1991, Schlieper, 1997). While hail insurance is usually offered by private insurers as a specialized type of insurance, more complex and more universal insurance models belong to the domain of the public sector or it is a form of public-private partnership (Wright, Hewitt, 1994). It is certain that these more complex forms of insurance, considering the types of risk that are being covered, the method of calculating insurance premium, methods of determining insurance indemnity and other relevant parameters, could not survive without government subsidies (Binswanger, 1986). It all points to the fact that these concepts of insurance become an integral part of the national agricultural policy and thus tends to affect the conservation and stabilization of farmers' income, increase in average income and improvement of credit ability of the insured, the stabilization of markets, increased productivity of agricultural production, as well as conservation and environmental protection (Ray, 1991).

In the past, the most discussed topics were various aspects of yield insurances. With this insurance, price change risk falls on the farmers. For this reason, the research center of attention comes to the issue of revenue insurance respectively the farmers' income. Revenue insurance is a combination of yield and price insurance, and in this case indemnity shall be made if revenue reaches the appropriate level (Marković, 2013). It means that this model allows insurance from revenue reduction caused by price fall, lower level of yield or a combination of these two causes (Bielza Maria et al., 2002). During 1994 this new insurance product appeared in two forms in the US market. The first form was consisted of individual production lines, where the difference between the predetermined amount of revenue and realized revenue of a certain product was compensated. Another form was related to the whole farm, and here payment has occurred if the total farm income is lower than a predefined amount (Berg, 2001).

By conclusion of the revenue insurance agreement with insurance organization, farmer reduces the variability of his/her incomes, but he/she still cannot influence the changes

that occur on the expenditure side. This could be partly solved by introducing coverage margin insurance, where the intention was to protect the variability of the expected net income, and in this way to cover the expected variable costs (mainly costs of inputs such as seed, fertilizer, pesticides, fuel), what will certainly be the subject of research in a new study.

Farmers will realize significant savings with the revenue insurance, given that with the purchase of a policy they will be insured at the same time from a reduction in yield, and the reduction of the market price as well (Mishra, Goodwin, 2006).

The aim of the research in this paper is to explain the role and importance of revenue insurance, as well as to point to the possibility of its application on the Serbian market in the case of concluded revenue insurance agreement in major field crops.

Materials and methods

The paper uses data of corn yields from the individual farm in Novi Sad municipality. Also, statistics on field yields that are based in the period of 10 years were also available. In this way the conditions for reliable and transparent procedure for the establishment of regional or individual yield were fulfilled. This means that the correct application of yield insurance is the first prerequisite for revenue insurance.

On the other hand, historical data on the corn price in the selected time period is used. Changes in yields and prices, including their regional diversity are key drivers of agricultural incomes, and thus the starting point for risk analysis. The relationship between yield and price is of the key importance because it largely determines the possibility of potential loss.

With realization of their products, farmer achieves appropriate market revenue, as a product of the actual yields and price during the harvest ($R = y p$). To prevent variability (volatility) of this parameter, he/she can enter into a contract with the insurance company and thus can predetermine guaranteed future income which represents guaranteed revenue, and which is defined as the product of the average yield, price during planting and coverage level:

$$R_g = y_i p_i \delta \quad (1)$$

In the basic type of revenue insurance, change in yield (price) is defined by reducing the yield or price fall following harvest compared with the planned values. In the event of failure to achieve the guaranteed income a farmer is entitled to indemnity which represents the difference between the guaranteed revenue and realized revenue (Knight and Coble, 1997):

$$P_m = \text{Max} \left[0, (y_i p_i \delta - p) \right] \quad (2)$$

The starting point for the determination of each insurance premium is the expectation of occurrence of the corresponding harmful event (Berg, 2001). In the revenue insurance,

it is calculated according to the following formula:

$$P_i = H\{p \langle y_i p_i \delta \rangle\} E(y_i p_i \delta - p \mid p \langle y_i p_i \delta \rangle) \quad (3)$$

where $H\{p \langle y_i p_i \delta \rangle\}$ means the probability of occurrence of harmful event, and the expression $E(y_i p_i \delta - p \mid p \langle y_i p_i \delta \rangle)$ is the expected value operator. In other words, the expected damage is calculated as the product of probability that the realized revenue is below the guaranteed value and of the expected value that assigned parameter will not be achieved, or that guaranteed revenue will not be achieved.

Insurance premium is calculated in the model which corresponds ultimately to the expected harm (i.e. fair premium and net risk premium) and it does not lead to the expected increase in income. In this way, the rule that the insurance is risk management tool is being respected, so it is not a mean of income support. In this case, the insurance premium corresponds to the expected value of damages, with the caveat that (\bar{y}_i) corresponds to the expected amount of yield, and (\bar{p}_i) is expected price of the product:

$$E(P_m) = E\left(\text{Max}\left[0, (\bar{y}_i \bar{p}_i \delta - p)\right]\right) \quad (4)$$

The sum of the market (realized) revenue and insurance benefit represents the gross revenue (5), and if premium was deducted from it, it would be received the net revenue (6):

$$R_b = p + \text{Max}\left[0, (y_i p_i \delta - p)\right] \quad (5)$$

$$R_n = -E\left(\text{Max}\left[0, (\bar{y}_i \bar{p}_i \delta - p)\right]\right) + p + \text{Max}\left[0, (y_i p_i \delta - p)\right] \quad (6)$$

Gross revenue does not necessarily have to be equal to the guaranteed revenue since in the case that the realized (market) revenue was beyond the guaranteed, there will be no payment of insurance indemnity. On the other hand, the net revenue is higher than the market (realized) revenue, except in case when this is greater than the guaranteed revenue.

Results and discussions

Application of revenue insurance in the world

Based on one of the basic principles of insurance – revenue insurance should be quantitative and measurable, and also unpredictable and not manipulated by farmer, and its premium must be economically feasible and achievable. On the other hand, this type of insurance requires historical data, or an appropriate risk analysis of one of the three components - yield, price or yield-price correlation.

In the early 90's, the United States and Canada began developing the first models of the revenue insurance policies (Goodwin, Ker, 1998), while today this type of insurance is the predominant form of risk management in the United States. During the 90s there was the introduction of new insurance programs (CAT-Police and Revenue comprehensive cover). Farmers have the obligation to pay relatively low administrative fee, otherwise guaranteed them protection from yield loss, and also indemnity in case of reduction of product prices (Marković, 2013). Here we can talk about three concepts: basic insurance against extreme crop and fruit damages (CAT-Police), supplementary insurance with varying coverage level and insurance indemnity (Buy-Up Police), as well as insurance from a reduction in yield and / or product price (Crop Revenue Coverage) (Berg, 2001).

Government support has a decisive influence on the functioning of this type of insurance, and the program covers more than 80% of the ten most important crops. For a large number of crops and fruits, public-private insurance system, supported by the Federal Crop Insurance Corporation (FCIC), and administered by the Agency for Risk Management (RMA), offers revenue insurance (income) with different types of cover. Currently 70% of insurance premium FCIC is for individual revenue coverage with a share of 15% to 30%. The public sector subsidizes 60% of the premium and co-financed losses in proportion to weight loss. However, on the other hand, the government has provided grants to farmers who have suffered damage from natural disasters, which resulted in reducing the number of interested to insure their crops. For this reason, it is recommended that in future the government, in case of accidents, provides assistance only to insured farmers (Meuwissen et al., 1999).

In 1999 the project Adjusted Gross Revenue (AGR) has started, and aim of this program was to establish revenue insurance of the entire farm, and thus it secured revenue losses based on changes in the average yield and prices of selected crops in the five-year period. This project lasted until 2001, initially in five states, and the process of calculating the guaranteed revenue was based on the data of Tax Administration (Skees, 1999).

Canada has introduced revenue insurance in the Alberta province, which is highly supported by the state.

In Brazil, as one of the most developed agricultural regions in the world, the system of crop insurance did not work or was almost absent for many years. Since 2006, the system of subsidizing insurance premium has been introducing, which leads to an improvement of the situation in this sector. However, due to poor integration in measures of agricultural policy and the lack of stability, participation (subsidizing) unfortunately stagnating or even declining since 2009. At that time, starts the initiative to introduce revenue insurance, which required strengthening of financial regulations, but it has not found support from the public and the government. This is the result of the fact that Brazil does not have a developed infrastructure for agricultural insurance, as well as the regional price mechanisms, and if they do exist, they are not available to the extent necessary to insure the revenue.

Since 2008, the EU has enabled Member States to use part of their budget for co-financing of agricultural insurance. However, only a few countries have used this possibility. A study conducted in the EU was focused on the changes in farmers' income, as a determinant of risk management, and pointed out that there is expressed interest in income insurance. This type of insurance is still present to a lesser extent in the private sector, rather than revenue insurance. This lies in the fact that the income is a more comprehensive concept from revenue and that, in this case should take into account more risk factors which will be at the same time under strong political influence (e.g. import and export tariffs, the system of subsidizing income). Within the focus of income support for EU farmers, a much greater impact has social, rather than production, and market aspect. Therefore, taking into account the tight budget of the EU and the discussion that is largely focused on the future of direct payments, it could be concluded that government support for comprehensive yield insurance (revenue) remains very limited.

In France there have been attempts to establish a pilot project for revenue insurance. Although there is very limited government support for the yield insurance, there was no support for this pilot project which would also, in addition to the yield, insure the product price.

On the other hand, for decades the system of agricultural insurance in Spain is completely based on public-private partnership and provides a wide range of risk coverage that reduce crop yields, but without insurance of price.

In Serbia, since 2014, a product was developed which can insure crops against the risk of income loss (revenue loss). Revenue insurance covers the difference between the guaranteed insured revenue and realized revenue. Insured event is the reduction of insured guaranteed revenue due to the occurrence of any of the contractual natural risks or price change risk. Natural risks include hail, fire and thunderbolt (mandatory coverage), storm and drought (in case of corn). Fall in prices belongs to a group of financial risk and here the coverage is also a mandatory. The subject of insurance are wheat and corn, and revenue insurance can be arranged during April, May and June, since then the first estimates of the prices of these crops after harvest are being provided. Expected price is agreed on the basis of the Paris Stock Exchange and Budapest, and current market trends in Serbia. Actual prices are determined on the basis of the prices actually achieved on the Commodity Exchange in Novi Sad. The insurance agreement determines the level of coverage, and the damage is compensated if the realized insured revenue was less than the contractual revenue and if it happened at least one of the above insured risks. On this basis, damage compensation represents the difference between the guaranteed insured income and realized income (Generali Insurance, 2014).

Analysis of the economic and legal aspects of the revenue insurance in the case of reducing the volatility of revenues in corn production

Establishing a balance between the growth of agricultural production and reducing risk

factors is the priority of every farm. In addition to negative climatic factors, the major threat to business is the drop in the price of their products. In this case, volume and price risk are mutually connected, and the benefits from insurance means covering the difference between guaranteed and realized revenue.

When it comes to indemnity payment on the basis of this insurance, it is not of great importance whether it was just a yield, or price (or both factors together) that affected harvests income (realized revenue) to be below the guaranteed revenue. Instead, this insurance shall compensate whenever any of these factors fall short.

Yield and price components are being determined twice, which represents significant characteristic of this type of insurance. First time when the average yield is being determined is before entering into an agreement, or before planting the selected crop, based on yield data in the previous period (5-10 years), which is important when you are defining the guaranteed revenue, as well as the coverage level. On the other hand, determination of the initial price, based on the data from the stock exchange, is also an important item in defining the guaranteed revenue, as well as the premium. During the harvest, the same parameters (yield and price) are observed again, since the amount of realized revenue and the eventual indemnity payment depends on their value.

Calculation of the actuarial fair insurance premium, taking into account the relationship between price and yield risks, is the main challenge of conducting revenue insurance. The importance of community consideration of risks, manifests itself in that periods of low yields may be accompanied by high prices. If a decline in yields and prices happens at the same time, this would lead to lower fair premium rates (Ahmed, Teresa Serra, 2015).

In tab. 1 it can be seen that in the first case in the production period between planting and harvest, it starts from the price fall, while in the third case the price growth has happened. In the second case forecasted price during planting is realized. In this way, only in model A, insurance indemnity payment according to formula (2) did not happen. This is due to the fact that a yield of 60 dt/ha, and despite the lower price, the market revenue exceeds the guaranteed revenue (Equation 1). In two other cases, which start from a larger reduction in yield, comes to the indemnity payment, which is in the third case, higher by 70 €/ha. The difference is that in the third case distinction between reduced yield (16.67%) and price increase (10%) is less pronounced, while in the second case appreciable reduction in yield is present (33.33%), and the price has remained on the same level.

Including the calculation of the expected amount of insurance premium (Formula 4), which is reduced by the amount of state subsidy, and by calculating the gross and net revenue (formula 5 and 6), we can see that their amounts in the second and third case are the same, indicating that guaranteed revenue is realized. If we look at the net revenue of all three variants, it is certain that the guaranteed net value exceeds the marginal cost of production and thus provides the farmer adequate margin coverage, which excludes in this case the need for additional insurance against loss of net income.

Table 1. Example of revenue insurance at corn

BASIC DATA	UM	Model A	Model B	Model C
Actual yield	dt/ha	60.00	50.00	40.00
Price during harvest	€/dt	10.00	11.00	12.00
Average yield (5-10 years)	dt/ha	75.00	75.00	75.00
Price during planting	€/dt	11.00	11.00	11.00
Level of coverage	%	70.00	70.00	70.00
DERIVED INDICATORS				
Market revenue	€/ha	600.00	550.00	480.00
Guaranteed revenue	€/ha	577.50	577.50	577.50
Indemnity	€/ha	0.00	27.50	97.50
Gross revenue	€/ha	600.00	577.50	577.50
Insurance premium*	€/ha	30.00	30.00	30.00
Net revenue	€/ha	570.00	547.50	547.50

* After deduction of state subsidy

Source: Authors-based on their calculations

The revenue insurance agreement should not be applied in our law for several reasons. The first reason is of an economic nature (Veselinović et al., 2014), because most of our agricultural producers does not have sufficient financial resources to insure their crops from basic and additional risks, so they are not able to insure the value of agricultural production. Another reason lies in the lack of interest of the insurance companies for this type of insurance, and therefore the agreement that would be concluded, but also insufficient education of agricultural producers in Serbia in terms of the characteristics of this agreement. The third reason is the lack of legal and theoretical practice in this area. The following example is intended to consider the possible elements of the revenue insurance agreement:

Table 2. Example of corn revenue insurance agreement

Revenue Insurance Agreement	
Parties	
Agricultural economy Petar Đurđev Futog, Vidovdanska 24, Serbia (Insured)	Generali Belgrade, Koce Racina 3, Serbia (Insurer)
Article 1. Subject of the agreement	
The subject of this agreement is Revenue Insurer’s payment of monetary indemnity to the Revenue Insured, which refers to the income on the line of mercantile corn, which will be planted in 2016, on a total area of 150 ha on a plot (cat. No. plot) in cadaster municipality of Futog. The basis for the payment is the difference between the guaranteed revenue and established or realized revenue.	

<p style="text-align: center;">Article 2. Guaranteed revenue</p> <p>Guaranteed revenue on 150 hectares planted with mercantile corn on the plot referred to in Article 1 of this Agreement is RSD.</p>
<p style="text-align: center;">Article 3. Realized revenue</p> <p>Realized revenue is determined by taking into account total yield of mercantile corn on the entire area, expressed in kilograms, on the plot from Article 1 of this Agreement and the price of corn on Commodity Exchange in Novi Sad, taking average price, counting from the date of completion until the day of harvest. Commencement day of the harvest, bearing in mind created conditions for grain maturity and weather conditions, determines the Insured giving notice to the Insurer, provided that the total duration of the harvest should not be longer than 7 days. Possible changes in this period, due to the weather or other circumstances are harmonized by Insured and Insurer together.</p> <p>Corn yield is determined based on the measurement of yields on 10 benchmark places, the size of per 1 ha, and the average yield on these plots is multiplied by the total number of hectares (150) and thus gives a total value of yield.</p> <p>The price on the Commodity Exchange shall be determined in accordance with the rules referred to in paragraph 1 of this Article, taking into account the official data from the Commodity Exchange announced on the official website of the Commodity Exchange.</p>
<p style="text-align: center;">Article 4. Premium</p> <p>The Revenue Insured pays Insurer a premium which insures less than the revenue in the amount of RSD per ha, totaling RSD. The premium is paid within the set deadlines, as follows: (to define the terms of premium payment).</p>
<p style="text-align: center;">Article 5. Indemnity for revenue less than the guaranteed</p> <p>Revenue Insurer is obliged to pay monetary amount to the Revenue Insured corresponding to the difference between the determined revenue and the guaranteed revenue, if the actual revenue is less than the guaranteed revenue.</p>
<p style="text-align: center;">Article 6. Participation of the Insured in risk coverage</p> <p>Insured accounts for 10% in the risk coverage.</p>
<p style="text-align: center;">Article 7. Control of application agro technical and other measures</p> <p>Insured is obliged to conduct agro technical measures at least within realized in the previous reference period, and the presentation of these measures is attached to this agreement and it is its integral part. The authorized person of insurance company shall perform control of agricultural practices, which may affect the corn yield on the plot referred to in Article 1 of this Agreement.</p>

<p>Article 8. Settlement of disputes</p> <p>For the settlement of disputes relating to this agreement, competence belongs to ad hoc arbitration, which will form the Parties, in that way each party shall appoint one arbitrator, and appointed arbitrators shall appoint the third arbitrator, who is also president of the ad hoc arbitration. Decision of ad hoc arbitration has the force of a court judgment. Ad hoc arbitration rules will apply to the rules of International Arbitration Chamber of Commerce of Serbia.</p>	
<p>Article 9. Number of copies of the contract</p> <p>The contract was concluded in four (4) copies, 2 of which are for each party.</p>	
<p>Article 10. Place and time of the conclusion of the agreement</p> <p>The contract was concluded in Novi Sad, 17 November 2015.</p>	
Insured	Insurer
Signature	Signature

Source: Authors-based on their analysis and research

The revenue insurance agreement is by its legal nature *sui generis* (Carić et al., 2011). It has in its content and elements of the insurance contract on the weather conditions, but also the fluctuations in market prices. For the farmer who insures value of agricultural production, it represents safety and in terms of the variability of weather parameters, but also the volatility of stock prices of agricultural products. In agricultural production, it can also mean the insurance against unforeseen plant diseases. Compared to the classic insurance agreement it means that this agreement covers more risks in one (Veselinović, 2011). In this way, with payment of a single premium insurance will comprise the insurance against more uncertain events, which is not characteristic of classical insurance agreement.

Conclusion

Based on the above example of revenue insurance in Serbia, as well as a review of the situation of this type of insurance in certain countries, it is evident that it represents a very significant support to the further stabilization of farm income. As with the insurance with comprehensive coverage of yield (guaranteed yield insurance), for the significant penetration of revenue insurance on the market as a whole, it is necessary to strengthen the support of the state. Consequently, in parallel, it is important that potential users or customers acquaint with the economic aspects of the functioning of this type of insurance.

On the other hand, it is very important to conduct a research survey in order to examine the opinions of domestic stock markets and the attitudes of local investment funds, insurers

and banks on the basic indicators related to revenue insurance. It would therefore be necessary to provide appropriate technical assumptions on stock exchanges, as well as the specialization of insurers to work with this model of insurance. The basic condition for this is the formation of knowledge through education and creating preconditions through equipping financial institutions and the stock markets. Also, a comprehensive analysis of the legal aspects, by comparative analysis and by making standard agreements, it would contribute to its easier implementation in economic practice.

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SMANJENJE VOLATILNOSTI PRINOSA I CENE U PROIZVODNJI KUKURUZA PRIMENOM OSIGURANJA VREDNOSTI PROIZVODNJE

*Todor Marković*⁵, *Janko Veselinović*⁶, *Željko Kokot*⁷

Rezime

Osiguranje vrednosti proizvodnje predstavlja novi instrument za upravljanje rizikom u poljoprivredi, a zasniva se na razlici garantovane i realizovane vrednosti proizvodnje celokupnog gazdinstva ili pojedinih linija proizvodnje. Primenom ovog instrumenta najčešće se osiguravaju oni usevi koji imaju značajno učešće u strukturi setve ili značajan prinos. Merkantilni kukuruz je najvažnija ratarska kultura u Srbiji, a klimatski uslovi i promena cene imaju veoma veliki uticaj na njegovu proizvodnju. Kao jedan od vidova borbe sa volatilnošću prihoda javlja se mogućnost osiguranja vrednosti proizvodnje kukuruza, zaključenjem ugovora o osiguranju. Međutim, osiguranje vrednosti proizvodnje veoma se malo primenjuje u svetu, dok se kod nas poslednjih godina tek uvodi. U ovom radu analiziraju se ekonomski i pravni aspekti ovog modela osiguranja sa ciljem utvrđivanja osnovnih mehanizama njegovog funkcionisanja, ali i uslova koji se moraju ispuniti da bi zaključenje ugovora imalo ekonomsku opravdanost za obe ugovorne strane (poljoprivrednike i finansijske institucije). Takođe, istražuje se i normativni okvir za sklapanje ovog ugovora i naglašava razlika u odnosu na klasični ugovor o osiguranju.

Ključne reči: *volatilnost, kukuruz, osiguranje, prinos, cena.*

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ECONOMIC ANALYSIS OF THE INFLUENCE OF MILK MARKET CONCENTRATION ON PROCUREMENT EFFICIENCY IN THE DEFENSE SYSTEM

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Summary

Increasing efficiency during realization of procurements in the defence system imposes the requirement to analyse the market, in order to detect all of its characteristics and to make conclusions which would benefit during planning of budgetary assets by one comprehensive process. Procuring milk and milk products represents a significant part of defence system's procurements which represents that a significant segment of the consumer standard of the Serbian Army, which implies the interest of authors to point to the significance of the concentration of the supply branch on the realization of procurements on the example of this market. The aim of this paper is to display the state and actual trends on the market of production and processing of milk, define methodological framework and point to the intensity and terms of competition and their influence on procurement criteria, especially price in the defence system of the Republic of Serbia.

Key words: *economic analysis, concentration, milk market, procurements, defence system.*

JEL: *D43, Q13.*

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Introduction

Dynamic conditions on today's global market, impose the need for continuous research in order to get information on necessary parameters that relate to characteristics on market structure and competition intensity. In economically developed countries the level of market concentration represents one of best known and most commonly used indicators of a company's monopoly power on the observed market. Behaviour of economic subjects and their relation to consumers can best be viewed by monitoring the market concentration level. In case of high concentration and a very limited market the choice of consumers is highly reduced. Upbringing of modern market structure for securing intensive and effective competition between economic subjects is an imperative of every country, especially developing ones.

Having in mind the significance of the milk and milk products industry on the life standard of citizens, activities of companies in this industry are from time to time under review by public opinion and regulatory bodies in the area of competition protection.

Procurement initiators in the Serbian Army examine and explore the market of each singular procurement item by: examining the market development level, comparing prices of multiple potential suppliers, monitor the quality, guaranty period, method and expenses of the item's life cycle, delivery deadlines, existing regulations and standards, possibilities to satisfy the needs of the procurer in another way on the market etc.

The literature review

Large number of different factors that act on the market position of economic subjects which can be tied, for both supply and demand segment, so they condition for the market to exert itself as a dynamic and insufficiently stable system. Side effects of such state are: unsteady rate of economic growth and cyclicity of economic development; insufficient utilization of resources; instability of prices; appearance of inflation and unemployment.

Deviation from perfectly competitive market means the state of disrupting optimal allocation of resources, understood in Pareto way. Pareto optimum implies that "distribution is optimal if it is such that every improvement of the situation of ones causes deterioration of the situation of the others. Put differently, distribution is optimal in Pareto way only if there isn't any change which can improve a situation of ones without harm to others (Gould, Ferguson, 1984)." Pareto efficiency in production implies equality of marginal utility of production factors, and in consumption the situation in which the relation between marginal usefulness and price is equal for all goods used. American Nobel Prize winner Joseph Stiglitz quotes eight important market imperfections that point to the imperfection of the market and deviation from Pareto efficiency (Stiglitz, 2013): incomplete (imperfect competition), external effects, public goods, imperfect information, incomplete market, unemployment and other macroeconomic disorders.

All stated deviations from Pareto market efficiency significantly influence the Serbian Army, as the user of budgetary assets, which exerts those aspects of imperfection in terms

of reducing approved financial assets and reducing consumption efficiency of budgetary assets, usually through problems in realizing public procurements.

The way that market mechanism functions, as well as positive and negative influences of that functioning on total economic and social trends, importantly depend on existing market forms, i.e. market morphology. Market structure significantly influences the trading conditions, forming of prices, behaviour of economic subject, primarily producers and sellers, but also consumers and buyers. Free functioning of market forces – competition depends on market structures (Lipczynski, Wilson, 2001; Ezekiel, 2012). Efficient regulation of market relations assumes knowledge of their structure, especially if those structures carry the characteristic of a monopoly or oligopoly.

In economically developed countries the level of market concentration represents one of most known and most frequently used indicators of monopoly power of a company on the observed market. Behaviour of economic subjects and their relations to consumers can best be viewed by tracking the market concentration level.

During determination of supply concentration level, market participation of certain individuals is used. Certain companies continually strive to increase their market participation, because there is a positive correlation between market participation and profitability. The aim to achieve greater market influence has the consequence of greater supply concentration level (Amato, Wilder, 2004).

During the study of the supply concentration level on a relevant market it is necessary two problems. First is choosing the relevant market on which supply concentration will be measured, and the other is the choice of variable over which the concentration level will be measured (Stojanović, Radivojević, 2008).

Concept of a relevant market deviates from a common understanding of the concept of a market in practice and economic theory. It has its two aspects – material and geographical. Relevant market includes relevant market of products and a relevant geographical market. Therefore, the market must be determined by the type of products (goods and services) sold on it, and bounded by the area on which they are bought and sold (Labus, 2008). Our law accepts the definition of relevant market that exists in the European Union. Relevant product market is a sum of products which are replaceable to consumers under acceptable conditions, especially on the basis of their properties, common purpose and price. Relevant geographical market is the territory on which market subjects participate in supply and demand on equal competition conditions, which differ from neighbouring territories (Law on competition protection, 2013).

The other problem while measuring concentration is the choice of suiting variable over which concentration is measured. Amongst variables used for that purpose are: total production, traffic, total assets, number of employees, revenue etc. Each of these variables carries certain limitations with it, so the concentration grade determined by its usage demands high level of analytics and researchers subjective assessments in order for the results to be understandable and applicable.

Having in mind the significance of producing raw milk and its processing in drinking milk and milk products, as well as its total established state of facts, and especially the structure of certain markets in production and processing cycle in this sector by conducting the analysis of state of competition on the market where raw cow's milk is bought and production and processing of milk and milk products, certain indicators should be obtain which will be used in measuring the concentration of the supply side of this branch.

Mitrović, Knežević, Veličković (2015) point that observing the milk production in the Republic of Serbia, also from 2009 to 2013, there was a downward trend in milk production in million liters from year to year, except in 2012, when the milk production compared to the year 2011 increased by 8 mill. litres The small farmers participate significantly in the total cow milk production in Serbia and their dominant position is a result of declining farms (Dražković, Rajković, Kostić, 2010).

Contrary to the milk production industry, the milk processing industry in Serbia is mainly concentrated in bigger capacities. These capacities have been recently privatized and modernized and dominate the domestic market with more than 90% of overall processing capacities in Serbia. Production of these processing capacities is mostly oriented toward liquid dairy products, while cheese production is mainly of less priority. On the other hand, there are a large number of small milk processing production facilities that cover 4-6% of overall capacities (there are over two hundred registered dairies in Serbia, but not all of them are active - most of them are dairies of medium and small capacity). Such dairy facilities mainly operate locally, and they are especially interested in production of cheese, spreads and other fermented milk products. In Serbia although purchase is growing, number of producers who deliver milk reduces. Therefore, it implies a trend of strengthening market-oriented farmers in Serbia (Zekić, Mijić, Jakšić, Milenković, 2016).

Methodology of measuring market concentration

The aim of this paper is to highlight the current trends on the milk and milk products market and point to the significance of determining the market structure through market structure, for more efficient realization of procurements and spending appropriation allocated budgetary assets in the defence system. The research subject is the economic analysis of the milk production market of the Republic of Serbia in order for the analysis of the given data on the market structure to influence the efficiency of the realised procurements for the defence system.

Getting information on a specific industry and its structure, economic researchers and economic decision makers use for different concentration indicators. As such, they are used for measuring the supply concentration level, but also for understanding the nature of competition between companies on a specific market in a certain moment in time. Between a large number of indicators for determining, i.e. measuring inequality level of participation of certain participants in a market structure, most often used ones are: Concentration of leading companies n (CR n), Herfindal-Hirschman index (HHI), Lorenz curve (concentration curve), Gini coefficient and Entropy index (Mikhalkina, Maitah, Šrédl,

2015). Application of these indicators relates to understanding, considering and analysing the existence or nonexistence of monopolistic market structure.

Many markets have shown the existence of a high level of correlation between specific concentration indicators. However, none of them can show the real nature of competition of a branch on its own. Theorists Hannah and Kay gave criteria which a certain indicator needs to satisfy in order to completely describe the concentration and nature of competition in a branch (Kostić, 2008).

- Concentration indicator needs one industry to classify in a more concentrated one when the participation sum of biggest production and sale companies exceeds that sum in the other;
- Market share transfer from small to big companies should bring to an increase in concentration. Also, entrance of new companies in a branch should reduce, and exit increase concentration;
- Connecting companies within each branch should increase the branch concentration level;
- If the chance for growth in a certain period are identical from big and small companies, effect of increasing will be far larger from bigger than for smaller companies, which would lead to an increase in concentration level.

According to mentioned criteria the biggest analytical significance is had by Herfindal-Hirschman coefficient which largely satisfies the stated criteria.

This index represents a convex function of market shares, and is therefore sensitive to their inequality. He represents a sum of squares of individual market shares of a company in one industry. It can be expressed through the following equation:

$$HHI = \sum_{i=1}^n X_i^2 \quad (1)$$

Where X_i is the market share of i company (Šaj, 2005).

The significance of the index can be viewed in the fact that even though it respects individual market shares of all companies in a branch it still reacts to the presence of a company with great market share, which significantly increases its value (Mihajlović, 2016).

Unlike the concentration ration of n leading companies, the value of Herfindahl-Hirschman index depends on the number of competitors on the market, and unlike its relevant market strength. The value of HHI is reduced with an increase in the number of competitors on the market. Also the value of this index grows with an increase of differentiation in market power size because large companies have the largest ponder in the calculation due to effect of squaring market shares. The biggest problem in determining the value of Herfindal-Hirschman index is the necessity of owning information on the value of market shares for each company that belongs to the observed market. From the formula that calculates

the Herfindal-Hirschman index it can be observed that companies with small market share value have a very small influence on the result. That is, for calculating the value of Herfindal-Hirschman index it is necessary to own data regarding market share of all companies whose market share greater than 1%.(Zhou, Gao, Yang, Zhou, 2005)

When the values of this index are calculated the market is classified as (Šaj, 2005; Dobre 2009):

- Un-concentrated – when HHI is bellow 15%;
- Moderately concentrated – when HHI is between 15% and 25% and
- Highly concentrated – when HHI is above 25%.

Sectoral analysis of the state of competition in the dairy sector, which includes the purchase of raw cow’s milk, production and processing of milk and milk products, wholesale and retail sale of milk and milk products was conducted from January 2014 until the end of July 2015. The production-processing cycle was included, i.e. purchase of raw cow’s milk and production and processing of milk and milk products. Other types of milk (sheep, goat, etc.) weren’t the subject of this analysis due to their extremely low representation of around 2% of the total amounts of milk produced in the Republic of Serbia.

With the goal of acquiring data and information necessary for the realization of sectoral analysis to the participants on the market of purchase, production and processing of milk and milk products, a choice of dairies has been made based on the following criteria: significance of certain participants on a purchase of raw milk market, installed production capacities and their position on regional market segments of producing and processing milk and milk products.

For the needs of research, concentration effects must be examined on the following relevant product markets: market for purchase of raw milk intended for further industrial processing; market for producing milk and milk products; market for selling milk and milk products.

According to the data from the Republic institute for statistics (available at: www.stat.gov.rs), dairies have purchased and processed around 818,000,000 litres of raw milk from primary milk producers in 2014, which is the data on aggregate size of the market for purchase of raw milk intended for further industrial processing in dairies that buy it. Based on the data from Ministry of agriculture and environmental protection, there are 202 dairies in Serbia, but actively around 120, taking into consideration that the number of active dairies varies from 120 to 140, depending on the year.

Table 1. Comparative review of yearly production of raw milk

Type of milk	Milk production (in thousands of liters)		
	2012.	2013.	2014.
Cow’s	1,465,000	1,451,000	1,492,000

Source: Ministry of agriculture and environmental protection (available at: www.mpzps.gov.rs);

Table 2. Amount of bought and processed cow's milk

Type of milk	Amount of bought and processed cow's milk (in thousands of litres)		
	2012.	2013.	2014.
Cow's	712,000	745,000	818,000

Source: Ministry of agriculture and environmental protection (available at: www.mpzps.gov.rs);

Data from previous tables point to the conclusion that in the observed and graded period, the amounts of produced primary milk were pretty stable and balanced. This type of qualification comes from the fact that yearly changes in those amounts varied between 1% and 2% (this production was greater in 2014 for 1.8% than comparative production in 2012). Changes on the side of purchased amounts of raw milk that dairies processed were far more intensive. That purchase in 2014 was 106 million or 14.9% greater than the purchased amount in 2012. That has further opted a positive tendency which relates to the growth of participation of purchased milk by dairies in total produced raw milk, which can be seen in table 3.

Table 3. Amount of purchased raw cow's milk intended for further processing and market shares of dairies, 2014

No.	Participant on the market	Amount of purchased raw milk (in thousands of litres)	Participation (in %)
1	Imlek	[...]	/30-40/
2	Somboled	[...]	/5-10/
3	Mlekara Šabac	41,229.03	5.0
4	Mlekoprodukt	34,071.68	4.2
5	Niška mlekara	[...]	/0-5/
6	Meggle Srbija	[...]	/0-5/
7	Granice	[...]	/0-5/
8	KUČ-COMPANY	21,074.31	2.6
9	Lazar	20,441.18	2.5
10	Ekomlek	14,366.51	1.8
11	Mlekara Leskovac	13,883.53	1.7
12	MLINPEK/MILK	910.00	0.1
13	Total	572,869.08	70.0
14	Other (110 млекара)	245,130.92	30.0
15	TOTAL	818,000.00	100.0

Source: Commission for protecting competition (available at: www.kzk.org.rs)

Contents of the previous table confirm adequate choice of surveyed dairies, since 12 chosen dairies participate with 70% of the total amount of purchased raw milk.

Based on the data from the table in can be concluded that participation of the company "Imlek" in the market for purchase of raw milk in the Republic of Serbia is /30- 40%/, "Niška mlekara" /0-5%/, dairy "Somboled" has the participation of /5-10%/, "Mlekara Šabac" - 5%/, "Mlekoprodukt" – 4.2%/, "MEGGLE SRBIJA" – /0-5%/, dairy „Granice“ – /0-5%/, „KUČ-

COMPANY“ – 2.6%, dairy „Lazar“ – 2.5%, „Ekomlek“ – 1.8%, „Mlekara Leskovac“ – 1.7%, and „MLINPEKMILK“ – 0.1%.

Analysing the effects of concentration on the market for purchase of raw cow’s milk in the Republic of Serbia, firstly the structure of the relevant market was analysed, market shares of participants on a market, as well as real and potential competitors. It is evident that “Imlek” has undoubtedly a leading role and represents a leader in this market with a share on this relevant market (/30-40%). All remaining competitors (dairies) have significantly smaller market shares from “Imlek” so the second participant on this market – dairy “Somboled” has a share of /5-10%. There isn’t any other competitor that has a significant share. They are dairies of local, i.e. regional significance, out of which none performs a significant competitive pressure on “Imlek”.

Table 4. Market concentration level measured by HHI

No.	Participant on the market	Amounts of purchased raw milk (in thousands of litres)	Participation (in %)	HHI
1	Imlek	[...]	/30-40/	[...]
2	Somboled	[...]	/5-10/	[...]
3	Mlekara Šabac	41,229.03	5.0	25.4
4	Mlekoprodukt	34,071.68	4.2	17.3
5	Niška mlekara	[...]	/0-5/	[...]
6	Meggle Srbija	[...]	/0-5/	[...]
7	Granice	[...]	/0-5/	[...]
8	KUČ-COMPANY	21,074.31	2.6	6.6
9	Lazar	20,441.18	2.5	6.2
10	Ekomlek	14,366.51	1.8	3.1
11	Mlekara Leskovac	13,883.53	1.7	2.9
12	MLINPEK/MILK	910.00	0.1	0.0
13	Total	572,869.08	70.0	
14	Other (110 dairies)	245,130.92	30.0	8.2
15	Total	818,000.00	100.0	1.575

Source: Commission for protecting competition (available at: www.kzk.org.rs)

Based on previously stated data (table 4) Herfindahl and Hirschman’s index (HHI) was calculated. According to this indicator the market for purchasing raw milk in the Republic of Serbia can be considered moderately concentrated, because the analysis pointed that HHI was 1.575 before conducting concentration.

Influence of the market structure on the realization of milk procurement in the defence system

Procurement function (Milojević, Vukoje, Mihajlović, 2013) is by its nature, very complex and comprehensive industry with material and financial operating of the defence system. It includes a wide spectrum of activities, ties and relations, starting from planning assets and

procurements, to researching the market and conducting the very procurement.

Researching efficiency is essential for every industry, and with that Serbian Army, because it contains and links the goals of that industry within it, resources and transforms the processes which represent the basis for realizing goals. Considering efficiency of the procurement function in the Serbian Army can't be abstracted from the influence and other functions in the defence system (planning and approving funds, planning procurements and execution of financing), because they are preconditions for realizing public procurements. It also can't be abstracted in relation to economic movements, and especially tracking and adjusting to modern market movements.

Timely procurement of movable property is very significant for regular life and training of the Serbian Army. In order to procure assets from the domain of "regular industries" (food, clothes, energy, fuel, medicine, consumables and the like) significant assets are approved in the yearly expenditure. In relation to this, a market analysis of purchase raw cow's milk and producing and processing milk and milk products which has a significance for bodies that perform procurements in the defence system was performed, because the market structure significantly influences the efficiency of realization of procurements.

For the purpose of conducting procurements an economic analysis is conducted, which contains: the name, amount and estimated individual and total cost; data on companies from which procurements can be performed; a proposal on the method and concept of performing procurements; the name of the purchasing body for realizing procurements; data on whether movable property that are procured are adopted in equipment and weapons etc. (available at: www.mod.gov.rs). Depending on the type of procurement, next to these basic elements of analysis, special data is used as well, as follows: possibility of a procurement, production perspective, tendencies on the market, possibility of procuring spare parts etc. Dominant place within economic analysis of procurements in the Serbian Army is had by the following criteria elements: purchase price, quality, warranty periods and security of supply. The choice between submitted offers, in the Serbian Army very often in practice is done by applying criteria of lowest offered price, which is taken as deciding criterion, if all of the conditions put in bidding documents are met, before all defined demand for quality etc. (Law on public procurements, 2015).

Analysis of prices formed under the influence of market mechanism, i.e. law of supply and demand is significantly complex (Milosavljević, 2001). It's known that large procurements respond producers-suppliers, because it accelerates the turnover of its assets and reduces production and transport costs. Likewise enlargement of procurements for the Serbian Army provides higher benefits and total economic effects. It should also be had in mind that the price is an instrument of trade marketing and element of marketing mix, therefore the supplier puts an important accent on forming prices as well.

If the frame of freedom for forming prices by the suppliers and bidders is larger, i.e. if it is about an imperfect market (monopoly or oligopoly) the procurement process that the Serbian Military implements is that more complex. On the other side, there are products and goods (for example medicine) whose price is minimized by regulations of the Serbian

government. In that case companies choose a strategy of renouncing margin and trying to increase earnings through an increase in turnovers, where the Serbian Army appears as a great spender (Krstić, Krstić, 2016).

However, sales and margins are mutually conditioned and a company usually asks a price that maximizes gain, using sales and margin as variables, in order to reach such price. The aim is to maximize total gain, not gain per unit.

Having in mind the aforementioned, based on the data on realized milk procurements and milk products in the defence system of the Republic of Serbia, in the research period of the market of purchasing raw cow's milk and producing and processing milk and milk products, it can be concluded that the most favourable bidder is the one offering the lowest price of previously mentioned "Imlek" products. Estimating the economic and financial strength of "Imlek", analysing the achieved revenue (Vukoje, 2013) of "Imlek", according to the data from public announced consolidated financial report for 2014 (available at: www.apr.gov.rs), its revenue is around 44.7 billion dinars, which is multiple times larger than the revenue of "Somboled", the next market participant, which according to the data from regular annual financial report from 2014 is 6.2 billion dinars. "Imlek" which is vertically integrated company, because it deals with purchase of raw milk, production of milk and milk products and selling milk and milk products, in this way more significantly does business on the market of the Republic of Serbia which allows it large possibility of reducing prices of offered products when it competes in procurement procedures.

"Imlek" has a large advantage in approaching supply and distribution markets, seeing as how it buys raw milk on almost the entire territory of the Republic of Serbia, which is a significantly larger part of the territory than the territory from which other dairies buy their raw milk in Serbia. For example, the next market participant "Somboled" buys its milk from far less places. Having in mind the strength of "Imlek's" suppliers and the market of raw milk purchase which is characterized by fragmented, atomized market structure and very low level of market concentration it can be said that it has a monopoly position which can be used for increasing profits.

Conclusion

On the example of the market for purchase of raw cow's milk and producing and processing milk and milk producing, this paper points a market movement trend of this branch and gives methodological basis for performing an analysis of this market by using a relevant market. Having in mind the significance of this industry for the defence system, as well as the life standard of citizens it isn't unusual that the activities in this industry are from time to time under review by public opinion and regulatory bodies in the area of protecting competition. With the goal of applying the methodology for measuring the concentration level on the market, it is necessary, as it is stated in the paper, to define the relevant market, then by combining the indicators of the concentration of supply and subjective grade to make conclusions which will be used in our case when defining budgetary assets for the needs of procurements in the defence system.

Analysing the effect of raw cow milk purchase concentration on the Serbian market, it's evident that "Imlek" has undoubtedly leading role and that it represents a leader on this market, whose share on this relevant market is (30-40%). All remaining competitors (dairies) have significant lower market shares than "Imlek" and raw milk purchase market that is characterized by fragmented, atomized market structure and very low market concentration level, it can be said that it has a monopoly which can be used to secure favorable position when offering its products as a supplier.

Rezultati trжишта bi se koristili radi unapređeња postupaka nabavki, a to bi uzročno-posledično vodilo efikasnijoj realizaciji bužeta odbrane i obezbeđivaњу odgovarajuћeg nivoa operativnih sposobnosti јединица Војске Србије

Results of thus coordinated analysis of the market would be used for promoting procurement procedure, which would by casual effect lead to more efficient realization of the budget of the defence system and securing a suitable level of operational capabilities of Serbian Army's units.

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EKONOMSKA ANALIZA UTICAJA KONCENTRACIJE TRŽIŠTA MLEKA NA EFIKASNOST NABAVKI U SISTEMU ODBRANE

Milan Mihajlović⁷, Snežana Krstić⁸, Slobodan Šegrt⁹, Dragana Pavlović¹⁰, Duško Jovanović¹¹, Tihomir Simeunović¹²

Rezime

Povećanje efikasnosti realizacije nabavki u sistemu odbrane nameće zahtev za analizom tržišta, kako bi se uočile sve njegove karakteristike i jednim sveobuhvatnim postupkom doneli zaključci koji su od koristi prilikom planiranja budžetskih sredstava. Nabavka mleka i mlečnih proizvoda predstavlja značajan deo ukupnih nabavki sistema odbrane što ih čini i važnim segmentom potrošačkog standarda Vojske Srbije, odakle sledi interesovanje autora da na primeru ovog tržišta ukažu na značaj koncentracije ponude grane za realizaciju nabavki. Cilj ovog rada je da prikaže stanje i aktuelne trendove na tržištu proizvodnje i prerade mleka, definiše metodološke okvir i ukaže na intenzitet i uslove konkurencije i njihov uticaj na kriterijume nabavki, posebno cenu, u sistemu odbrane Republike Srbije.

Ključne reči: ekonomska analiza, koncentracija, tržište mleka, nabavke, sistem odbrane.

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ANALYSIS AND FORECASTING OF PROFIT BY USING SIMULATION MODELS FOR GROWING PEA IN CONVENTIONAL AND ORGANIC PLANT PRODUCTION IN SERBIA

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Summary

Bean is the third most important food legume crop of the world after soybean and groundnuts; it provides an important source of dietary proteins, carbohydrates, minerals and fiber essential in human nutrition worldwide. A high, per capita bean consumption of 13 to 40 kg yr⁻¹ was observed in developing countries. In EU developed countries, market of the organic products is growing in average 10 % per annum, but this growth has not been followed by production growth and this is the chance for Serbian products. Organic bean growing enables the producers a higher profit. Expenses in organic production are higher (2170 EUR/ha) than those in conventional bean production (1825 EUR/ha). However, net profit in the organic production was estimated to 1440 EUR/ha, while the profit in the conventional concept was 315 EUR/ha. Also, profitability rate and the economic efficiency coefficient had higher values when growing bean in organic concept.

Key words: *bean, expenses, net profit, organic production*

JEL: *Q16*

Introduction

Bean (*Phaseolus vulgaris* L.) is an edible legume that belongs to the family *Leguminosae/Fabaceae*, subfamily *Papilionideae* described in the tribe *Phaseoleae*, sub tribe *Phaseolinae*

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in the section *Phaseoli* (Debouck, 1991). Cultivars and landraces of *P. vulgaris* are derived from independent domestication of wild beans in the Andean and Middle American centers (Chacon et al., 2005). Bean is the third most important legume crop in the world after soybean and groundnuts, it provides an important source of dietary proteins, carbohydrates, minerals and fiber essential in human nutrition worldwide. A high per capita consumption of 13 to 40 kg yr⁻¹ bean was observed in developing countries, especially within low-income families in urban and rural areas (Singh, 1999). Bean remains the primary source of dietary protein in most of the developing countries where it is regarded as poor man's meat. In addition to its central nutritional and dietary role, bean is gaining importance as a source of household income for small scale farmers, who sell through intermediaries to urban dwellers and exporters (Kusolwa, 2007). Recent studies highlighted nutritional values and health benefits of dry bean diets (Thompson et al., 2008; Mitchell et al., 2009).

Bean (*Phaseolus vulgaris*) is grown in Serbia on more than 20.000 acres, as a pure crop, with average perennial yield about 1.3 t/ha (FAO 2012). During last five years, certified organic surface has grown rapidly and it was very hard to gain the information regarding the income from these surfaces, since Serbia does not keep official records data on organic production (Stefanović et al., 2010). Certified organic production is increased and the data systematically collects Ministry of Agriculture and Environmental Protection, through accredited companies to control and certification (http://www.dnrl.minpolj.gov.rs/o_nama/organska.html).

The increasing demand for healthy food and the need for environmental and economic sustainability of agricultural production promoted the organic farming worldwide. The economic feasibility is a key factor for technology adoption and sustainable production (Wander et al., 2007). In order to obtain higher prices on the market, the significant point could be the certificated organic production. Organic production implies ecological management of production, improvement of biodiversity, circulation of matter in the nature, microbiological activity in land and environment protection (Zdravković et al., 2012). Conventional production demands the use of chemical preparations, which directly distort the existing soil structure. It also impacts the fertility of soil, food quality and leads to complete distortion of the environment (Petrović, 2014). In developed EU countries, the organic market is growing averagely 10 % per year, where this increase is not accompanied by the production growth and we believe that this is the chance for Serbian products (Berenji et al., 2013).

Profit forecast is very important for any company. Monte Carlo methods are stochastic techniques – meaning they are based on the use of random numbers and probability statistics to investigate problems. Monte Carlo simulation shows stochastic processes where time is not crucial, but simulates some sources of uncertainty that impact the value of gain so it can be a method of repeated tries (Zekić et al., 2014). This method gives the unique balance among estimations and calculations, so it is very suitable for estimation of economic results in agriculture (Wayne, 2004, Korn et al., 2010). Monte Carlo simulation forecasts the gain depending on changes of input variables (price, yield etc). The basic use of this method was simulation based on mathematic model that simulates real effect of input change (Zekić et al., 2014).

The aim of this research was to analyze two concepts of bean production (conventional and organic) by applying the method of productivity, profitability and its comparison.

Material and method

In order to research the productivity and profitability of growing bean in conventional and organic way a trial was set up at the experimental field of Institute for Vegetable Crops, Smederevska Palanka. The Institute has 2.2 ha of certified soil for vegetable growing in organic concept. Organic bean was grown on this certified organic field and the conventional production was performed in the nearby uncertified plot. The size of the trial field in both concepts was one acre. During the vegetation season, standard technology of bean growing was applied for both concepts.

Prices of dry bean produced in conventional way were taken from wholesale market (STIPS, 2013). Prices of dry bean produced in organic concept were estimated by interviewing producers/sellers of organic bean from Belgrade and Novi Sad.

Economic indicators of profitability of bean production were calculated by applying analytic calculation. Total expenses, total income, gain, the costs per unit, breakeven point (kg/a), the rate of profitability and cost-effectiveness ratio (%) were calculated.

Forecast of net profit for conventional and organic system of growing dry bean has been done by applying method Monte Carlo simulation model in Microsoft Excel program (Wayne, 2004).

Net Profit = Sales Volume x (Selling Price - Unit cost) - Fixed costs.

Results and discussion

Cost of agricultural production depends on the price and refund of the expenses incurred during production (Clark et al., 1999). In order to evaluate the risk of investing in crop production, managers must make an assessment of the cost of basic inputs in production and to determinate the necessary yield for its coverage. More detailed information regarding the production costs enable the producers the estimation of the budget (Fonash, 2009). The highest expenses were in organic bean growing concept 2170 EUR/ha, while in conventional growing it was 1825 EUR/ha (Table 1). The knowledge of specific costs and its participation in total production structure is important for business management, when the economic analysis of production points to dominant expenses which have the highest impact on the price of the finished product (Kanisek et al., 2008).

Table 1: Costs of conventional and certified organic dry bean production per area unit (EUR / ha)

Costs:	dry bean (EUR/ha)	
	conventional	organic
mineral fertilizer	250	0
application of mineral fertilizer	30	0

Costs:	dry bean (EUR/ha)	
	conventional	organic
basic soil tillage	100	100
additional soil tillage	40	40
pre-sowing soil preparation	30	30
seeds	570	750
sowing	30	30
herbicides	35	0
foliar fertilizers	40	30
pesticides	30	0
allowed pesticides	75	75
spraying	125	75
cultivation	90	90
human labour	230	500
certification	0	250
harvest	150	150
Total:	1825	2170

Source: Pavlović, 2016

Structure of the total expenses in our research proves that the highest expenses in both ways of production are seeds and labour work for removing the weeds from the crops (Table 1). These expenses are much higher when growing beans in organic production (Table 1). Identical results were reported by Clark et al., 1999. These costs take 19.75% in organic and 11.08% in conventional production from total expenses.

Bean yield in organic and conventional production was similar. In our research it was 950 kg/ha in organic and 1070 kg/ha in conventional. In most organic productions, the yield was significantly lower, up to 34% (De Ponti et al., 2012, Seufert et al., 2012). This is not the case with beans, which has very high yield comparing to other vegetable crops grown in the organic concept. Clark et al., 1999, also found higher yield of bean in the organic production than other agricultural cultures. The difference in yield was not significant. Heilig and Kelly 2012 found that the yield and the differences of yield for organic and conventional crop production were the result of different genotype. Yield differences among different genotypes in the same cropping system can vary up to 25%. The profit in the organic bean production directly depends from the selling prices. The selling price of the bean produced in the organic concept was 35% higher than conventional due to limited offer of products without residuals (Sellen et al., 1994). Organic farming can be a viable option even if the producer prices are the same as those of conventional food (Wander et al., 2007). If the price of the product is reduced by the premium that most countries provide for producers as a stimulant for the organic production, then the profitability of growing organic crops is further increased. The price of dry bean grain, produced in the organic concept in Serbia is 3.8 EUR/kg (Table 2).

Table 2: Achieved dry bean yields per unit area (kg / ha), the price per unit (EUR / kg), the value of production (EUR / ha).

Indicators:	dry bean	
	conventional	organic
yield (kg / ha)	1070	950
Price (EUR/kg)	2,00	3,80
Production value (EUR)	2.140,00	3.610,00

Source: Pavlović, 2016

Relatively low cost price of production and high selling price make organic production highly profitable (Clark et al., 1999). Sellen et al., 1994 set a trial in London and found that the total costs of organic bean production were 3480 EUR/ha. Total value of expenses in Serbia for the same production was lower and amounts 2170 EUR/ha. On the other hand, the total costs made in conventional production were lower (1825 EUR/ha). Business goal was to decrease the expenses and increase the total income and operate more economically in that way (Pavlović et al., 2014). The total income in the organic bean production concept, in our research, was 3610 EUR/ha (Table 2). The lower income was achieved in conventional production and was 2140 EUR/ha. Border of profitability were 571.05 kg/ha (organic production) and 912.5 kg/ha (Table 3). By analysing both concepts of production, income was higher than outcome, which proves that both researched concepts were economical. Similar results were found by Sellen et al., 1994, Clark et al., 1999, Salami et al., 2009, Garcia et al., 2012, Sibiko et al., 2013.

Table 3: Indicators of economy of production of conventional and organic dry bean production

Indicators:	dry bean	
	conventional	organic
Total cost (EUR/ha)	1.825,00	2.170,00
Value of production (EUR/ha)	2.140,00	3.610,00
Cost price (EUR/kg)	2,00	3,80
gain(EUR/ ha)	315,00	1.440,00
border of profitability (kg / ha)	912.50	571,05
business rate of profitability (gain on 100EUR)	14.72	39,25
coefficient of cost-effectiveness (e)	1,17	1,66

Source: Pavlović, 2016

Calculated rate of profitability was 39.89 EUR (organic concept), in the conventional production it was 14.72 EUR (Table 3). The economical coefficient in our research was 1.66 % for organic and 1.17 % for conventional bean production. The obtained values indicate the existence of business success in both analyzed concepts, except that it is slightly higher in organic production. The calculated parameters show that both the concept of production has a business success. It was significantly higher in organic bean production (Table 3). Similar results in their research had Garcia et al., 2012. Profit forecast according to Monte Carlo method has been done according to projected market prices of conventional and organic

bean production. Height of projected prices was estimated according to market oscillation in past years (STIPS, 2013) and the financial effects for these two production ways were observed. Designed in three ways sales, the expected price of 1070kg of dry bean produced conventionally would be 2.40 EUR/kg. The expected price in organic growing for 950kg would be 4.5 EUR /kg. The uncertain variable is unit cost. Unit costs could be from 1.7 EUR up to 3.5 EUR in conventional growing and from 2.28 EUR up to 5.00 EUR in organic, and the most probable costs would be 2.15 EUR and 3.60 EUR. Net profit based on average sales volume, average selling price, and average unit cost. Calculated on this model, net profit was 93.41 EUR in conventional and 348.16 EUR in organic bean growing concept (Table 4).

Table 4. Financial forecast to conventional and organic dry bean production by Monte Carlo model

Conventional production			Organic production		
Sales Scenarios	Volume	Price	Sales Scenarios	Volume	Price
Hot market	200.00	2.00EUR	Hot market	180.00	3.80EUR
Ok Market	570.00	2.20EUR	Ok Market	450.00	4.20EUR
Slow Market	300.00	3.80EUR	Slow Market	320.00	5.60EUR
Sales and Cost Data		Average	Sales and Cost Data		Average
Sales Scenario		356.67	Sales Scenario		316.67
Sales Volume		2.67	Sales Volume		4.50
Selling Price		2.40EUR	Selling Price		3.43EUR
Unit Cost		2.15EUR	Unit Cost		3.60EUR
Cost Scenarios		Unit Cost	Cost Scenarios		Unit Cost
Minimum Cost		1.70EUR	Minimum Cost		2.28EUR
Most Likely Cost		2.00EUR	Most Likely Cost		3.00EUR
Maximum Cost		3.50EUR	Maximum Cost		5.00EUR
Fixed Costs		1.70EUR	Fixed Costs		2.28EUR
Profit Forecast (Net Profit)		93.41EUR	Profit Forecast (Net Profit)		348.16EUR

Source: Pavlović, 2016

Conclusion

The analysis of conventional concept of bean production generated higher income than outcome which points to the economy of both concepts of production. Those farmers, who have large areas of cultivated land and have no possibility of engaging workers, may produce beans by conventional breeding concept. The calculated economic parameters indicate that the concept of production profitable. On the other hand due to the higher cost of certified organic beans on the market and the possibility realizing higher profit more interesting is the production of beans at an organic concept. Calculated cost-effectiveness ratio for organic production was 1.66%, while for the conventional concept it was somewhat lower (1.17%). The value of this relative indicator of success, directly points to the bean production concept that should be applied by producers. The results show that producers should choose the cultivation of beans in accordance with the principles of organic crop production. Then, according to the results obtained indicate that the choice of the concept of organic production does not significantly affect the reduction in yield of beans. In this way, the beans are classified

in the group of those plant species should take more area on cultivated land on which to cultivate organic certified beans.

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ANALIZA I PREDVIĐANJE PROFITA U KONVENCIONALNOJ I ORGANSKOJ BILJNOJ PROIZVODNJI PASULJA U SRBIJI

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Rezime

Gajenje pasulja u skladu sa organskim principima omogućava proizvođačima veći profit u odnosu na konvencionalni sistem gajenja. Ispitivana i komparirana je proizvodnja pasulja u konvencionalnom i organskom sistemu gajenja metodama bazičnih ekonomskih parametara a za metodu prognoze korišćena je Monte Carlo simulacija na osnovu projektovanih prosečnih tržišnih cena po jedinici proizvoda. Troškovi u organskoj proizvodnji su veći (2170 EUR /ha) od troškova u konvencionalnoj proizvodnji pasulja (1745 EUR /ha). Međutim, ostvarena dobit u konceptu organske proizvodnje je iznosila 1402 EUR /ha, dok kod konvencionalnog koncepta je 955 EUR /ha. Takođe, stopa rentabilnosti poslovanja kao i koeficijent ekonomičnosti su imali veće izračunate vrednosti u gajenju pasulja po konceptu organske biljne proizvodnje. Simulacijom rasta cena na tržištu korišćenjem Monte Carlo simulacionog modela u konvencionalnoj proizvodnji figurira neto profit od 93.4 EUR /ha, dok je u organskoj veći i iznosi 348.16 EUR /ha.

Ključne reči: pasulj, troškovi, neto profit, organska proizvodnja

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EFFICACY OF STUDYING AS PREDICTOR OF HIGHER EDUCATION QUALITY: THE CASE STUDY OF FACULTY OF AGRICULTURE

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Summary

Creation of education policy starts at, among other things, the vision of education system's quality. Comprehension of the concept of quality is multifaceted, so in higher education the holistic, multidisciplinary approach is the most appropriate for it acknowledges different segments of quality. One of those is measuring efficiency of studying based on input: type of high school, and the success achieved in high school, what is the goal of this research. Applying regression analysis on a sample of 1,114 subjects, students of the Faculty of Agriculture, the influence of success in high school to the average years of study and accomplished success during studies had been explored. For all courses, defining the influence of success in high school to the average years of study had negative coefficient of correlation, which means that by increasing the number of points earned in high school there is a decrease of average years of study (sum coefficient, $r = -0.23$). Due to the fact that the problem is in the uneven criteria of evaluation and assessment at high school level of education in Serbia, especially between high schools and vocational schools, results of this research are pointing out the necessity for equalization and compatibility of all elements in education system, and of bringing national outcomes of education at all levels and national qualification frames.

Key words: *quality of higher education, studying efficacy, educational policy.*

JEL: *C20, I210, I240, Q19*

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Introduction

Traditional role of education in the acquisition of knowledge of an individual and development of his abilities is getting new features by conditioning the readiness of the entire education system for fast transformation and adjustment to those demands and changes (Šegrt, Kolarski, 2015). In these processes, the role of university is aimed to promoting knowledge and skills needed in 21st century, transfer of knowledge and overall strengthening of its bonds with society, their better interaction and fulfilment of common goals, and also achieving social and individual educational needs (Babić-Kekez, 2009). In developing their curricula, much will depend on the determination of higher education institutions to confront some cherished traditions in teaching and learning (Yorke, 2003). That is of exceptional importance for creating education policy and reform processes in education system especially in countries in social transition, like Serbia.

Whilst creating education policy it is very important to define minimum requirements for ensuring education quality. Thereby, it is necessary to determine the meaning of quality, knowing that there are different approaches and understanding of education quality. Whether the word 'quality' is used or not, every education system is structured around a certain vision of education quality. Within that frame, it is possible to talk about at least five alternative concepts of education quality: 1. Education quality as excellence. Where excellence is the vision leading the education process. 2. Education quality as consistency. Here equality represents the vision guiding the educational efforts. 3. Education quality as fitting the purpose. Precision and perfection in some subject areas represent the vision forming the education system. In this context, education quality is seen as preparation (specialization) of students for certain roles. 4. Education quality as 'value for money'. This means that quality of education corresponds with personal and social investments. 5. Education quality as transformative potential. In this context, social and personal changes represent the vision guiding educational efforts. Quality in education represents basis for positive changes of an individual and the society (Harvey, 2009). Said concepts can be implemented in education policy nonexclusively, on the contrary, they can double the demands and ensure higher level of quality.

Operationalizing of demands for quality in higher education is not new: there have been offered number of disputes and definitions of quality. Holistic, multidisciplinary approach in defining the quality in higher education is the most appropriate, the approach that takes care of interests of all in education and considers its different segments (Kovač, et al., 2002). One of those segments is evaluation, internal and external measurement of system efficiency. Quality is often set as effectiveness, the level of desired objectives achieved. In that case, high quality means increase of effectiveness that is locally defined. On one hand, quality can be set as incarnation of characteristics (meaning excellence) that is accepted by certain society. On the other hand, quality can transfer to ability to come to results, as in the term 'school quality' (Milutinović, 2009; Easton, 2005). This paper considers quality of education from evaluation segment, measuring efficiency of the system, respectively we have researched the efficiency of studying as one of the predictors of education quality.

In legal and strategic documents referring to higher education system in Serbia, quality of education is provided by demands for higher quality of environment/conditions of the program/curriculum process of class/learning and learning outcomes, applying the system of accreditation of institutions and programs of education, according to international standards and establishing international cooperation in monitoring and evaluation of quality of education system (Strategy of education development in Serbia, Official Newsletter, RS,72/2012.). Meaning that quality is normatively established by prescribed standards and that consensus is reached on national (local) level. Amongst theoretics prevails the attitude that standard is normative demand accordingly managing the education system, respectively, education standard can be directly bound to outcome value as outcome standards (outcome, achievement, efficiency), but can be regulational, editing the process (Pastuović, 2005). Considering that correctly fortified standards and criteria for enrolling at faculties (success in some four-year high school), we can talk about input standards. In this way, speaking, it is very simple to determine the efficiency of studying as a predictor of quality, expressed through coefficient of input and output achieved standard (DEA-Data Envelopment Analysis). However, the problem lies in uneven criteria for evaluation and assessment at high school education level, especially between high schools and vocational schools, due to non-existing national education outcomes. Measuring the efficiency of studying and quality of teaching process itself, is more difficult because we have students with different input parameters, such as average grade in high school and number of points won in entrance exam and output parameters – average grade during studies as well as years of studying. This way we would, beside the measure of study efficiency, in a way measure the successfulness of high schools which students come from (Bojanić et al., 2015). In that sense, the results of this research are, among other things, function of pointing out the necessity for equalization and compatibility of all elements in education system, and of bringing national outcomes of education at all levels and national qualification frames.

Student success is a subject which has been analysed by many authors in different ways. However, all of them agree that the success of students at the undergraduate level is best determined by analysing the length of studies, and the average grades achieved during the studies as the best indicators of success. The average length of studies and the success achieved at the studies is affected by a number of factors, including the level of previously acquired knowledge, the conditions at the faculty, etc. The evaluation of faculty teaching by students has come to be one nearly ubiquitous measure of teaching effectiveness and, often, a major consideration for promotion, tenure and merit at most institutions of higher education (James et al., 2008). The aim of this research is to determine the effect of the secondary school previously attended by students, and their success achieved in the secondary school to the efficiency of studying. It is clear that previous education has a significant effect on the results achieved by students, but these relations need a more detailed analysis, which is the subject of this study.

In developing their curricula, much will depend on the determination of higher education institutions to confront some cherished traditions in teaching and learning.

Method

The subject of the present research is the success and the average duration of studying of graduate students of Faculty of Agriculture in Novi Sad as a function of their secondary school success and the type of secondary school from which they are coming.

The aim of the research is determining the effect of success achieved in secondary school and the type of secondary school on the length of studies and the success achieved during the studies.

The relations between the observed variables were analysed using different statistical methods (Milojević, Zekić, 2015). Using descriptive analysis, the structure of graduate students was first graphically represented based on several indicators, such as the share of graduates by departments, their average grade, length of study, which was then followed by the analysis and determination of dependence of these results on the secondary school from which students came and the success they achieved in secondary school.

Similar methods were used for different problems (Janošević et. al, 2010; Kuiper, College, 2008; Vukelić, Novković, 2009; Vukelić et al., 2010; Aberson, 2014; Muller, Hofmann, 2014).

The relations that govern the dependent and independent variables were identified using regression analysis. The data were analysed using the Statistica 12, statistical analysis software package.

The observed data refer to the students graduated from the Faculty of Agriculture in Novi Sad in the period from 2000 to 2014. The collected database is incomplete, but it is sufficient for analysing and testing the significance between individual variables.

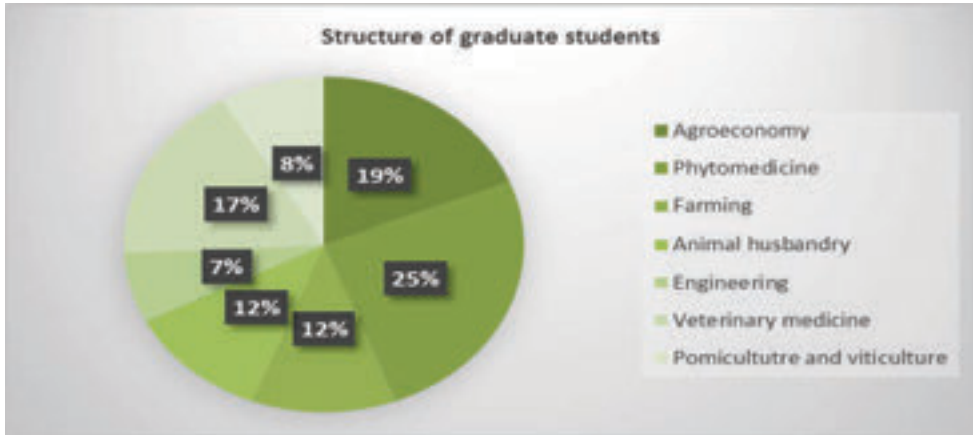
The structure of graduate students by departments

The data available refer to 1.114 students from seven different departments of the Faculty of Agriculture in Novi Sad (agroecology, veterinary medicine, phytomedicine, farming, animal husbandry, pomiculture and viticulture, and agricultural engineering), who graduated over the period between 2000 and 2014.

The data also refer to the type of secondary school from which students come, the number of credits which they bring from the secondary school, duration of studies, and the success achieved during the studies.

The structure of students graduated in the observed period by departments is presented in **Chart 1**.

Chart 1. Structure of graduate students by departments for the period of 2000-2014



Source: Author's Analysis

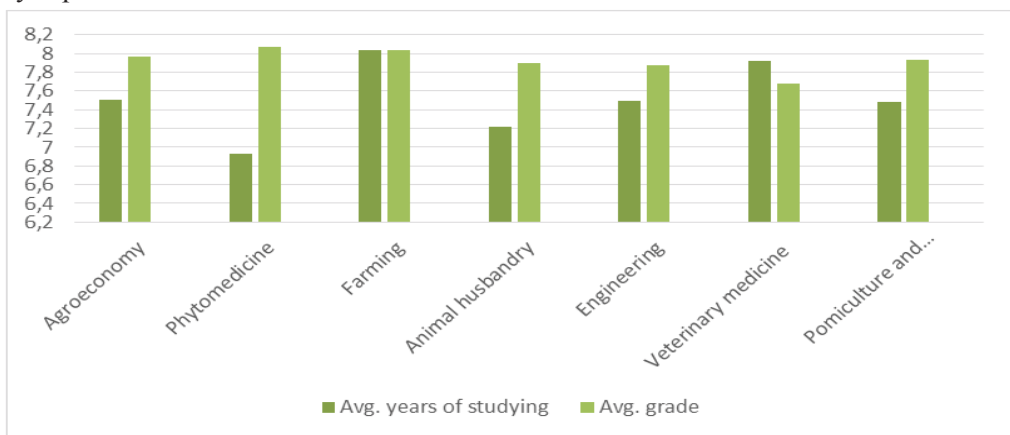
As indicated by the above graphical presentation, most students in the observed period have graduated from the Department of Phytomedicine. They make a quarter of the total graduates in the reporting fourteen-year period.

Then follow the departments of agroecology (18.85%), veterinary medicine (17.15%), farming (11.67%), animal husbandry (11.58%), pomiculture and viticulture (8.44%), and agricultural engineering (6.73%).

The average years of studying and the average grade achieved by the students during their studies is presented in **Chart 2**.

The duration of studies ranged from 6.93 years (department of phytomedicine) to 8.04 years (department of farming).

Chart 2. Average number of years of studying and the average grades for the observed period by departments



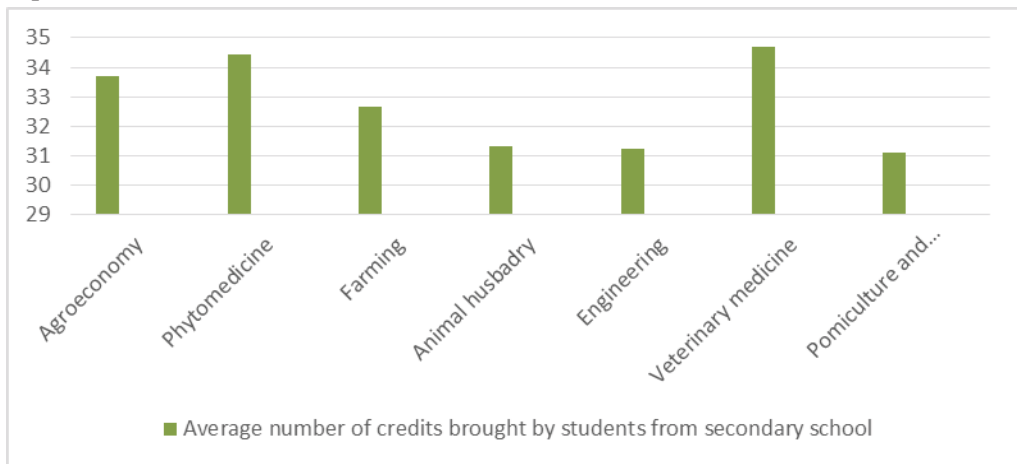
Source: Author's Analysis

An interesting fact is that students from the department of farming, although studying the longest, also have a rather high average grade compared to the students of other departments (8.04) which puts them on the second place behind students of phytomedicine whose average grade is 8.07. They are followed by the students of agroecology (7.97), followed by the students of pomiculture and viticulture (7.93), animal husbandry (7.90), agricultural engineering (7.88) and veterinary medicine (7.68).

The number of credits brought by the students of different departments from secondary school is presented in **Chart 3**.

The highest number of credits from secondary school on average is brought by the graduates from the department of veterinary medicine (34.68), with students of pomiculture and viticulture being the weakest in this respect (31.10). Somewhat better were the students who graduated from the departments of agricultural engineering (31.25), animal husbandry (31.33), farming (32.64), while the students of agroecology (33.68) and phytomedicine (34.43) were scoring rather good.

Chart 3. Average number of credits brought by students from secondary school by departments

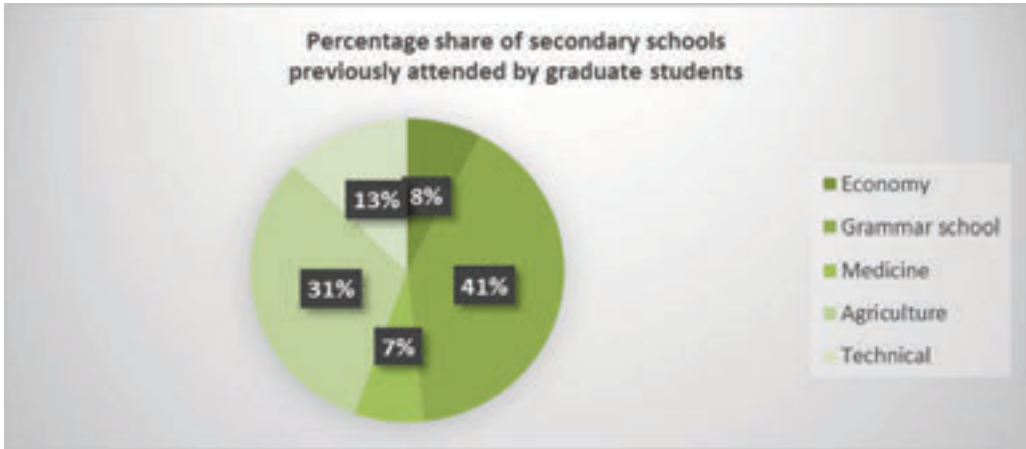


Source: Author's Analysis

The structure of graduates based on the secondary school they attended

When analysing the type of secondary school previously attended by the students who graduated in the reporting period, it can be seen that the most successful students come largely from grammar school (as many as 40.36%). They were followed by the students coming from secondary school of agriculture (31.39%), secondary technical school (12.91%), secondary school of economy (7.73%), while the lowest share is that of the students who attended secondary medical school (7.17%), see **Chart 4**.

Chart 4. Shares of secondary schools previously attended by the students who graduated in the reporting period (%)



Source: Author's Analysis

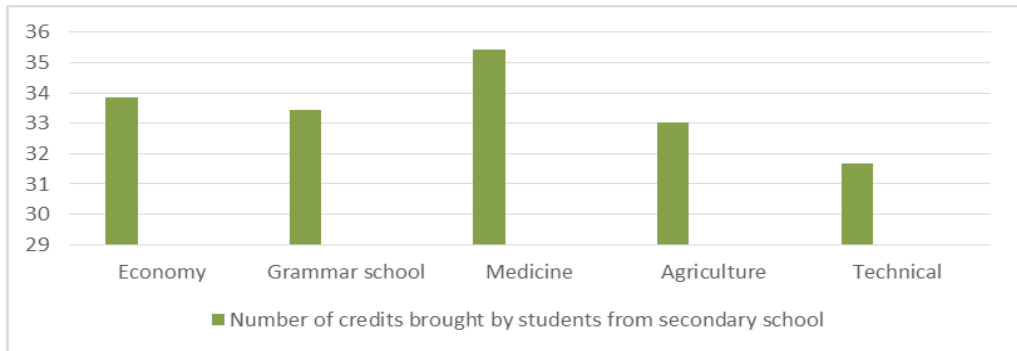
The average number of credits brought by the students from these secondary schools is presented in **Chart 5**.

As indicated by the above data, the students with the highest number of credits (35.42) came from medical school. They were followed by the students from the school of economy (33.86), grammar school (33.44), agriculture (33.03) and secondary technical school (31.67). The average number of credits brought by the students from secondary school is 33.26.

Chart 6 shows the students' average length of studies and the success they achieved as a function of secondary school they previously attended.

The shortest duration of studying was that of the students coming from secondary medical school - 7.06 years. Students coming from grammar school needed 7.33 years on average to finish their studies, while economists needed 7.59 years. Students coming from secondary technical schools finished their studies for 7.50 years on average, while the most time is need when the students previously attended secondary agricultural school - 7.64 years. The total average length of studies was 7.46 years.

Chart 5. Average number of credits brought by the students from secondary school by the type of school

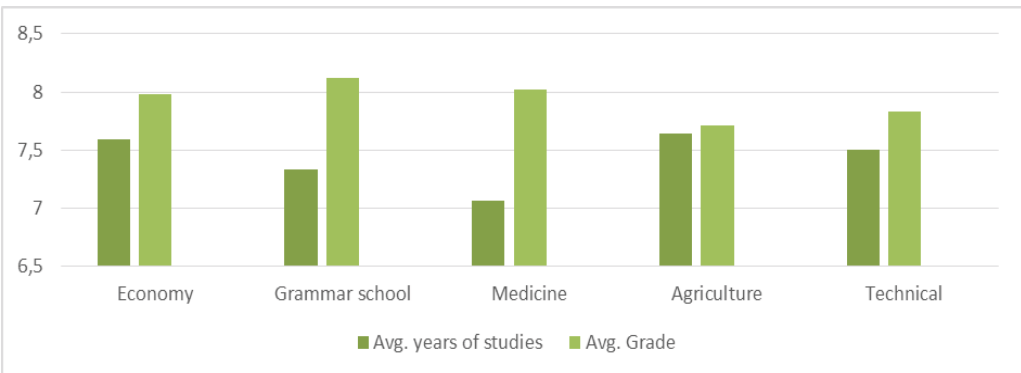


Source: Author's Analysis

The highest average grade during studies is achieved by students coming from grammar school.

They were followed by the students previously attending medical school 8.02, economy 7.98, technical school 7.83, while the list is closed by those coming from secondary agricultural school (7.71). The total average grade was 7.94.

Chart 6. Average length of studies and average grades as a function of secondary school previously attended.



Source: Author's Analysis

Shares of secondary of schools previously attended by departments from which students were graduated

In the next step, the structure of secondary schools previously attended by students was analysed in relation to individual departments.

Agroeconomy is clearly dominated by the students coming from grammar school. The second place is held by the students coming from economic school. Together, these schools make 79% of graduates (**Chart 7**).

Chart 7. Structure of secondary schools previously attended by graduates from the department of agroeconomy



Source: Author's Analysis

The department of Phytomedicine is also dominated by the students coming from grammar school, making over half of the total number of the graduates (51%). They are followed by the students coming from secondary agricultural (21%), medical (16%), technical (10%) and economic school (2%).

The graduates from the department of farming are mostly coming from grammar school (47%). They are followed by the students coming from agricultural (27%), technical (15%), medical (7%) schools, while those coming from secondary school of economy are at the end of the list (4%), which is again expected.

The situation is somewhat different with the department of animal husbandry, which is significantly dominated by the students coming from secondary agricultural school with a share of 65% of total graduates. They are followed by those coming from grammar school (22%), while the share of others is much lower: the share of the students previously attending secondary technical school is 9%, while the students coming from medicine and economy jointly share the remaining 4% of the total graduates.

Most of the students from the department of agricultural engineering previously attended secondary technical school (61%). They are followed by those coming from grammar school (22%) and secondary agriculture (14%), with the share of the students coming from secondary school of economy being the lowest (3%). No students coming from secondary medical school have graduated from this department.

Interestingly, most of the students graduated in the reporting period from the department of veterinary medicine came from secondary school of agriculture - 60%. The share of those previously attending grammar school is 31%, while of those coming from medical school is only 8%. It has been recorded that in the reporting period only one student who previously attended secondary school of economy has graduated from the department of veterinary

medicine, which makes 0.52%, while the students coming from secondary technical school were not represented.

At the department of pomiculture and viticulture, most graduates come from grammar school - 46%. They are followed by the students previously attending secondary school of agriculture (35%) and secondary technical school (14%). The share of students coming from medical and economic school is rather small, 4% and 1%, respectively.

Results

The effects of the total number of credits brought by the students from secondary school on the length of studying

In the next step, using regression analysis, the effect of secondary school success on the length of studies was analysed based on the number of credits (Table 1).

Table 1. Effect of the number of credits brought from secondary school on the length of studies

Regression Summary for Dependent Variable yrs. of studies(List1 in input data R= .22991593 R2= .05286134 Adjusted R2= .05200959 F(1,1112)=62.063 p<.00000 Std Error of estimate: 1.7316						
N=1114	b*	Std. Err. of b*	b	Std. Err. of b	t(1112)	p-value
Intercept			10.55823	0.397074	26.59010	0.000000
Number of sec. school credits	-0.229916	0.029185	-0.09325	0.011837	-7.87798	0.000000

Source: Result of prediction

As indicated by the results, as the number of credits that reflect the success in secondary school increases, the length of studies decreases. Increasing the number of secondary school credits by one shortens the duration of studies by about one month. This information is deduced based on the parameter b, or the regression coefficient.

Also, the correlation coefficient is observed to have a negative value (- 0.2299), which means that there is a negative correlation between the number of credits brought by students from secondary school and the number of years of studying. The squared correlation coefficient, or coefficient of determination (in this case 5.27%), indicates that the dependence of the length of studies is explained with only about 5% of the number of credits brought by the students, while the remaining 95% is a result of unexplained factors (coefficient of nondetermination).

The effects of the total number of credits brought by the students from secondary school on the average grade

The number of credits brought by the students from secondary school is positively correlated with average grades during studies. Namely, increasing the number of credits for one, the average grade increases by about 0.06 (Table 2).

Table 2. The effect of the number of credits brought from secondary school on the average grade during studies

Regression Summary for Dependent Variable: average grade (List1 in Input data) R= ,39879917 R2= ,15904078 Adjusted R2= ,15828452 F(1,1112)=210,30 p<0,0000 Std Error of estimate: ,60395						
N=1114	b*	Std Err. of b*	b	Std Err. of b	t(1112)	p-value
Intercept			5,945775	0,138490	42,93280	0,00
Number of sec. school credits	0,398799	0,027500	0,059870	0,004128	14,50171	0,00

Source: Result of prediction

The 0.16 coefficient of determination indicates that 16% of the average grade during studies can be explained by the credits brought from secondary school.

The effect of the secondary school success on the length of studies and the average grade by departments

Agroeconomy

At the department of agroeconomy, increasing the number of secondary school credits for one makes the average duration of studies by 0.14 years shorter (**Table3**).

Table 3. The effect of the number of secondary school on the length of studies

Regression Summary for Dependent Variable: yrs. of studies (List1 in agr01) R= ,32914615 R2= ,10833719 Adjusted R2= ,10405035 F(1,208)=25,272 p<,00000 Std Error of estimate: 1,7155						
N=210	b*	Std Err. of b*	b	Std Err. of b	t(208)	p-value
Intercept			12,27050	0,954427	12,85641	0,000000
Number of sec. school credits	-0,329146	0,065474	-0,14136	0,028120	-5,02713	0,000001

Source: Result of prediction

The coefficient of correlation has also a negative value, and it is statistically very important. The coefficient of determination is 0.10, meaning that 10% of the length of studies can be explained by secondary school credits. The standard error of regression is 1.7155. **Table 4** shows the effect of credits on average student grades.

Table 4. The effect of secondary school credit on the average grade

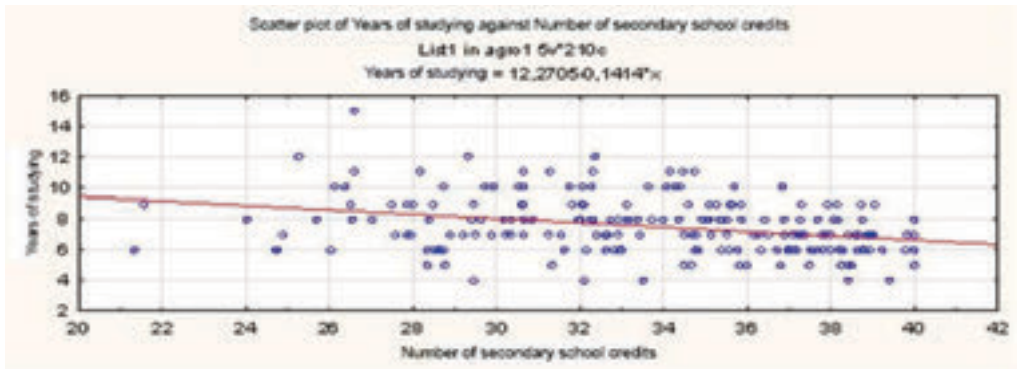
Regression Summary for Dependent Variable: average grade (List1 in agr01) R= ,48026364 R2= ,23065317 Adjusted R2= ,22695438 F(1,208)=62,359 p<,00000 Std Error of estimate: ,55191						
N=210	b*	Std Err. of b*	b	Std Err. of b	t(208)	p-value
Intercept			5,565408	0,307061	18,12479	0,000000
Number of sec. school credits	0,480264	0,060818	0,071440	0,009047	7,89678	0,000000

Source: Result of prediction

Here, there is a positive correlation between the average grade and the number of credits brought by the students – it is 0.4803 and it is statistically very significant. Increasing the secondary school credits by one, the average grade increases by 0.0714. The number of credits participates in the average grade with 22.70%. The average deviation of original values of the dependent variable of the estimated values is 0.552.

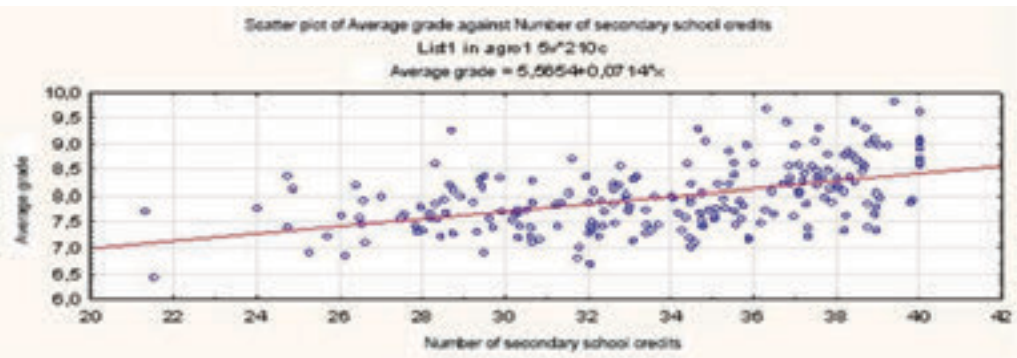
Using scatter plots (**Charts 8 and 9**), the following part of this paper presents the regressions related to the analysis of the effect of students' secondary school credits on the length of studies and average grades.

Chart 8. Scatter plot for the years of studying against the credits brought by the students of agroecology from secondary school



Source: Result of prediction

Chart 9. Scatter plot for the average grade against the credit brought by the students of agroecology from secondary school



Source: Result of prediction

The above scatter plots confirm the observed relation between the secondary school success of the students of agroecology and the results of their study from the aspect of length of study and average grades achieved during the studies.

Phytomedicine

For the department of Phytomedicine, the correlation coefficient between the credits and the length of study is -0.2697 , indicating a negative correlation between the two phenomena. Increasing credits for one, the average length of study shortens by 0.11 years.

Based on the coefficient of determination, it can be concluded that approximately 7% of the length of study is affected by the number of credits.

In the analysis of the effect of credits on the average grade of students there is a 0.5206 positive correlation between variable, which is statistically highly significant.

Increasing credits for one, the average grade among students of Phytomedicine is growing by about 0.086. The dependent variable is explained with the independent variable in nearly 27%.

Farming

There are certain changes when it comes to the students of farming in the observed effects compared to the students of agroecology and phytomedicine. Namely, the coefficient of correlation in this department is also negative, but the model based on which the effects of the success of these students in secondary school was considered on the length of studies was not statistically significant. This means that secondary education is not a decisive factor for the length of study of the students of the farming department.

At the department of farming, higher numbers of secondary school credits also imply shorter average studying. Increasing the number of credits by one, the average length of study is reduced by 0.061 years.

The small significance of credits for the length of study of students of farming is also indicated by the low coefficient of determination, which is as low as 1.74%.

In contrast to the length of study where the secondary school success is not critical, their average grades of students of farming are significantly affected by their secondary school success. The coefficient of correlation is statistically highly significant – 0.3457 – and indicates a positive linear relationship among the variables.

Increasing the number of credits for one, there is an increase in average grades of students of farming by approximately 0.05.

Unlike the previous regression, here, the number of credits significantly affects the average grade (11.27%), as indicated by the value of the coefficient of determination.

Animal husbandry

When it comes to the students of department of animal husbandry there is also a negative correlation between secondary school success and the length of studies, as indicated by the coefficient of correlation which is -0.3708 .

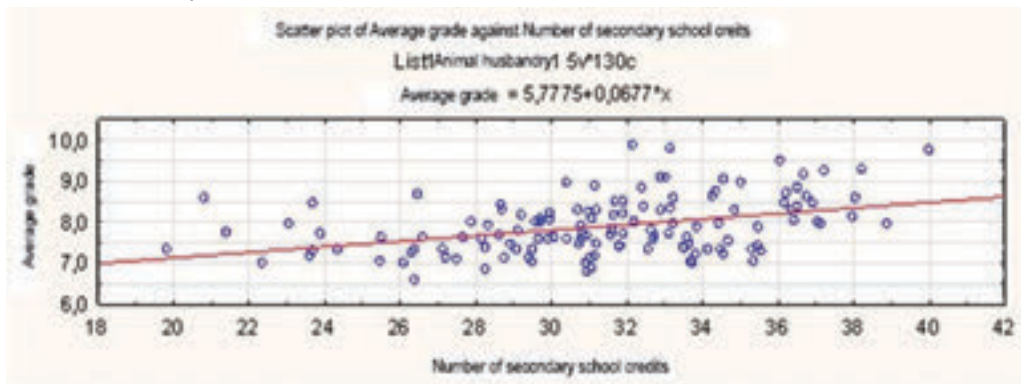
Increasing the number of secondary school credits for one, the duration of studies is reduced

by approximately 0.16 years. The coefficient of determination is 0.13, while the standard error of regression is 1.6661.

On the other hand, the effect of credits on the average grade achieved during the studies is positive; expressed through the value of the coefficient of correlation, it is 0.3969. On the average, increasing the number of credits for one, the average credit of students of this department increases for approximately 0.07.

The coefficient of determination indicates a 15% effect of the number of credits on the average grade, while the effect of other factors is 85%. These relations can be seen from the scatter plot (**Chart 10**).

Chart 10. Scatter plot of the average grade against the number of credits for the students of animal husbandry



Source: Result of prediction

Agricultural engineering

As was the case with the previously observed departments, there is a statistically significant negative correlation between secondary school success and the length of study at the department of agricultural engineering as indicated by the coefficient of correlation (-0.2497). The number of credits which reflects secondary school success affects the duration of studies in approximately 5%. When increasing the number of credits for one, the length of studies decreases for 0.10 years.

Analysing the effect of secondary school success on success achieved during the studies reveals that increasing the number of credits for one leads to the increase in the average grade by 0.09. The coefficient of correlation is positive and relatively high (0.5461), indicating the importance of secondary education for the success of the students of agricultural engineering. The coefficient of determination is slightly higher and amounts almost 0.29, which means that knowledge acquired in secondary school affects the average grade at the end of undergraduate studies with 29%.

Veterinary medicine

Similarly to the department of farming, a negative correlation has also been found between secondary school success and the length of studies at the department of veterinary medicine, which is not statistically significant, and it is -0.1338. This suggests a minimum level of effect of secondary school credits on the average length of studies. At this department, increasing the number of credits by one reduces the average length of studies by only 0.06 years.

On the other hand, knowledge acquired in secondary school has a much higher effect on the average grade during the studies (12.50%). Increasing number of credits for one, the average grade also increases by a little more than 0.05.

Pomiculture and viticulture

Similar to the departments of veterinary medicine and farming, there is a negative correlation also at the department of pomiculture and viticulture, which is statistically not significant and indicates a minor effect of previously acquired knowledge on the length of studies. On the other hand, there is a statistically significant positive correlation between secondary school success and average grade at the end of studies, which is 0.3407. The coefficient of determination indicates that secondary school credits affect the average grade during studies with nearly 11%.

Increasing the number of credits by one, the average grade of the students at this department increases by approximately 0.05.

Conclusion

The present research on the effect of the type of secondary school and the secondary school success on the length of studies and the success achieved during undergraduate studies of students of Faculty of Agriculture in Novi Sad provided some interesting results.

First, a descriptive analysis showed that the average age of studying is approximately 7 years and 6 months, with the average grade being 7.94. The average number of credits brought by students from secondary school is 33.26.

There is the highest number of students graduated from the department of phytomedicine. The same department achieved the best average, which has not prevented the students from being the most effective in the terms of the duration of studies.

The students with the highest number of secondary school credits were those graduated from the department of veterinary medicine.

Regarding the secondary school they previously attended, the students coming from grammar school were the most successful. There is the highest percentage of graduate students coming from grammar school. The best average during studies has been achieved by the students previously attending grammar school. However, this made them somewhat slower, a fact which allowed students coming from secondary medical school to be the fastest to graduate. Students coming from secondary medical school also had the highest success during previous education.

In the terms of departments, students coming from grammar school accounted for the majority of graduates in agroecology, phytomedicine, farming, pomiculture and viticulture, while the majority of graduates of veterinary medicine and animal husbandry were previously attended secondary school of agriculture. Students coming of secondary technical schools are traditionally attracted by the department of agricultural engineering, so understandably the highest number of the students graduated from this department came from secondary technical school.

These data should be interpreted very carefully because the criteria used by different secondary schools in the process of evaluation are not quite uniform. Taking secondary school success as a relative indicator, and on the basis of its share among graduate students and the effect on the results achieved during the study, the conclusion is that the students previously attending grammar school are still more achieving than those come from other secondary schools.

In this paper, using regression analysis, the effect of secondary school success on the average length of studies and success achieved during the studies has been investigated. The analysis of the effect of secondary school success on average length of studies showed a negative coefficient of correlation in all departments, indicating that the increase of secondary school credits leads to the decrease in the average length of studies (total coefficient, $r = -0.23$). In some departments, this indicator is statistically highly significant (agroecology, phytomedicine, animal husbandry, and agricultural engineering), while in the others it is insignificant (farming, veterinary medicine, pomiculture and viticulture), indicating that secondary school success has no statistically significant effect on the length of studies in these departments.

The effect of previously acquired knowledge on the success achieved during the studies is positively focused and thus determined by positive coefficient of correlation (overall coefficient $r = 0.39$). Also, the success during the studies is much more effected by secondary school success (coefficient of determination, $r^2 = 0.1583$) than the average length of studies (coefficient of determination, $r^2 = 0.052$).

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EFIKASNOST STUDIRANJA KAO PREDIKTOR KVALITETA OBRAZOVANJA: STUDIJA SLUČAJA POLJOPRIVREDNOG FAKULTETA

Beba Mutavdžić⁵, Snežana Babić-Kekez⁶, Nebojša Novković⁷, Tihomir Novaković⁸

Sažetak

Pri kreiranju obrazovne politike polazi se, između ostalog, od vizije kvaliteta obrazovnog sistema. Shvatanje pojma kvalitet je višeznačno, te je u visokom obrazovanju najprimereniji holistički, multidisciplinarni pristup koji uvažava različite segmente kvaliteta. Jedan od njih je merenje efikasnosti studiranja na osnovu ulaznih parametara: vrste srednje škole i postignutog uspeha u srednjoj školi. Primenom regresione analize, na uzorku od 1114 ispitanika, studenata Poljoprivrednog fakulteta, istraživana je uticaj uspeha u srednjoj školi na prosečan vek studiranja i ostvaren uspeh tokom studija. Kod svih smerova, prilikom definisanja uticaja uspeha u srednjoj školi na prosečan vek studiranja, koeficijent korelacije je negativan, što govori da sa povećanjem broja bodova iz srednje škole opada prosečan vek studiranja (ukupan koeficijent, $r = -0,23$). S obzirom na to da je problem u neujednačenim kriterijumima vrednovanja i ocenjivanja na nivou srednjoškolskog obrazovanja u Srbiji, posebno između gimnazija i srednjih stručnih škola, rezultati ovog istraživanja su, između ostalog, u funkciji ukazivanja na nephodnost ujednačavanja i kompatibilnosti svih elemenata sistema obrazovanja, donošenja nacionalnih ishoda obrazovanja na svim nivoima i nacionalnog okvira kvalifikacija.

Ključne reči: *kvalitet visoko školskog obrazovanja, efikasnost studiranja, obrazovna politika.*

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CLIMATE CHANGE RISKS, AGRICULTURAL PRODUCTION, AND THE ROLE OF INSURANCE

Vladimir Njegomir,¹ Radovan Pejanović², Goran Maksimović³

Summary

Climate change in the form of global warming is visible, tangible, measurable and is one of the most significant risks facing the world. During the conceptualization as the objective of the paper, we have determined the analysis of the impact of climate change on agricultural production and the ways of reduction of negative impacts. The most important results of the present work are the analysis of the implications of climate change on agricultural production and food security, adaptation possibilities of agriculture and the role of agriculture insurance. The main conclusions are that climate change negatively affects agricultural production and food security, especially in subtropical areas while there is limited potential for a positive impact of climate change in the northern hemisphere. There are two possible choices for agricultural producers, under the implications of climate change, that are not necessarily mutually exclusive: 1) finding a long term sustainable solution based on the adaptation and 2) obtaining insurance coverage.

Keywords: climate change, agriculture, risk, insurance.

JEL: Q01, Q54, G22.

Introduction

Climate represents the average state of the atmosphere over a town or area in a given time period (Enciklopedija leksikografskog zavoda, 1967). Climate as a time-weighted average represents a mathematical artifact that does not occur in reality (Steht, von Storch, 1999). The climate elements include, for example, the temperature of the air, land and oceans, humidity, precipitation, wind, and the climate factors include the terrain, latitude, distance from the sea, altitude, vegetation and finally a man.

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Climate affects all aspects of human life, his way of dressing, feelings and behavior, manner and content of the food, costs of heating or cooling. It also determines the diversity of agricultural production, affects the development of tourism, types of plant species. Thus, climate change directly affects all aspects of human life and particularly those elements that are directly determined by climate, such as agriculture.

Climate changes are influenced by minor or major changes in shorter or longer periods of time in the atmosphere, biosphere, lithosphere and hydrosphere. Climate changes are now visible, tangible and measurable, and are one of the most significant risks facing the world. The world is faced with an increase in global average temperature. Since the beginning of the twentieth century until 2014, the average global air temperature rose to $+0.7^{\circ}\text{C}$, whereby this growth has not been continuous. The rapid increase in the average temperature at the global level, in the amount of $+0.18^{\circ}\text{C}$ for the decade, was recorded in the period after 1976. Also, the melting ice is evidenced by NASA data that indicate that the area of ice in the Arctic decreases on average by 9% per decade. The global average sea levels increased by about 10 to 25 centimeters during the last 100 years.

These consequences of climate changes will directly affect all economic activities and particularly agricultural production. During the conceptualization as the objective of the paper, we have determined the analysis of the impact of climate change on agricultural production and the ways of reduction of negative impacts. In an effort to realize the set goal, in this paper, we analyze the implications of climate change on agricultural production and food security, adaptation measures and the role of agriculture insurance in reducing the negative effects of climate changes.

Methodology and data sources

Our research is focused on the analysis of the climate changes implications on sustainability of agricultural production and measures that agricultural producers can use to absorb the negative consequences. We use statistical methods in research, with the aim of the data processing and comparison method of theoretical basics and empirical solutions of different risks measures applications. Primarily, we follow the movements of indices and trends of climate changes and their impacts on agricultural production and food security. We compare foreign empirical evidence and experiences in agricultural production risk management and give proposals of their applications in Serbia.

Using combined data we explore the issue of food security and adaptation measures and insurance as the most important measures that agricultural producers can use in managing production risks. After comparing various available forms of prevention and financing of consequences of climate changes with foreign empirical evidence we give proposals for improvement in terms of efficiency of applied risk management practices in Serbia.

Data are gathered from various trustful sources. We use sources of various leading scientists in the field of agricultural economics, risk management and insurance. We base our conclusions on data from Intergovernmental Panel on Climate Change, European Commission, Food and Agricultural Organization of the United Nations, Commodity Exchange in Novi Sad and World Bank.

Climate changes implications on agricultural production

The impact of climate change, which are evident in the increase of atmospheric and sea temperature, melting of ice and rising sea levels, on the agricultural production is not the same in all areas of the world nor is it easy predictable. However, there are consequences that can be associated with higher temperatures. These consequences can be divided into potentially positive and potentially negative to agricultural production and insurers of production risks of agricultural production.

Positive effects of climate changes in agricultural production may include (Heintz, 2008):

- Rapid expansion of thermophilic plants, or plants that require a warmer environment for the normal development in the northern areas;
- Farmers will be able to grow crops with longer vegetation stages, which will result in increased yields;
- The extended growth phase will extend the period of grazing pastures;
- Higher levels of carbon dioxide support photosynthesis;
- Increased precipitation in some areas will increase yields.

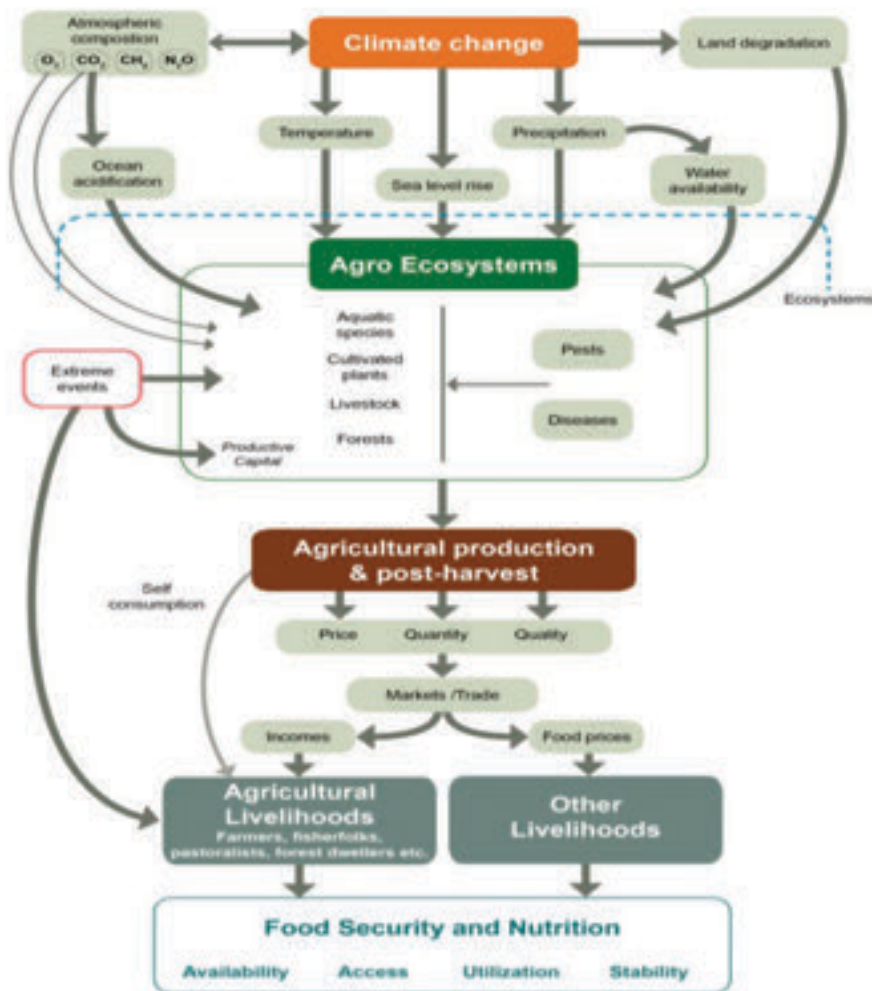
The negative consequences of climate changes in agricultural production may include (Heintz, 2008):

- Extended periods with temperatures above 35°C would cause heat stress in flowering plants, which will reduce yields in subtropical areas to 70%;
- Higher temperatures in northern areas will increase evaporation, significantly disrupting the water balance in the soil and in plants;
- Higher rates of evaporation in tropical and subtropical areas will dry land and will be the cause of the salinization and reduction of arable land;
- Higher temperatures will accelerate the process of flowering of fruit trees, which will increase the risk of the impact of late spring frosts to flowers;
- The higher temperatures of the seas and oceans will have direct influence on aquaculture where the most dangerous effects will be the spread of flowering of seaweed and jellyfish as well as the warming of streams intended for aquaculture. Water contains less of oxygen when heated, and can cause a negative effect on fish and other organisms;
- Patterns of animals' infections can be changed and the increase in the density of organisms and geographical coverage is possible;
- Decreased rainfall in some areas will reduce yields;
- Increased precipitation in some areas will increase the humidity and reduce yields;
- Increasing temperature leads to less snowfall, which will cause lower spring moisture that plants need in the spring. There will be an increase in forest fires in North America;

- Areas where climate changes will cause a complete cessation of rainfall, agricultural production will not be possible (for example, the agricultural production in Australia will move from the southeast to the northwest part of the country).

The latest in a series of reports of the Intergovernmental Panel on Climate Change (IPCC, 2014) confirms the key findings of the previous report concerning the evolution of the climate as well as the key physical effects, such as effects on the land and oceans, temperature change, sea level rise and increasing ocean acidity. All these changes caused by climate changes have a negative impact on all aspects of agricultural production. This report indicates that the impacts of climate changes occur in a series of physical changes and indirect impacts on the systems and then on humans (see Figure 1).

Figure 1. Chain impacts of climate change on agricultural production and food security



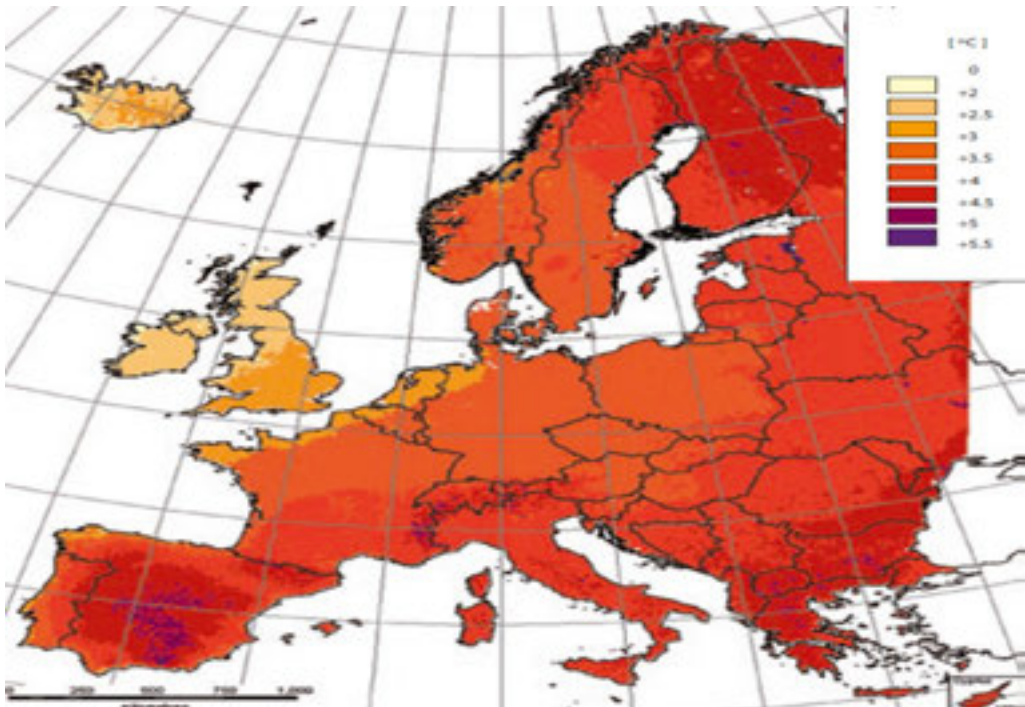
Source: FAO (2016a).

Global climate change, in addition to the direct impact of the increase in catastrophic events, such as hurricanes and winter storms, has numerous other effects, such as impacts to the availability of food, habitation, human health, ecosystems and water resources.

Spring occurs earlier, which has an impact on the Earth's biological systems, including changes such as bird migration and egg-laying and changes in the types of plants and animals. In the Alps, for example, it is observed that certain plant species migrate upward by one to four meters per decade and some species of plants that were previously found only on mountain tops are completely extinct.

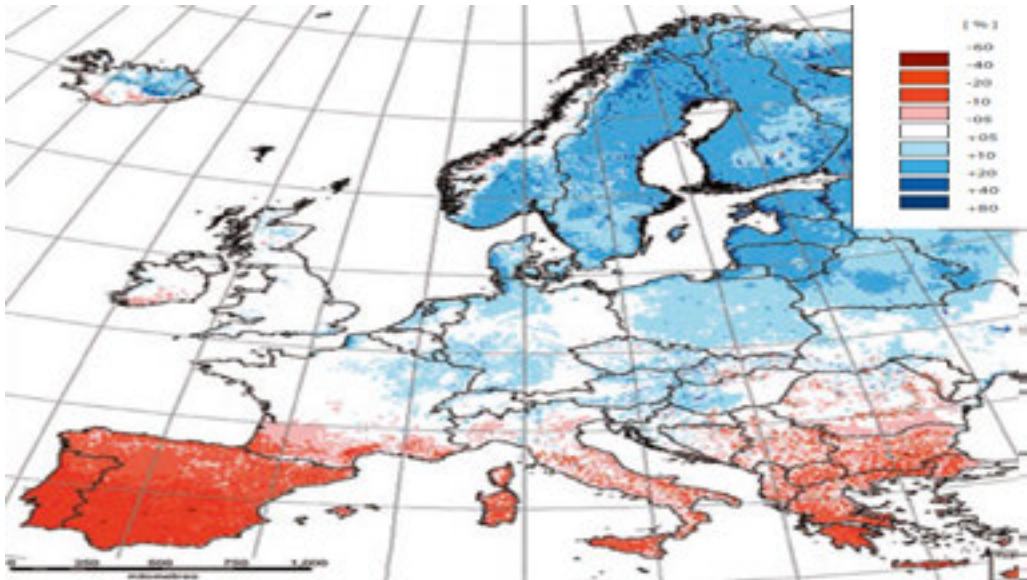
Thanks to the increase in air temperature there are changes in the diversity of animal species, in particular insects, because it is found that butterflies, dragonflies, moths, beetles and other insects live in large areas, both in terms of latitude and altitude, at which they were not able to survive before due to the cold. Increased water temperatures, combined with changes in the surface of the ice cover, salinity and oxygen levels, influence the change in the diversity of both marine and freshwater flora and fauna. Projected changes in average annual temperatures and average rainfall in Europe until the end of the XXI century are presented in figures 2 and 3.

Figure 2. Projected changes in average annual temperature by the end of the twenty-first century



Source: EC (2008).

Figure 3. Projected changes in average annual precipitation by the end of the twenty-first century



Source: EC (2008).

Figures showing projected changes in average annual temperatures and annual precipitation clearly indicate that changes in agricultural production also affect Europe. Some of the changes in the agricultural production are already felt.

A warmer and drier years will contribute to a greater likelihood of heat waves and droughts on one the hand, and floods on the other. This is indicated by a study of Bernard Lehner and his colleagues at the University of Kassel in Germany, which was published in the scientific journal “Climatic Change” (Lehner et al., 2006). This study deals with the risks posed by floods and droughts in Europe. An integrated analysis of possible impacts of climate changes on the future realization of floods and droughts on the continent indicates that in northern and north-eastern parts of Europe will be increased likelihood of floods in the future while in the southern and southeastern parts of Europe will be increased probability of droughts, whereby the extreme events, floods and droughts will occur with a higher likelihood (estimates are that they will occur every 10 to 50 years by 2070, and their current frequency is on average every 100 years). These developments will result in adverse events such as forest fires, as well as damages in sectors such as agriculture, domestic freight forwarding and supply.

Estimates are that at lower latitudes there will be the decline in yields of agricultural production, which can lead to increased risk of hunger in these areas (EC, 2008). In higher latitudes, such as areas further north in the northern hemisphere, there will be a modest increase in the yield of agricultural production if the temperature does not rise by more than 3°C, but if the rise would be greater even in these areas will be a decline in the results of agricultural production (EC, 2008).

Assumed escalating of problems with droughts and water scarcity will cause the reduction of arable land and an increase in desert areas. There are also forecasts that indicate that the entire Mediterranean basin will be exposed to severe droughts. Very high temperatures can induce structural changes caused by subsidence of soil in areas where the soil structure is dominated by clay, a phenomenon that is already manifested in the UK.

Food security under conditions of realization of climate change risks

Food security, and its sufficient availability of nutrition of the population is the key reason for the existence of agricultural production since it firstly occurred. With the increasing population needs to increase agricultural production are continuing. The assumption is that by 2050, global agricultural output will have to increase by 60% compared to today's levels. Namely, in order to meet the food needs of the projected population growth and food consumption per capita, historically manifested continuity of growth in agricultural production will have to continue in order to ensure the doubling of current production (Tubiello, Jean-Francois, Howden, 2007).

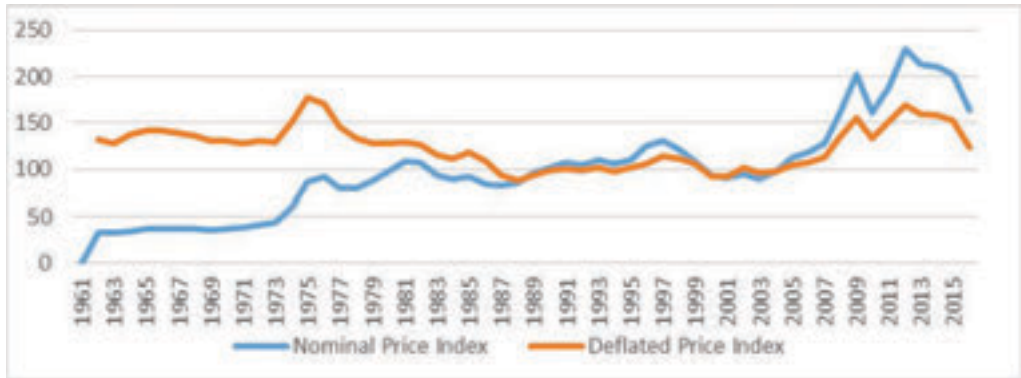
The historical trend of growth in agricultural production occurs from the fifties of the twentieth century from when significant investment in the productivity of agricultural production has been made. The whole process is called Green Revolution, which is considered to be resulted with today's levels of over 170% more grain to only 8% increase of cultivated land, compared to more than 50 years ago. Such an increase in production volume provided that the current volume of production of cereals provides food security at a level of 1 kg per person per day (Burke, Lobell, 2010). These data refer to the average in the world. However, there are significant regional differences, and it is believed that globally more than one billion people are actually starving. This is due to faster population growth than is the growth in the volume of agricultural production. Viewed regionally in the world, only in Africa a real drop in cereal production per capita has been noticed. The reason is the fast growth of population relative to cereal production.

With the adoption of sustainable development goals, the world is dedicated to hunger elimination, security and safety of food and nutrition improvement in 2030. However, the big problem is climate changes. It is believed that in the future it can only be expected decline in the volume of agricultural production in the world, especially when viewed in correlation with the increasing population. Although there will be a slower population growth, climate change has already begun to undermine the livelihood and food security of the most vulnerable populations. Ensuring food security and good nutrition status under conditions of climate changes is a serious challenge that humankind faces already (FAO, 2016).

The only way to avoid the effects of climate change on the reduction in the volume of agricultural production and the volume of arable land is the international exchange. An additional issue that arises is the question of access to food, that is the questions of whether the countries in which the food security is compromised will be able to share food. The answer to this question is linked to the movement of prices of agricultural products and food on the global level. Growth in global food prices has been particularly evident since 2005 (see Figure 4) when, after a catastrophic drought in the US global food prices reached a

historic record level. Soaring food prices in the period from 2005 to 2013 was 74%. In such circumstances, it is evident that access to food will be reduced in poorer countries, especially with more pronounced effects of climate changes, which will further contribute to the growth of food prices, as shown by 2012.

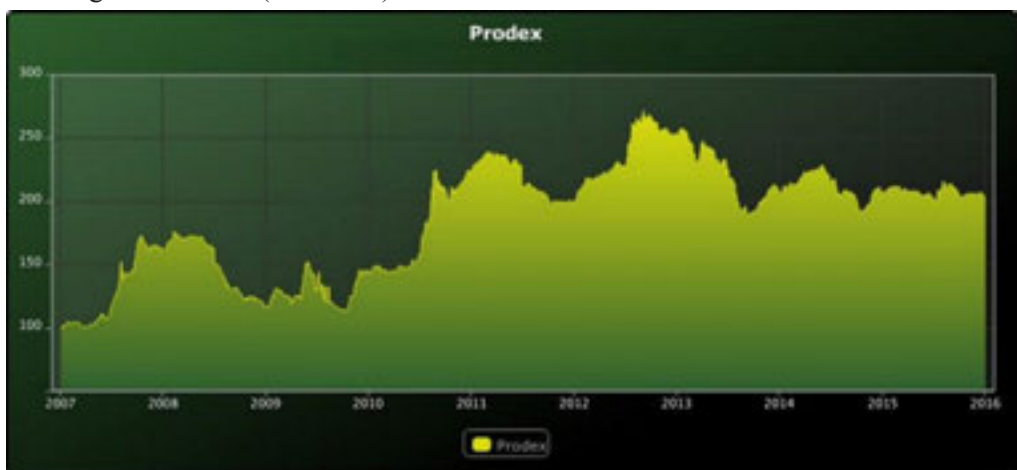
Figure 4. Indices of food prices in the world in the period 1961-2015 (2002-2004=100)



Source: FAO (2016b).

The international food price index of the Food and Agriculture Organization (FAO) is presented in the Figure 4. This index is a measure of the monthly changes in international prices of the food basket. This basket consists of the average price index for the five groups of food products, with an average, weighted share of each of the five groups in total exports in 2002-2004. Similar trends of sharp price movements are manifested in Serbia at the Commodity Exchange in Novi Sad (see Figure 5).

Figure 5. The index of market prices of primary agricultural products on the Commodity Exchange in Novi Sad (PRODEX)



Source: PRODEX (2016).

Figure 5 shows similar price movements or the movements observed, but all that movement is at higher price levels, especially in the period after 2010, when there was a sudden increase in the prices of agricultural products.

Adaptation of agriculture to climate changes

Climate changes are real and are a cause of concern for sustainable economic development, and in particular sustainable development of agriculture. Finding adaptation solutions is critical in the years to come, particularly in agriculture. The main task of adaptation measures is the reduction of the vulnerability of agricultural production to the catastrophic damages caused by climate changes and strengthening of the capacity of rural areas for recovering of their economy and environment.

Estimates of the International Organization for Food and Agriculture (FAO) are that 11% of arable land in developing countries will be lost by 2085 due to climate changes, which will reduce the production of cereals in more than 65 countries (McClellan et al., 2005). If we consider Africa in particular, estimates are that 25% to 42% of the habitat will be lost, which will jeopardize agricultural production and the reduction in crops for food and medicinal purposes. Thus, agricultural production is relatively under the greatest negative impact of climate changes, which is especially highlighted in the least developed countries. Unlike undeveloped countries, the developed countries of the northern hemisphere to some extent will be able to take advantage of the positive effects of global warming. The problem in developing countries, and especially in undeveloped countries, is the fact that in these countries adequate institutions and infrastructure for dealing with climate changes does not exist, despite the fact that agricultural production has a very important role in their national economies.

Adaptation of agricultural production to climate changes does not require a completely innovating of agricultural practices. It requires the adjustment of good agricultural practices to changes in environmental conditions. Adaptation refers to policies, practices and projects with the aim for reduction of negative consequences and/or exploitation of the opportunities that are associated with climate changes, including climate variability and extremes (EEA, 2016). Another approach to the interpretation of the term “adaptation” involves the activities of policies, processes and capital adjustments in order to respond to the presence of climate changes, as well as the changes in social, institutional and technical structures and features that affect capacity for the recognition and realization of these activities. (Adger et al., 2007).

There are a wide variety of adaptive measures of agricultural production to climate changes. These measures include various options, from technology to management, such as production practices, and policy, such as adaptation action plans (Howden et al., 2007). Measures that can be applied for the adaptation vary from those that creates smaller or larger changes in the existing agricultural systems. Implementation of the measures that have a marginal impact on the existing agricultural systems can have significant benefits under conditions of moderate climate changes. However, there are limits of the effectiveness of such changes in the conditions of serious climate changes. Therefore, the systemic changes are necessary

in the allocation of the resources, such as targeted diversification of production systems and livelihood.

Agricultural producers apply a series of measures aimed at adaptation to climate changes. These measures include crop rotation in order to make best use of available water resources, adjusting sowing dates according to temperature and rainfall patterns, use different types of crops that are better adapted to new weather conditions that can include extreme temperatures and droughts, planting of hedges with the aim of protection from wind and evaporation. Providing better information on climate risks and adaptation options, advisory services and training of farmers are key adaptive measures in agriculture.

Adaptation strategies for the agricultural production exposed to climate changes are already prepared or developed in various countries of the European Union. The focus of these adaptation strategies is mainly the prevention of impacts of weather extremes that are considered imminent danger, such as floods.

As climate changes intensify, farmers may need to use other types or new crops. Some adaptation measures imposed by climate changes will be costly due to heavy investments in new equipment and infrastructure, such as building or improving irrigation systems or adapting ventilation in barns. Agricultural producers cannot themselves bear the burden of application of adaptation measures. Public policy should provide adequate support to allow farmers to adapt structures of agricultural holdings and production methods and to continue providing services to rural surroundings.

The role of the agricultural insurance

Agricultural production is threatened by a number of risks which are managed in different ways (Pejanović, Njegomir, 2011). Among the methods available for production risks management the most important role has insurance. Insurance improves agricultural production by making farmers' entrepreneurial activities more stable and certain. Insurance reduces the uncertainty of farmers and the need for creation of individual savings accounts or funds, given that the need for cash reserves is reduced (Raulston et al., 2010) By releasing the need for accumulation of surplus funds that can be profitably engaged, insurance additionally supports agricultural development (Njegomir, Pejanović 2011). In addition to indirect economic protection from the destructive effects of natural forces and human activities, insurance represents a form of security pledge (collateral) that allows agricultural producers easier access to capital through loans at lower costs. The importance of agriculture insurance is evidenced through the exclusion of state subsidies for the payment of insurance premiums from the Free Trade Agreement signed within the World Trade Organization in 1994, provided that the insurance provides financial compensation for the climate and natural disasters (Baez, Wong, 2007).

Despite the great importance that insurance has, various studies have shown conflicting results regarding the factors that have a positive impact on agricultural producers to conclude insurance contracts. For example, Velandia et al. (2009) found that the conclusion of insurance contracts is positively affected by the level of business risks while it is negatively influenced with land ownership, income achieved outside agriculture and education. However,

Sherrick et al. (2004) found that farmers are more willing to conclude insurance if their perceived risk for the realization of yields is greater and if they are engaged in production on farms that are larger, older and that are not leased. Also, Enjolras and Sentis (2008) analyzing the agricultural insurance in France found that the size and financial strength of farmers, diversified production and catastrophic climatic events have a positive impact on farmers' decision on the conclusion of insurance.

Historically, agricultural insurance has evolved from hail insurance, when during the last century, farmers have organized in societies for risk sharing, in order to protect their crops from the risk of fire. Over time, the scope of coverage has widened in terms of risks' covered, but also in terms of types of agricultural insurance. Global agriculture insurance premium has reached 18.5 billion dollars in 2008, of which the largest part (about 62%) came from North America, 18% from Asia, 16% from Europe and the rest from Latin America, Africa and Australia. Total realized agriculture insurance premium in emerging markets in 2007 was less than 20% of global premium (Baez, Wong, 2007).

The basic division of agricultural insurance is the division on crop insurance and livestock insurance. Crop insurance provides coverage for all types of crops, fruits, flowers and vegetables, and livestock insurance covers losses that may arise due to the death or unplanned destruction, illness or accidental injury of horses, pigs, sheep, bulls, cows, calves and goats and other domestic animals, and in some cases some wild animals may be included. Crop insurance is the most widespread type of agriculture insurance, which accounted for about 90% of the total agriculture premium in 2008 (Iturrioz, 2009). Insurance types that are common in agriculture insurance include: 1) traditional insurance, based on the compensation of the actual losses caused by the insured risk or all risks, 2) yield insurance and 3) insurance based on the application of the indices (see Table 1).

Table 1. Types of agricultural insurance

<i>Type of Agricultural Insurance Product</i>	<i>Payouts</i>	<i>Availability</i>
a) Indemnity Based Agricultural Insurance <i>(insurance payouts based on the actual loss at the insured unit level)</i>		
1. Named Peril	Percentage of Damage	Widespread
2. Multiple Peril	Yield Loss	Widespread
b) Index based Agricultural Insurance <i>(insurance payouts based on an index measurement)</i>		
3. Area-Yield Index	Area-yield Loss	USA, India, and Brazil
4. Crop Weather Index Insurance	Weather Index payout scale	India, México, Malawi, Canadá, USA
5. NDVI ¹ Index Insurance	NDVI Index payout scale	Mexico, Spain, Canada
6. Livestock Mortality Index Insurance	Livestock mortality index payout scale	Mongolia
7. Forestry Fire Index Insurance	Ignition focus/ burnt area payout scale	Canada, USA
c) Crop Revenue Insurance <i>(insurance payouts based on yield measurement and crop prices)</i>		
6. Crop Revenue Insurance (CRI)	Yield and Price Loss	Limited to USA

Source: World Bank (2009).

Conclusion

By conducting analyses that have been presented in the work, we have come to the conclusion that the impact of climate changes on agricultural production and food security is proven, visible and greatly limiting for the agricultural production. In fact, if current trends of climate changes continue, agricultural production will be strongly negatively impacted. Positive effects can be expected in the northern hemisphere, but only on condition that there is no accelerated pace of climate changes.

Agricultural producers in dealing with the effects of climate changes have at their disposal two key mechanisms: 1) finding a long term sustainable solution based on the adaptation and 2) obtaining insurance. The implementation of these mechanisms, especially with regard to the implementation of adaptation measures, can be very expensive. Public policy should provide adequate support to allow farmers to adapt agricultural production to amended climate conditions.

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RIZICI OD KLIMATSKIH PROMENA, POLJOPRIVREDNA PROIZVODNJA I ULOGA OSIGURANJA

Vladimir Njegomir⁴, Radovan Pejanović⁵, Goran Maksimović⁶

Rezime

Promena klime u vidu globalnog zagrevanja je vidljiva, opipljiva i merljiva i predstavlja jedan on najznačajnijih rizika sa kojima se svet suočava. Prilikom konceptualizacije kao cilj rada odredili smo analizu uticaja klimatskih promena na poljoprivrednu proizvodnju i načina za redukciju negativnih uticaja. Najvažnije rezultate u radu predstavljaju analize implikacija klimatskih promena na poljoprivrednu proizvodnju i sigurnost hrane, adaptacione mogućnosti poljoprivrede i ulogu osiguranja poljoprivrede. Osnovni zaključci su da klimatske promene utiču značajno negativno na poljoprivrednu proizvodnju i sigurnost hrane, posebno u suptropskim oblastima dok u severnoj hemisferi postoji potencijal za pozitivan uticaj klimatskih promena. Postoje dva ključna moguća izbora za poljoprivredne proizvođače u uslovima implikacija klimatskih promena koji ne moraju biti međusobno isključivi: 1) pronalaženje dugoročno održivog rešenja na bazi adaptacije i 2) pribavljanje osiguravajućeg pokrivača.

Ključne reči: klimatske promene, poljoprivreda, rizik, osiguranje.

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CREATING THE VALUE CHAIN MILK BETWEEN BOSNIA AND HERZEGOVINA AND CROATIA

Ivana Plazibat¹, Ferhat Čejvanović², Zorica Vasiljević³

Summary

More than ever distribution of fast moving consumer goods (FMCG) between two neighbors, and ex partners in CEFTA 2006, Croatia and B&H becomes in focus of producers and retailers. Mainly because customs liberation that existed between two ex CEFTA partners ceased to be valid by entering Croatia in EU, and leaving CEFTA. Bosnia and Herzegovina was most important trading partner for Croatia, with the highest rate of trade liberalization within CEFTA 2006. At the same time Croatia was the most important trade partner for B&H.

According to above mentioned the aim of this paper is to find out the possibility of the promotion of foreign trade between Bosnia and Herzegovina and Croatia for consumer products (milk and dairy products). Those FMCG earlier exchanged between two partners became today more costly. For that reason, to make these products more attractive to their consumers retailers and producers from both countries must jointly work to create greater value, i.e. compensate for the price difference through creation of the value chain between B&H and Croatia retailers and producers.

Key words: *FMCG, value chain, milk, dairy products, Croatia, B&H*

JEL: *Q17*

Introduction

The trade plays an important role in the economy and society. However, despite the openness of markets, the effects of the retail trade in the Croatian economy are not satisfactory (Segetlija, 2008). The same observations can be made for the role of trade in the economy of Bosnia and Herzegovina.

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The milk production is economically very important because it is in the function of human food production and nutrition of the whole population. From an economic point of view, the milk production is also very important because it is the daily production, which allows the same kind of daily sales on the market, as well as it enhances liquidity, accelerates the capital turnover and creates a sense of security in the economy operations.

The value chain of milk and dairy products includes the full range of activities required to bring a product from production, transportation, processing, and retail up to the final consumer. The value chain of milk and dairy products has been increased by the series of combinations that include the engagement of equipment, labor, knowledge and skills, and raw materials for the production of milk and dairy products.

B&H and Croatia traditionally had a high degree of trade exchange in agricultural products and in particular in the milk and dairy products' trade. The reasons for the traditionally good trade have roots in the following: the former joint state, territorial cohesion, language, the links between economic entities, as well as in consumers' habits. After the collapse of the former state, the two countries have maintained a high degree of foreign trade.

In the last 15 years B&H and Croatia have signed the agreements on mutual preferential trade in several occasions. It should be particularly noted that in the period from 2007 to mid-2013 it was effective the CEFTA 2006 Agreement whose participants were B&H and Croatia as well. Croatia was the most important and largest partner in foreign trade for B&H. Since the 1st July 2013 Croatia was not any more a member of CEFTA 2006, but it became a member of the European Union.

Material and Method

In the study there have been used the published scientific and professional articles dealing with the creating value chains' issue, as well as researching data published in the in the publication of the Foreign Trade Chamber of B&H. They were also used official data of the Statistics Agency of B&H. The following scientific methods have been used: the desk research method, descriptive method, methods of analysis and synthesis, induction and deduction methods, comparative method as well as the methods of descriptive statistics.

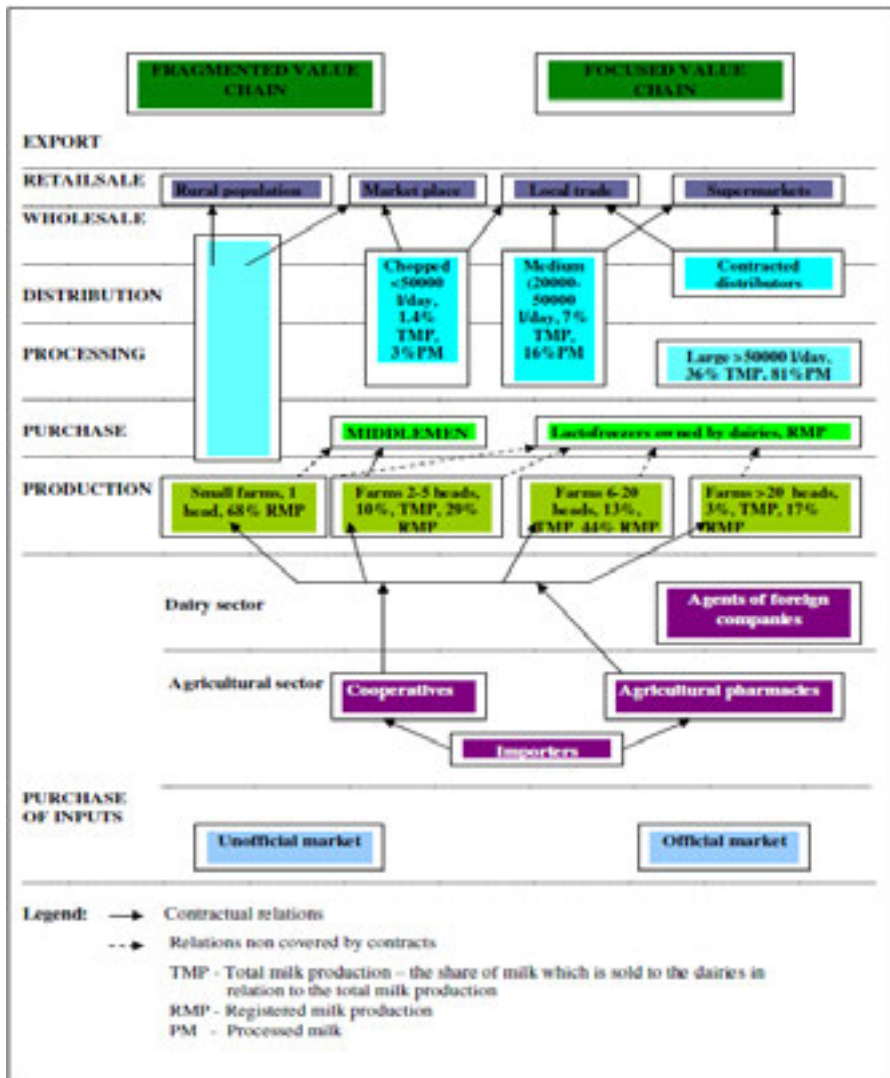
The Value Chain of Milk and Dairy Products in Bosnia and Herzegovina

The value chain is a series of nine primary and supporting activities which adds value to products or services, i.e. it has been associated the supply side with the demand side of the enterprise business. That is why the creation of profitable value chain requires the harmonization between the wishes of the customers, i.e. of the demand chain and what is created in the supply chain. In order that the supply chains achieve the maximal value, it is necessary to harmonize the supply flow the consumers' value flow, due to rapid changes in their tastes, desires and requirements (Perkov, Ćosić, 2012).

The value chain in the production of milk and dairy products consists of activities and procedures that the product should be available to the consumer. The value chain in the

production of milk and dairy products begins with production of feed for dairy animals. The dairy animals produce fresh milk by their metabolism and this milk has been transported to the dairy plants, where milk is processed into several dairy products. The produced dairy products have been then packaged and prepared for distribution. The milk and dairy products are distributed to the retail facilities in which they are available to the buyers and consumers. The value chain of milk and dairy products in Bosnia and Herzegovina is shown in the Figure 1.

Figure 1. The value chain of milk and dairy products in Bosnia and Herzegovina



Source: FMPVŠ FBiH - Federalno ministarstvo poljoprivrede, vodoprivrede i šumarstva Federacije Bosne i Hercegovine (2014), Strategija povećanja konkurentnosti i privlačenja ulaganja u vrijednosne lance mlijeka i mliječnih proizvoda i voća i povrća u Federaciji Bosne i Hercegovine, p. 35.

Each value chain has certain specific characteristics. Such is the case with the value chain of milk and dairy products, which is shown in Figure 1. In this Figure there could not be shown all factors affecting this value chain, e.g. the accompanying institutions, laboratories for the analysis of milk quality, as well as the foreign trade policy of one or more countries.

What is specific for the current situation in the foreign trade of milk and dairy products between B&H and Croatia are the CEFTA 2006 Agreement and the Agreement on Stabilization and Accession between B&H and EU. What both countries can do in order to increase the value chain is to develop and improve the quality of milk and dairy products.

Foreign Trade of Milk and Dairy Products between Bosnia and Herzegovina and Republic of Croatia

The Republic of Croatia became a full member of the European Union on 1st July 2013. Since that day it has been ceased an application of CEFTA 2006 by the Republic of Croatia.

On the other side, until 1st June 2015 Bosnia and Herzegovina had signed the Interim Agreement on Stabilization and Accession with the European Union, and since that date it has been in force the Agreement between the European Union and Bosnia and Herzegovina.

Exiting of Croatia from the membership of the CEFTA 2006 Agreement and joining the European Union has resulted in changes in the foreign trade between B&H and Croatia. The reason for this is before all in different foreign trade conditions between the members of the CEFTA 2006 Agreement and the European Union. Namely, in the framework of CEFTA 2006 Agreement, between the member states there was no restrictions in trade, there was no customs duties and no quotas for certain agricultural products.

Table 1 shows the foreign trade of milk and dairy products between B&H and Croatia in the period 2011-2014.

Table 1. The foreign trade of milk and dairy products between B&H and Croatia in the 2011-2014 period

Year	Export from B&H to Croatia (€)	Import from Croatia to B&H (€)	B&H/ Balance (€)	Hr/ Balance (€)	Trend ↓↑ B&H and Croatia	
					%	
					Export from B&H	Import to B&H
2011	23,638,542	38,116,737	-14,478,195	14,478,195	-	-
2012	23,336,695	25,138,298	-1,801,603	1,801,603	-1.27	-34.04
2013	13,994,172	23,247,228	-9,253,056	9,253,056	-40.03	-7.52
2014	-	17,059,579	-17,059,579	17,059,579	-100.00	-26.61

Source: Calculated by the authors based on data collected from the Foreign Trade Chamber of B&H, available at <http://komorabih.ba/vanjskotrgovinska-razmjena/>

The analysis of data presented in Table 1 shows that the trade of milk and dairy products between B&H and Croatia had fluctuations in the analyzed period (2011-2014). Export of milk and dairy products from B&H to Croatia in 2011 and 2012 was almost at the same level (over 23 million €). Export in 2013 fell to the level of about 14 million €, representing a decrease of 40%. In 2014 there was no export of these products from B&H to Croatia. The reason for that was in the fact that Croatia became the EU member state since 1st July 2013 and the milk and milk products produced in B&H did not meet the standards of the EU market any more. Import of milk and dairy products from Croatia to B&H had continuous drop in the analyzed period and it amounted around 38 million € in 2011, while in 2014 it dropped to the level of 17 million €. The largest fall in import of milk and dairy products was recorded in 2014.

Namely, accession of Croatia to EU have changed the conditions for import of the Croatian products into B&H, because the Croatian products got the same regime as other EU products which are imported to B&H. The Agreement on Stabilization and Accession (SAA) between EU and B&H determined that milk and dairy products have a customs duty rate of 10% as well as the additional levies. These protective measures significantly increase the selling prices, thus making the milk and dairy products less competitive in the market of Bosnia and Herzegovina. The foreign trade deficit of B&H in trade with Croatia amounted to about 14.5 million € in 2011. In 2012, the deficit was reduced considerably and it amounted to approximately 1.8 million €. In 2013 the foreign trade deficit again had the increasing trend and amounted to over 9 million €, while in 2014 the deficit was as much as it was the whole import value of the products imported from Croatia to B&H (over 17 mil. €).

By accession of Croatia into the EU, there have been officially ceased to be applied certain customs benefits in the framework of CEFTA 2006 Agreement, which Croatia had in the foreign trade with Bosnia and Herzegovina, as since 1st July 2013 the foreign trade exchange between the two countries takes place under the regulations of the Agreement on Stabilization and Accession (SAA).

It should be noted that the current food safety system in Bosnia and Herzegovina has not met all the criteria which ensure obtaining the export licenses for the EU market, so since 1st July 2013 it was stopped the export of milk and dairy products on the Croatian market.

What B&H and Croatia should do in the future is to find a new market chain for the milk and dairy products in order to make them present on the markets of both countries. The institutions in B&H are currently working on the preparation and harmonization of domestic legislation with European regulations in order to fully meet all the conditions which will enable the export of the animal origin products to the EU, so the milk and dairy products as well.

Discussion on the Improvement of the Milk and Dairy Products' Trade between Bosnia and Herzegovina and Croatia

An implementation of the SAA obligations, especially those that create the conditions and allow export of milk and dairy products, is a task of institutions in Bosnia and Herzegovina

in the coming period. Also, B&H should identify the alternative markets (e.g. Turkey and Russia) for sales of milk and dairy products.

Bosnia and Herzegovina is facing with the condition that must be met in order that milk and dairy products could be exported on the EU market, which is primarily related to the acceptance of European standards which B&H producers must achieve and accept, and what needs to be approved and agreed by the EU.

After accession of Croatia to European Union, there has been a change in respect of imports from objects of Croatian origin. The objects of Croatian origin were able to continue to export to Bosnia and Herzegovina if they got approval by the Croatian authority competent for trade with other EU member states and if they are listed on the EU lists of approved facilities.

All objects of Croatian origin which did not meet the cited requirements in accordance with the laws in force in Bosnia and Herzegovina were not be able to make imports into B&H since 22nd July 2013 and they have been deleted from the Register of Veterinary Office of Bosnia and Herzegovina.

A great problem in the food safety and standards in the value chain of milk and dairy products are insufficient laboratory capacities in B&H, as well as the systems for analysis of the fresh milk quality. This is also a chance and an opportunity to be increased the value chain of milk and dairy products in this segment. And this increase is reflected in need for modernization and procurement of the high standard equipment for analysis of a larger number of samples in accordance with the EU standards. The meeting of the EU standards creates the conditions for higher exports of milk and dairy products and increase of production value.

Since September 2015 the European Union has allowed the export of dairy products from Bosnia and Herzegovina to the European Union countries. Four dairy plants in Bosnia and Herzegovina have obtained permission to export to the EU countries, and those are the following dairy plants: Livno, Mlijekoprodukt from Kozarska Dubica, Milkos Sarajevo and Megle Bihac. It is expected in the future that foreign trade of dairy products between Bosnia and Herzegovina and Croatia will reach the level as before the accession of Croatia to EU.

Conclusion

The competition fast moves the business environment, irreversibly changing the supply chain and management of its functions. Traditional supply chain is connected linearly. Modern approach in the supply chain management assumes that the organizations have to improve communication and flow of information. In this way, the traditional supply chain has been transformed into the adaptive and real-time supply network. This allows the organizations to achieve the management by the flexible, fast-responding network of supply chain as a single entity. The supply chain networks represent very complex, interdependent structures, with a large number of related suppliers, service providers and buyers who are also the members of other supply chains (Rejman-Petrović et al., 2012).

One of the essential prerequisites that every economic subject has to fulfill when placed in an organized market economy is the ability to respond faster to the changes and demands from

that environment. In this sense, it is necessary to create quite certain assumptions in order to be timely respond and adapt to the conditions imposed by the environment and at the same time, by adequate development policy to impose to the market the own production programs (Bošković, 2013).

By development of the trade business entities and their cooperative formations it should be started development of production companies in the area of food products and thus it should be enabled the improvement of the foreign trade balance in this sector. The new and more efficient organizational forms of distributive trade (particularly the new types of stores) should be established based on the use of modern management technologies and business strategies that take into account the complete value chains (Ćejvanović et al., 2015).

To the economic subjects within distributive trade of food products there have been offered possibilities of modern solutions in their development strategy. This would result in their higher efficiency and thus competitiveness in the domestic and foreign markets. The international value chains, particularly for the small countries such as Republic of Croatia, offer prospects for economic development (Segetlija, 2008).

What should be emphasized it is the importance of knowledge and skills for improvement of the added value along the value chain of milk and dairy products. First of all it is necessary to fulfill the (new) customers' requirements, together with more effective communication with partners in the value chain. Furthermore, it is necessary to benefit from the exchange of information and cooperation with partners along the value chain, together with participation in innovative processes. It is particularly important to recognize where could be made the profit in the value chain of milk and dairy products.

In the analysis of the milk and dairy products' value chain in B&H and Croatia it came to the conclusion that the accession of Croatia to the European Union on the 1st July 2013 changed circumstances in terms of import from Croatia to B&H. The objects of Croatian origin were able to continue to be exported to Bosnia and Herzegovina if they have been approved by the competent Croatian authority for trade with other EU member states and if they are listed on the lists of approved objects in EU. Based on the all abovementioned, it can be concluded that although B&H and Croatia have traditionally well-developed trade in the area of milk and dairy products, by accession of Croatia to the European Union, those trade relations have been deranged. In this regard, it is necessary that both countries find the ways for solutions emerged in new situation, i.e. to find the value chain in the trade of milk and dairy products in order to increase the value and advance the foreign trade exchange of milk and dairy products for the benefit of both countries.

In general it can be concluded that the expansion of the EU market by accession of a new member (Croatia) caused the significant changes in economic flows between Bosnia and Herzegovina and its most important trade partner - Republic of Croatia.

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I-DISTANCE AND SEPARABILITY COEFFICIENT IN BUSINESS EVALUATION OF SME'S IN AGRIBUSINESS¹

Blaženka Popović², Slobodan Ceranić³, Tamara Paunović⁴

Summary

Systematic and continuous process of measuring and comparing business results of companies regarding to business results of leaders, in order to obtain information that will help the company to take action to improve its performance, is in a function of improving business operations. Accordingly, the first objective of this paper is, based on the coefficient of separability, to determine which indicators of business conditions and business results have the greatest impact on differences in the business operations of the observed SMEs operating in the food industry. The second objective of this work is to make the ranking of companies based on the business conditions and business results using discriminant analysis (I-distance), and then, to determine the overall rank of companies using general ranking coefficient (Ker). The results show that companies are significantly separated according to business results rather than to business conditions, and in addition, the business results also had a crucial impact on the overall rank of each company.

Keywords: *Agribusiness, SMEs, separability coefficient, I-distance.*

JEL: *Q13, C38.*

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Introduction

Optimal use of agricultural resources, increase in production volume, creating a stable market, increase in exports of agricultural and food products and the realization of an integrated agricultural, rural and regional development are the strategic goals for the agriculture development of the Republic of Serbia (Maletic et al., 2011). Achievement of the objectives is highly dependent on development level of small and medium entrepreneurship in agribusiness. In order to encourage the development of small and medium-sized enterprises in the agribusiness, it is necessary to provide appropriate conditions that will stimulate the development of this sector of the economy (Popovic et al., 2011).

Small and medium enterprises are the main source of employment and the driving force of most developed countries in the world, and therefore, they should have such importance and role in development of agribusiness, especially in rural areas of Serbia (Ceranic, 2004). There are 20 million enterprises in the EU, over 99% of which are SMEs. They provide 80 million jobs and contribute to 60% of gross domestic product of the European Union. SMSs provide two-thirds of private sector jobs in the EU.

Their importance is reflected in significant flexibility, but also in increasing the efficiency of inputs utilization. In other words, it is very important to determine the factors that affect the performance and business operations of the same companies, because these companies are mostly financed from their own revenues, with a little help of government (Popovic, 2008). Therefore, the paper used separability coefficient (resolving power coefficient) to determine which indicators of business conditions and business results have the greatest impact on the separation of the observed three groups of enterprises in food industry (meat industry, dairy industry and milling industry). In previous research, this coefficient proved to be a good measure of quantifying the separation of clusters of family farms in western Serbia according to the indicators of business conditions (Lakic, Maletic, 1998) and business results (Lakic, Maletic, 1999), as well as in the case of morphological differentiation of bees (Nedic et al., 2012).

In order to determine the overall rank of each company, the rank of each company is determined separately according to business conditions and according to business results using the I-distance. A key argument for using I-distance method is the ability of this method to aggregate the large number of variables into a single numerical value, which is a summary of performance measures of the observed objects. Therefore, this method is widely used in various studies for ranking: countries (Ivanovic, Fanchetti 1973, Ivanovic, 1973; Seke et al., 2013), municipalities (Popovic, Maletic, 2007), banks (Bulajić et al., 2011; Bulajić et al., 2011), universities (Jeremic et al., 2011a), sports competitions (Jeremic, Radojicic, 2010), companies (Radojicic et al., 1998), health system of countries (Jeremic et al., 2011b, 2012).

Material and methods

The study included 19 small and medium-sized enterprises in the food industry, 8 of them from the meat industry, 6 in the dairy processing and 5 in the bread-making industry. Representative indicators of business conditions (X_i) and business results (Y_i) are shown in Table 1.

One of the aims of this paper is that, based on the separability coefficient, determines the extent to which each of the indicators of the conditions and results, and together, contributes to separation of observed enterprises group. In the case of division of a statistical set into subsets based on multidimensional criteria, the question that arises is the extent to which each indicator affects the separation of elements into subsets (Ivanovic, 1977).

Table 1. The observed indicators of business conditions and business results

Business conditions (X_i)	Business results (Y_i)
X_1 - Total capital	Y_1 - Business income per employee
X_2 - Original capital	Y_2 - Sales income
X_3 - Number of employees	Y_3 - Business expenses per employee
X_4 - Real property, existing equipment and biological assets	Y_4 - Depreciation costs and provision
X_5 - Stocks	Y_5 - Business profit
X_6 - Business assets	Y_6 - Profit from operating activities before tax
X_7 - Fixed liabilities	Y_7 - Financial incomes
X_8 - Fixed assets per employee	Y_8 - Financial expenses
X_9 - Current assets per employee	Y_9 - Net profit per employee

Source: Author's choice of indicators

Separability coefficients used in this study, are differ in their shape, depending on the number of given subsets that were separated.

Partial separability coefficient of two subsets compared the characteristic X_p , can be shown as follows (Erdeljan et al.,1974):

$$\sigma_p^2 = \frac{n_r n_k |\bar{X}_r - \bar{X}_k|}{\sum_{i=1}^{n_k} \sum_{j=1}^{n_r} |x_{ki} - x_{rj}|} \tag{1}$$

where the group of companies are marked with R and K, their indicators are X_{ki} and X_{rj} , the corresponding averages of these indicators are \bar{X}_r and \bar{X}_k , and the feature volumes are n_r and n_k . Partial separability coefficient of “s” subset compared the characteristic X_p , can be shown as follows:

$$\sigma_p^s = \frac{\sum_{k=1}^s \sum_{r>k}^s n_r n_k |\bar{X}_r - \bar{X}_k|}{\sum_{k=1}^s \sum_{r>k}^s \sum_{i=1}^{n_k} \sum_{j=1}^{n_r} |x_{ki} - x_{rj}|} \tag{2}$$

The separability coefficient for “s” subsets with respect to m indicators is given as a geometric mean of partial separability coefficient for one feature:

$$\sigma_{(m)}^s = \sqrt[m]{\sigma_1^s \cdot \sigma_2^s \cdot \dots \cdot \sigma_m^s} \tag{3}$$

Separability coefficient varies in the range of [0, 1]. If the value of the coefficient is closer to 1, then the greater is the separation, if it is close to 0, then the mutually overlapping of subsets is getting stronger, and therefore should be considered as a subset created by the integration of two or more subsets.

The above patterns are used to find out to what extent observed enterprises are separated compared to indicators of business conditions and business results.

In order to determine the ranking list of observed enterprises (sequential classification) based on a selected set of features, I-distance method is used. I-distance is a metric in n-dimensional space. A key argument for using I-distance method is its ability to synthesize a large number of variables into a single numerical value (Ivanovic, 1963). This is particularly useful for the variables that are shown in different measuring units. For a selected set of variables $X^T = (X_1, X_2, \dots, X_k)$ chosen to characterize the entities, the I-distance between the two entities $e_r = (X_{1r}, X_{2r}, \dots, X_{kr})$ and $e_s = (X_{1s}, X_{2s}, \dots, X_{ks})$ is defined as:

$$D(r, s) = \sum_{i=1}^k \frac{|d_i(r, s)|}{\sigma_i} \prod_{j=1}^{i-1} (1 - r_{ij}) \tag{4}$$

where $d_i(r, s)$ is the distance between the values of variable X_i for e_r and e_s , e.g., the discriminate effect,

$$d_i(r, s) = |x_{ir} - x_{is}| \quad i \in \{1, \dots, k\} \tag{5}$$

σ_i the standard deviation of x_i , and $r_{j_i,1,2,\dots,j-1}$ is a partial coefficient of the correlation between x_i and x_j ($j < i$), (Ivanović, 1973).

The construction of the I - distance is iterative; it is calculated through the following steps:

- Calculate the value of the discriminate effect of the variable X_1 (the most significant variable, that which provides the largest amount of information on the phenomena that are to be ranked).
- Add the value of the discriminate effect of X_2 which is not covered by X_1 .
- Add the value of the discriminate effect of X_3 which is not covered by X_1 and X_2 .
- Repeat the procedure for all variables (Mihailovic et al., 2009).

Sometimes it is not possible to establish the same sign for all variables, and therefore may appear negative correlation coefficient and negative partial correlation coefficient. That is why I-squared distance is often used and it is defined as:

$$D^2(r, s) = \sum_{r=1}^k \frac{d_i^2(r, s)}{\sigma_i^2} \prod_{j=1}^{i-1} (1 - r_{j_i,1,2,\dots,j-1}^2) \quad (6)$$

The overall rank coefficient (K_{er}) is the ratio of the calculated values of I-distance for the criteria of results (D_r) and values of I- distance for the criteria of business conditions (D_u)

$$K_{er} = \frac{D_r}{D_u} \quad (7)$$

Based on calculated I-distance, mutual distance matrices, which contain information necessary for objective classification, are formed. Ranking list of elements of the set P is obtained when all the elements of the set P align according to size of the calculated I-distance. This ranking list shows the rank of each element, but also gives the difference in distances between the individual elements.

I squared-distance is used to determine the ranking of enterprises according to business conditions. Business results were also examined, and the rank is defined based on these results. Based on business conditions and business results, the overall ranking of enterprises (K_{er}) is determined.

Furthermore, based on this method, managers can be successfully provided with information relating to efficient and fast decision making, to direct production process and to rationally use economic conditions, in order to maximize profits.

The research results

In order to achieve its aim, incremental analysis were used, first of all, using the calculation of partial separability coefficient differences between the group of enterprises

came expressed, based on individual performance and based on separability power of themselves. Separability power of all the features simultaneously is demonstrated by calculating total separability coefficient.

The obtained results of business conditions (Table 2.) show that the subset of enterprises that processed meat make medium separation from dairy in relation to indicators X_7 (fixed liabilities) and X_8 (fixed assets per employee), and minimum separation is to business assets (0.0223) and original capital (0.0407). If comparing enterprises that processed meat and bakery, the greatest separation is observed in business assets (0.4861) and stocks (0.4523), and lowest value of 0.0310 is with indicator X_4 (real estate-property, existing equipment and biological assets). Subsets of dairies and bakeries are mostly separated by the value of total capital (0.6453) and current assets per employee (0.5880). These two subsets are least separated compared to the value of original capital and number of employees.

Table 2. Partial separability coefficients for business conditions

Indicators of business conditions	σ_p^2		σ_p^3	
	meat processing-dairies	meat processing-bakeries	dairies-bakeries	meat processing-dairies-bakeries
X_1	0.0980	0.3546	0.6453	0.3134
X_2	0.0407	0.0598	0.0343	0.0469
X_3	0.3445	0.3900	0.0860	0.3237
X_4	0.2436	0.0310	0.3126	0.1768
X_5	0.1198	0.4523	0.4004	0.2714
X_6	0.0223	0.4861	0.4207	0.3003
X_7	0.5666	0.3849	0.1256	0.4036
X_8	0.5363	0.3664	0.3441	0.4426
X_9	0.4142	0.2178	0.5880	0.3984

Source: Author's calculations

Comparative observation of calculated partial coefficients allows certain generalizations. Subset of enterprises that processed meat is separated from the other

two subsets by number of employees and fixed liabilities, dairies by indicator X_4 (property, existing equipment and biological assets) and bakeries are separated from the other two subsets by indicators X_1 (total capital) and X_6 (business assets).

Partial separability coefficient (σ_p^3) of these three subsets, compared to characteristic X_p , shows that the maximum value is calculated for indicator X_8 (fixed assets per employee), so therefore, this indicator contributes most to a separation of these three subsets. All three subsets are least separated by value of original capital.

Separation of enterprises that processed meat, dairies and bakeries for all nine indicators of business conditions, at the same time is very low $\sigma_{(m)}^3 = 0.2569$, indicating that these three subsets are slightly different regarding business conditions, or that their business conditions are very similar.

Separation of observed enterprises subsets for all nine indicators of business results, at the same time is $\sigma_{(m)}^3 = 0.4841$, suggesting that these three subsets are more separated by results than by business conditions.

Table 3. Partial separability coefficients for business results

Indicators of business results	σ_p^2			σ_p^3
	meat processing-dairies	meat processing-bakeries	dairies-bakeries	meat processing-dairies-bakeries
Y_1	0.8354	0.5791	0.9759	0.8037
Y_2	0.8970	0.0181	0.9556	0.6043
Y_3	0.9274	0.5382	0.9878	0.8343
Y_4	0.2288	0.6907	0.4619	0.4577
Y_5	0.2611	0.1660	0.0821	0.1811
Y_6	0.6939	0.6370	0.0577	0.4877
Y_7	0.1745	0.1909	0.5780	0.2540
Y_8	0.8162	0.1850	0.7905	0.5866
Y_9	0.8143	0.8039	0.1186	0.5981

Source: Author's calculations

The separation level of dairies and bakeries is extremely high for the following indicators: business expenses per employee (0.9878), business income per employee (0.9759) and sales income (0.9556). The situation is similar with enterprises that processed meat and dairies (Y_3 - 0.9274, Y_2 - 0.8970 and Y_1 - 0.8354). The largest separation between

dairies and bakeries is in net profit per employee (0.8039). Based on calculated partial separability coefficients (σ_p^2), it can be concluded that in a large number of indicators dairies are well separated from meat processors and bakeries, while a slightly lower level of separation is between enterprises that processed meat and bakeries (Table 3.).

Partial separability coefficients (σ_p^3) that are calculated, indicate that the separation of these three subsets of enterprises is most affected by business expenses per employee (0.8343), business income per employee (0.8037), sales income (0.6043), net profit per employee (0.5981) and financial expenses (0.5866). When it comes to business results, business profit (0.1811) and financial income (0.2540) have the least impact on the separation of these three subsets.

In order to better comprehend the business differences between observed enterprises, their ranking is done based on actual business conditions and results (Table 4.). This list, in addition to rank of each enterprise, also gives the difference in distances between individual enterprises, which is a very important indicator.

Table 4. The results of I-squared distances and ranks of enterprises according to I – distance

Enterprises	Business conditions		Business results		Rank coefficient	Rank according to K_{er}
	I - distance value	Rank	I - distance value	Rank	K_{er}	
Meat processing I	6.85	1	25.42	9	3.7109	19
Meat processing II	46.02	18	41.16	18	0.8944	12
Meat processing III	39.67	10	35.85	13	0.9037	14
Meat processing IV	37.50	8	12.02	1	0.3205	1
Meat processing V	45.13	17	36.32	14	0.8048	9
Meat processing VI	44.78	16	40.70	17	0.9089	15
Meat processing VII	33.80	6	22.02	6	0.6515	6
Meat processing VIII	42.22	13	26.56	10	0.6291	5
Dairy I	44.04	15	35.61	12	0.8086	10
Dairy II	42.47	14	42.74	19	1.0064	18
Dairy III	19.74	2	16.57	4	0.8394	11
Dairy IV	29.68	4	29.37	11	0.9896	17

Enterprises	Business conditions		Business results		Rank coefficient	Rank according to K_{er}
	I - distance value	Rank	I - distance value	Rank	K_{er}	
Dairy V	47.54	19	38.24	16	0.8044	8
Dairy VI	41.07	12	21.36	5	0.5201	4
Bakery I	33.86	7	22.57	7	0.6666	7
Bakery II	26.60	3	23.84	8	0.8962	13
Bakery III	30.47	5	13.06	2	0.4286	3
Bakery IV	38.12	9	15.99	3	0.4195	2
Bakery V	39.73	11	37.34	15	0.9398	16

Source: Author's calculations

Based on the presented classification of enterprises it can be noticed that the enterprises with the best conditions (range 1-3) realized lower results, which is also indicated in range coefficients 9, 4 and 8. It can be concluded that the available conditions are not adequately used, as illustrated by general (total) range coefficient 19, 11 and 13. The I-distance value for business conditions in enterprises with range 1 (6.85) is almost three times less than the following I - distance values (range 2 - 19.74), which indicates that the enterprise has a most favorable business conditions, but achieves average results,

which leads him to the last place according to business success (K_{er} - 19).

Enterprises that have had medium business conditions among the observed enterprises (ranks 8, 9 and 5), but the best business results (ranks 1, 3, and 2) take up the best places

in the general ranking (K_{er} - 1, 2 and 3).

After that, our set of data is further analyzed, and the correlation coefficient of each indicator with the value of I-distance was calculated and presented in Table 5. and Table 6. (Pearson correlations were used). This is one of the key parts of the work, since it provides information on the importance of each indicator for the ranking process (Jeremić, 2012).

Table 5. Correlations of input indicators of business conditions with I-distance

Indicators of business conditions	r
X ₂ - Original capital	0.83**
X ₄ - Property, existing equipment and biological assets	0.80**
X ₈ - Fixed assets per employee	0.78**
X ₇ - Fixed liabilities	0.70**
X ₁ - Total capital	0.62**
X ₉ - Current assets per employee	0.62**
X ₅ - Stocks	0.58**
X ₆ - Business assets	0.37 ^{ns}
X ₃ - Number of employees	0.07 ^{ns}

Source: Author's calculations ** p < 0.01, * p < 0.05, ^{ns} not significant

As the results show (Table 5.), the most important indicator in enterprises ranking by business conditions is original capital with the correlation coefficient $r = 0.83$ ($p < 0.01$), closely followed by the property, existing equipment and biological assets, $r = 0.80$ ($p < 0.01$). The least impact on the enterprises ranking by business conditions had a number of employees ($r = 0.07$ and $p > 0.05$).

Table 6. Correlations of input indicators of business results with I - distance

Indicators of business results	r
Y ₅ - Business profit	0.80**
Y ₉ - Net profit per employee	0.74**
Y ₆ - Profit from operating activities before tax	0.71**
Y ₂ - Revenues from sales	0.68**
Y ₁ - Business income per employee	0.68**
Y ₃ - Business expenses per employee	0.64**
Y ₄ - Depreciation and amortization	0.57**
Y ₈ - Financial expenses	0.41 ^{ns}
Y ₇ - Financial incomes	0.36 ^{ns}

Source: Author's calculations ** p < 0.01, * p < 0.05, ^{ns} not significant

In business results (Table 6.), the most important feature for ranking enterprises is business profit with a correlation coefficient $r = 0.80$ ($p < 0.01$), and net profit per employee ($r = 0.74$, $p < 0.01$), as well as profit from operating activities before tax ($r =$

0.71, $p < 0.01$). The results obtained are as expected, given that the profit is one of the most important indicators of the financial performance of each enterprise. Financial expenses and financial incomes had no statistically significant effect in the ranking of enterprises according to the business results ($p > 0.05$).

Discussion

Enterprises in the field of agro-industrial complex, as well as the overall economy in the last decade were operating under very unfavorable, as it were “impossible”, conditions. The consequence of this situation is a great impoverishment of the majority of enterprises, which is clearly reflected in marked decrease of both natural and financial parameters of success.

The research results indicate that the observed enterprises are significantly more separated in achieved results rather than in business conditions. The results obtained by using the separability coefficients were also confirmed by using the method of I – distance, because the achieved business results had more effect on overall ranking of enterprises, rather than business conditions. According to the business results, a significant separation of dairies subset on the one side, and remaining two on the other, can be noticed. After using the method of I - distance, it can be concluded that, on average, dairies achieved the worst results, which also confirms the results obtained using the separability coefficient.

Enterprises that have had lower business conditions have worked better, have better use of resources and have achieved better economic results. At the same time, enterprises that have a more favorable business conditions have not achieved adequate production results, because the available resources are not used properly.

The research results indicate that there are significant reserves in the internal economy for business improvement and competitiveness through rational use of all the available conditions. By optimizing the production structure and production assortment, by rational use of resources and by minimizing operating expenses managers can improve the internal economy and increase the competitiveness of its enterprises (Popovic et al., 2008). Appropriate measures of economic policy are also necessary in order to create such economic conditions that are essential for successful market operation and development of SMEs in agribusiness.

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PRIMENA I - Odstojanja i koeficijenta separabilnosti u oceni poslovanja MSP u agrobiznisu

Blaženka Popović⁵, Slobodan Ceranić⁶, Tamara Paunović⁷

Sažetak

Sistematski i kontinuirani proces merenja i upoređivanja poslovnih rezultata preduzeća u odnosu na poslovne rezultate lidera radi dobijanja informacija koje će pomoći preduzeću da preduzme akcije za poboljšanje svojih performansi je u funkciji unapređenja poslovanja. S tim u vezi je postavljen i prvi cilj rada, a to je da se primenom koeficijenta separabilnosti utvrdi koji pokazatelji uslova i rezultata poslovanja najviše utiču na razlike u poslovanju posmatranih MSP iz prehrambene industrije. Drugi cilj rada je da se primenom diskriminacione analize (I-odstojanja) izvrši rangiranje preduzeća na osnovu uslova kao i rezultata poslovanja, a zatim da se pomoću opšteg koeficijanta ranga (K_{ev}) odredi opšti rang preduzeća. Rezultati analize pokazuju da se preduzeća značajnije razdvajaju prema rezultatima nego prema uslovima poslovanja, a rezultati poslovanja su takođe presudno uticali na opšti rang svakog preduzeća.

Ključne reči: Agrobiznis, MSP, koeficijent separabilnosti, I - odstojanje

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SOURCES OF FINANCE FOR RURAL TOURISM IN THE REPUBLIC OF SERBIA

Gordana Radović¹

Summary

Rural tourism in the Republic of Serbia has not been developed in line with available resources. Insufficient investments as well as undefined strategic development directions are the reason for that. The reason for that are insufficient investments as well as undefined strategic development directions. The aim of this paper is to present sources of financing for rural tourism, i.e. the rural tourism offer in the Republic of Serbia. The paper includes field research method, analyses, syntheses and statistical method. The author concludes that self-financing has been the dominant source of rural tourism financing in the Republic of Serbia so far. Currently, most of the respondents are not realizing their investments due to the insufficient accumulative ability of rural tourism and agriculture, as their related field, but also due to the lack of good external financial resources. In order to develop rural tourism in the Republic of Serbia it is necessary to define financing modalities which include innovative sources of financing for all segments of the rural tourism offer.

Key words: *rural tourism, sources of financing, development, the Republic of Serbia*

JEL: *R29, Q12, Q14, L83*

Introduction

According to the definition most commonly used in literature and widely accepted in the European Union, rural tourism is a form of tourism which encompasses all activities that can take place in rural areas. Rural tourism is one of the most labour intensive industries, thus being a potential contributor to creating new jobs and economic development of rural areas, which is frequently seen as the most significant element in rural development strategies (Mitchell, Hall, 2005). It has been estimated that there are over 50 different forms of rural tourism, which are defined by reasons that bring tourists to rural areas. According to the Organisation for Economic Cooperation and Development (OECD) data, agritourism is the most common form of rural tourism in the European Union. According to (Ciani, 2003), the development of agritourism and joining tourism activities to existing agricultural activities will eventually lead to the improvement of standard of living on farms.

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According to (Long, Lane, 2000), the rural tourism development in Europe can be divided into two phases: (1) the period until the end of the 20th century; (2) the period from the beginning of 21st century. A significant growth of service providers, number of partnerships, volume of turnover and the development of rural tourism product was recorded in the first phase of the rural tourism development. “The growth of tourism demand, in the period between 1980 and 2000 in Europe was 52%, which was the all-time high as compared to other tourism regions” (Boskovic, 2003). According to (Long, Lane, 2000), the second phase of rural tourism development started at the beginning of the 21st century. This phase is more complex and it will review the position of rural tourism in development policies, implementation of those policies, and the role of rural tourism both in the development of the village and in the development process of the entire tourism.

The rural tourism development in the EU region is also the result of continuous financial support. The importance of financial support in the rural tourism development, with the aim of reducing discrepancies between levels of development of rural regions, was emphasized in the Maastricht Treaty, signed in 1992. The Common Agricultural Policy reform, realized at the end of the 20th century, and its action programme, AGENDA 2000, have resulted in the introduction of the rural development policy, with a special emphasis on the rural tourism development. For this purpose, the European Union budget allocated significant financial resources. Since 2007, financing of rural tourism has been realized through European Agricultural Fund for Rural Development (EAFRD).

The rural tourism development has economic, social and political importance. Main features of rural tourism in terms of its economic importance are: (a) the impact on increase in welfare and economic development of local and economic community and the region; (b) the impact on the rise of local population living standards; (c) the impact on social changes in everyday life of local population (Boyne, 2005). Economic effects can be direct and indirect. Direct economic effects are seen through the provision of additional revenues to rural population, valorization of women labour in agricultural households, job creation and economic development of rural areas. If rural tourism products were placed on the foreign market, rural tourism could also influence the balance of payments of the country. Indirect economic effects are manifested through the development of activities related to rural tourism, but they primarily reflect well on the development of agriculture and trade. The development of rural tourism has social and political importance since it is also a means for introducing cultures, history, customs, gastronomy, life styles, which eventually leads to better understanding of different peoples. According to (George et al., 2009), the rural tourism development “cannot be observed solely as an economic growth, but it also has to be observed from the aspect of environmental and social development.”

Based on the Organisation for Economic Cooperation and Development (OECD) classification, around 85% of the Republic of Serbia territory is considered rural. Dominant activity within this area is agriculture, predominantly extensive agriculture. According to the 2012 agricultural census results, there are 628,552 agricultural households on the territory of the Republic of Serbia. Only 78,301 or 12.4% of households are involved in other profitable

activities (OPA) in addition to agriculture. The least number of such households can be found in the AP Vojvodina, only 5.7%, while the most are found in Šumadija and Western Serbia 16.7% (Bogdanović, Babović, 2014). Analysis of statistical data has shown that the share of rural tourism, as compared to other profitable activities, is negligible, below 1%. Predominant activities are processing of milk, fruit and vegetable (Agricultural census, 2012.).

Resources required for the development of rural tourism comprise: natural, human, social, physical and financial resources. The Republic of Serbia has high quality natural resources significant for the development of rural tourism. They include: wide variety of landscapes, wealth of flora and fauna, unpolluted air, water and land, an abundance of thermal waters, pleasant climate and alike. As for human resources, it can be pointed out that a part of the population in rural areas is economically inactive and they can be engaged in the rural tourism. Education can be a limiting factor of development, so it is necessary to provide financial resource for the education of population. Social resources which are significant for the development of rural tourism include: rich cultural and historical heritage, preserved distinctive ethnic features, folklore, traditional handicrafts and gastronomy, treasury of folk customs, old crafts and numerous manifestations held in rural areas. The Republic of Serbia does not have appropriate physical resources for the development of rural tourism, due to the fact that public infrastructure, i.e. traffic, telecommunications, power and utilities are all characterized by low quality. Furthermore, signposting is insufficiently developed. In order to develop rural tourism in the Republic of Serbia, it is also necessary to provide required source of finance for each of the above mentioned resources. Consequently, these resources will be valorised on the market, that is, they will be used for the development of rural tourism. Having analysed given data, it can be concluded that financial resources are one of the most significant limitations of the rural tourism development in the Republic of Serbia (Radović, 2015).

The purpose of this paper is to show the sources of financing for rural tourism and tourist offer in the Republic of Serbia so far. Also, it is necessary to provide sources for financing the rural tourism demand for the development of rural tourism in the Republic of Serbia, but that issue requires separate research and analysis.

Literature Overview

The issue of rural tourism financing has not been sufficiently studied in the available literature. Below is the list of relevant sources which can be used as a starting point for the research.

According to (Sznajder et al., 2009) the development of rural tourism is related to: natural, demographic, infrastructural and financial resources as well as the government support in the field of rural and regional development. The above mentioned point of view is particularly important for this paper since it points out the importance of financial resources and government support for the development of rural tourism. According to (Svržnjak et al., 2014) financing is usually the most difficult part of rural tourism development because, as some studies show, finding the means of financing is the most time (resource) consuming for developing (implementation) of rural tourism projects.

According to (Berst, Adams, 2008) rural tourism is a segment of multifunctional rural development and precursors for its development are: (a) demographic factors; (b) natural resources; (c) available funds; (d) state policy in the field of regional and agricultural development; (e) infrastructural development (traffic and social).

Rural tourism financing is directly linked with the financing of agriculture. According to (Todorović, Štetić, 2009) there are significant connections between agriculture and tourism. These economic activities are complementary and multiply connected. Agriculture is the producer, while tourism is the consumer of agricultural products. Furthermore, according to the authors cited above, rural tourism is an important factor of the development tendencies of rural areas, additional activity of rural population, market of agricultural products, a component of agricultural development and a “softener” of depopulation. Hence, due to the unfavourable economic position of agriculture and insufficient accumulation of this economic branch, the rural tourism financing is aggravated.

According to the World Tourism Organisation, major economic significance of the rural tourism is its ability to eliminate poverty (“*tourism helps poverty elimination*”). Rural tourism is mostly developed in regions with limited financial, but exceptional natural resources which could serve as a platform for agricultural development (Jing, 2006).

According to (Roberts, Hall, 2003) rural tourism can be relatively “sensitive” element of rural development. These authors have classified financial resources as limiting factors. More specifically, they say that investments, setting up new companies and employing people can be restricted by low turnover. Furthermore, the high season is frequently short, which means a short period for income generation, that is, “supply of capital”.

Problems related to the development of rural tourism in the Republic of Serbia are: (a) the lack of Register and defined rural tourism standards; (b) insufficient affiliation of service providers within rural tourism, as well as their education; (c) insufficient supply of tourist facilities; (d) undeveloped infrastructure and signposting; (e) incompatibility of rural tourism subjects prescribed by law with actual situation; (f) undeveloped tourist mediation, that is insufficient engagement of tourist agencies in the promotion and sales of rural tourism product (Radović, 2013). In order to overcome above mentioned problems, it is necessary to provide financial resources, that is, modalities of financing.

More precisely, it is necessary to define modalities of financing of rural tourism development in the narrow, but also in a wider sense. Financing the development of rural tourism offer in the narrow sense comprises financing of accommodation development, ancillary equipment and catering facilities. Also, in order to develop rural tourism in the Republic of Serbia it is necessary to define modalities of financing the development of rural tourism offer in a wider sense. Proposed aspects include financing the development of: rural infrastructure, personnel, facilities, promotions and distribution channels (Radović, 2015).

Examples of some European countries with developed rural tourism prove that in the initial stage of the development, the financial support of the state is necessary. According to (Bonham, Mak) until 1993, governments of all states in the United States of America were

financing the promotion of tourism and travelling within the USA.

According to (Bakić, Hrabovski-Tomić, 2010) economic support of the government for the development of tourism is seen through monetary and fiscal policy. For the a/m authors, economic support of the government means direct investments of the state from the budget and other funds, attracting foreign donors, granting development loans as well as subsidized interests. All these forms of economic support are also crucially important for the development of rural tourism.

Potential sources of financing of rural tourism in the Republic of Serbia could also come from loans given by specialized agricultural banks. According to the potential concept, the specialized agricultural bank should consolidate all existing ways of providing agricultural loans from the state budget. Initial capital of this bank could also be provided from the funds of current specialized state financial institutions which provide loans for agriculture, but also from funds generated from the lease of state agricultural land. Loans issued by specialized agricultural banks would provide efficient financing, strategically directed agricultural development, as well as rural development on the entire territory of the Republic of Serbia (Radović, 2014).

Sources cited from the available literature point out the importance of financial resources for the development of rural tourism and indicate potential sources of financing of this activity.

Methodology and Data Sources

The subject of the research is to define the source of financing of rural tourism in the Republic of Serbia so far from the aspect of rural tourist offer observed in the narrow sense. The paper has used field research method, analyses, syntheses as well as statistical method. The field research method has been implemented in order to gather data on sources of financing of rural tourism offer. The statistical method has been used for processing of data obtained through surveys, while analysis and synthesis method are applied for the purpose of drawing conclusions based on conducted research.

Random sampling is used for obtaining a sample. The National Association “Rural Tourism of Serbia” database is used for creating the sample. This database provides the most complete overview of the rural tourism offer since the Republic of Serbia does not have the Register of Tourism and hence the rural tourism register. Data sources in carried out surveys are subjects of rural tourism: rural households, homecraft, ethno houses, ethno villages, salashes (traditional farms in Vojvodina), hotels located in rural areas, as well as other service providers in the field of rural tourism in the Republic of Serbia.

According to the National Association “Rural Tourism of Serbia” database, on 31 December 2012, there were 950 service providers in rural tourism on the territory of the Republic of Serbia. Having in mind that 104 subjects have been included in the research, which is 10.95% of the total number of service providers in rural tourism in the Republic of Serbia in the observed period. The research was conducted in the period between June 2012 and October 2013.

The survey covered rural tourism subjects within districts and municipalities of the Republic of Serbia, which had the largest rural tourism offer in the observed period. The districts in question are the following: South of Bačka, South of Banat, Kolubara, Mačva, Moravica, Pirot, North of Bačka, Srem, Šumadija, West of Bačka and Zlatibor district. Respondents from the a/m districts involved in the survey come from the following municipalities: Arilje, Aranđelovac, Bajina Bašta, Čajetina, Dimitrovgrad, Gornji Milanovac, Irig, Ivanjica, Kosjerić, Kragujevac, Kovin, Kula, Kovačica, Knić, Loznica, Ljig, Ljubovija, Mali Idoš, Mionica, Novi Sad, Nova Varoš, Osečina, Prokuplje, Prijepolje, Pirot, Požega, Sombor, Subotica, Srbobran, Užice and Valjevo.

Research Results and Discussion

The results of the survey regarding sources of financing for rural tourism offer on the territory of the Republic of Serbia so far are as follows: (Radović, 2015)

- [1] 71 respondents (68.1%) used self-financing as a source of financing;
- [2] 6 respondents (5.7%) used other sources of financing, in addition to self-financing;
- [3] 3 respondents (2.8%) used self-financing and subsidies of the Ministry of Agriculture of the Republic of Serbia;
- [4] 3 respondents (2.8%) used self-financing and bank loans as sources of financing;
- [5] 3 respondents (2.8%) used self-financing and subsidies of the AP Vojvodina Secretariat as sources of financing;
- [6] 2 respondents (1.8%) used self-financing, subsidies of the Ministry of Agriculture of the Republic of Serbia and other sources of financing;
- [7] 1 respondent (1%) used self-financing and loans provided by the Development Fund of the Republic of Serbia as a source of financing
- [8] 1 respondent (1%) stated that they only used subsidies of the Ministry of Agriculture of the Republic of Serbia as a source of financing;
- [9] 1 respondent (1%) stated that they used local government subsidies as a source of financing;
- [10] 1 respondent (1%) stated that they used bank loans as a source of financing;
- [11] 1 respondent (1%) stated that they used self-financing and local government subsidies as sources of financing;
- [12] 1 respondent (1%) stated that they used self-financing, loans provided by the Development Fund of the Republic of Serbia and bank loans as sources of financing;
- [13] 1 respondent (1%) used self-financing, subsidies of the AP Vojvodina Secretariat and bank loans as sources of financing;
- [14] 1 respondent (1%) used self-financing, subsidies of the Ministry of Agriculture of the

Republic of Serbia and bank loans and other sources of financing;

[15] 1 respondent (1%) used self-financing, subsidies of the AP Vojvodina Secretariat, foreign donations – cross border cooperation projects and other sources of financing;

[16] 1 respondent (1%) stated that they used self-financing, subsidies of the AP Vojvodina Secretariat, local government subsidies, foreign donations – cross border cooperation projects as sources of financing;

[17] 1 respondent (1%) stated that they used self-financing, subsidies of the Ministry of Agriculture of the Republic of Serbia, local government subsidies and bank loans;

[18] 1 respondent (1%) stated that they used self-financing, bank loans, subsidies of the AP Vojvodina Secretariat, local government subsidies and other sources of financing;

[19] 1 respondent (1%) stated that they used self-financing, subsidies of the Ministry of Agriculture of the Republic of Serbia, bank loans and subsidies of the AP Vojvodina Secretariat as sources of financing;

[20] 1 respondent (1%) stated that they used self-financing, subsidies of the Ministry of Agriculture of the Republic of Serbia, loans provided by the Development Fund of the Republic of Serbia, bank loans, subsidies of the AP Vojvodina Secretariat and local government subsidies as sources of financing;

[21] 1 respondent (1%) stated that they used self-financing, subsidies of the Ministry of Agriculture of the Republic of Serbia, loans provided by the Development Fund of the Republic of Serbia, bank loans and other sources of financing;

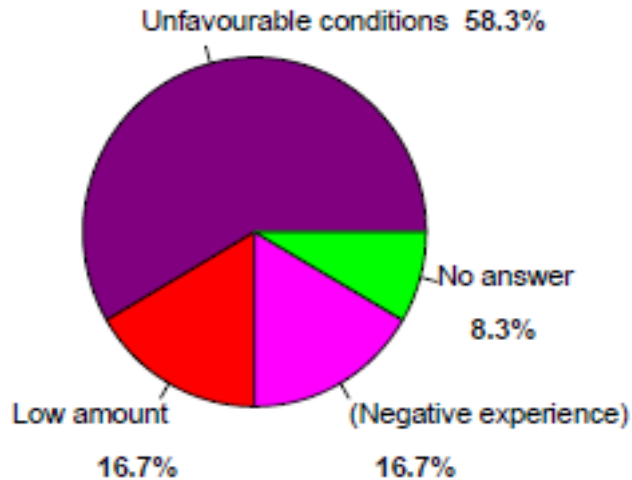
[22] 1 respondent (1%) stated that they used subsidies and loans provided by the Ministry of Economy of the Republic of Serbia as sources of financing.

By analysing and summarizing results of the statistical data processing it can be concluded that self-financing had dominant role in the structure of sources of financing of rural tourism in the Republic of Serbia so far. This source of financing was used by 68.1% of respondents, while combined with other sources it was used by 27.9%, that is 96% of rural tourism providers used self-financing as the only or additional source of financing.

In addition to self-financing, sources of financing of rural tourism in the Republic of Serbia included: (a) subsidies of the Ministry of Agriculture, Forestry and Water Management; (b) subsidies of the Ministry of Economy; (c) loans provided by the Ministry of Economy issued through the Development Fund of the Republic of Serbia; (d) subsidies of the Provincial Secretariat for Agriculture, Forestry and Water Management; (e) subsidies of the Provincial Secretariat for Economy; (f) local government subsidies; (g) business bank loans; (h) foreign donations from the CBC projects; (i) donations provided by the Millennium Development Goals Achievement Fund of the Government of the Kingdom of Spain; (j) donations provided by the Global Environmental Fund (GEF); (k) donations provided by Sweden in cooperation with the *International Management Group (IMG)*; (l) donation provided by the US Agency for International Development (*USAID*).

In the previous period, the initiation of development of rural tourism in the Republic of Serbia has largely been stimulated by foreign sources of co-financing. Their value cannot be appreciated only in terms of quantity, but also through quantitative guidance of the rural tourism development (Radović, Pejanović, 2015).

Graph 1. Experience with bank loans

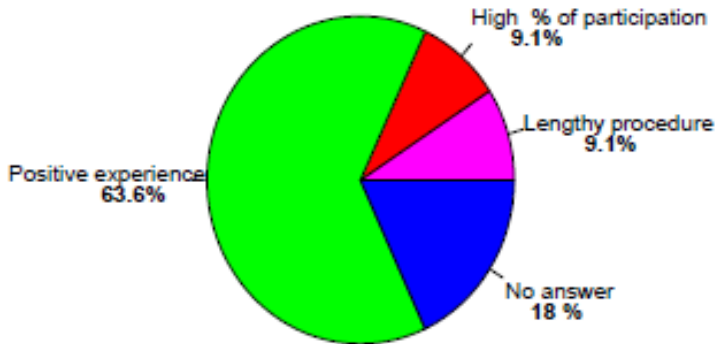


Source: Radović, 2015.

The following section deals with statistical analysis findings of the survey related to the satisfaction of respondents with individual sources of financing. According to these results, as much as 58.3% of respondents stated that bank loans are characterized by “unfavourable conditions”. 16.7% of respondents had bad experience with this source of financing, while 16.7% of respondents stated “low amounts” as the main disadvantage of this kind of financing. 8.3% of respondents did not answer the question, so it can be assumed that they did not use bank loans as the source of financing for the rural tourism. (*Graph 1.*)

According to statistical analysis results of the survey, 63.6% of rural tourism subjects had positive experience with subsidies of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia. Out of the total number of respondents, 18.2% had negative experience. The structure of respondents with negative experience is the following: 9.1% respondents stated “high participation rate” as a negative feature, while 9.1% pointed out that “lengthy procedures” are a downside of this kind of financing. This question was not answered by 18.2% of subjects, so it can be assumed that they did not use this source of financing. (*Graph 2.*)

Graph 2. Experience with subsidies of the Ministry of Agriculture of RS



Source: Radović, 2015.

Based on survey results regarding sources of financing of rural tourism offer on the territory of the Republic of Serbia, in the current period, it can be said that the highest percentage of respondents (56.7%) have no current investments. The second highest number (37.5%) is taken by subjects who are currently realizing their investments and finance them from their own sources (self-financing) 1.8% of subjects finance their current investments using self-financing and bank loans, while the remaining subjects combine self-financing with some form of government support (Table 1.).

Table 1. Sources of financing of current investments

Sources of financing	Frequency (number of respondents)	Percentage (%)
– self-financing	39	37.5
– self-financing and subsidies of the Provincial Secretariat	1	1.0
– self-financing and local government subsidies	1	1.0
– self-financing and bank loans	2	1.8
– self-financing and other methods (subsidies and loans of the Ministry of Economy of the Republic of Serbia)	1	1.0
– local government subsidies and subsidies of the Ministry of Agriculture of the Republic of Serbia	1	1.0
– no current investments	59	56.7
Total:	104	100.0

Source: Radović, 2015.

It can be concluded that majority of rural tourism subjects in the Republic of Serbia in the current period does not realize their investments due to the lack of financial resources, that is, adequate modalities of financing. The absence of financial resources is the consequence

of insufficient accumulative ability of rural tourism and agriculture as well as the lack of high quality external sources of financing. The cause of insufficient accumulative ability of rural tourism is inefficient exploitation of accommodation facilities. According to statistical analysis findings, the largest share of rural tourism subjects (39.4%) had up to 100 nights spent at their accommodation. This result indicates low cost effectiveness and insufficient accumulation and potential for self-financing of rural tourism in the Republic of Serbia. The lack of financial resources for subjects of rural tourism is also the result of low accumulation of agriculture, as its complementary activity, having in mind that 72.1% respondents stated that they are equally involved in agriculture and rural tourism (Radović, 2015).

It is worth noting that majority (51.9%) of respondents, without current investments, stated that they are planning to invest in the development of rural tourism within the next five years. According to statistical analysis findings, respondents stated that sources of financing for their future investments will be: (a) their own funds – 60.7% respondents; (b) government subsidies – 22.6% respondents; (c) business banks loans – 7.1% respondents; (d) cross-border cooperation funds – 2.4% respondents, (e) loans obtained from foreign investment funds -1.2% respondents; while 6% of respondents did not give a specific answer (Radović, 2015).

Conclusions and Recommendations

The development of rural tourism in the Republic of Serbia is a complex process considering the fact that rural regions are classified as the most heterogeneous in Europe in terms of natural, economic, demographic and social conditions. Hence, it is essential to treat development of rural tourism as multi-sectoral in the future. It should lay its foundation on adequate legal and strategic framework, accurate action plans, which will define both sources of financing and monitoring of results achieved.

Based on the survey results, it can be concluded that self-financing has been a predominant source of financing of rural tourism in the Republic of Serbia so far, given that 96% of respondents used self-financing as the only or additional source of financing. Rural tourism service providers chose to self-finance their activity due to the insufficient government support and unfavourable bank loans.

Currently, most respondents do not realize their investments owing to the lack of financial resources caused by insufficient accumulative ability of rural tourism and agriculture and absence of good external sources of financing. The cause of insufficient accumulative ability of rural tourism is inefficient exploitation of accommodation facilities. The lack of sources of financing for service providers in rural tourism is also a result of low accumulation of agriculture, as its complementary activity, since 72.1% respondents stated that they are equally involved in agriculture and rural tourism. Respondents who realize their investments in the current period primarily finance them from their own funds, because of the lack of high quality external sources of financing. Most of the respondents, although without current investments, stated that they plan to invest in the development of rural tourism in the next five years. In order not to form their views solely on optimism, it is necessary to define modalities

of financing of all segments of rural tourism offer in the period to come.

Having in mind that the development of rural tourism in the Republic of Serbia, as compared to countries in the region with a similar development period, is still in its initial stage, it is necessary to make government financial support a dominant source of financing. Due to the limited capabilities of state, provincial and local government budgets, it is necessary to examine the possibility for implementing the concept of a specialized agricultural bank. As a development financial institution, this bank would grant loans for priority development projects in the field of rural tourism under more favourable conditions. Thus, it is necessary to adopt the Strategy for Rural Tourism Development, annual programs and action plans regarding the rural tourism development as well as regular monitoring of implementation of plan documents.

Also, it is necessary to develop innovative sources of financing of all segments of rural tourism offer. More precisely, it is necessary to provide financing of rural tourism based on market principles. The market, here, refers to the perfect competition market in terms of its involvement in domestic banking market, in addition to business banks and other financial institutions, such as micro-credit organizations and savings and credit cooperatives.

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IZVORI FINANSIRANJA RURALNOG TURIZMA U REPUBLICI SRBIJI

Gordana Radović²

Sažetak

Republika Srbija nema razvijenost ruralnog turizma adekvatnu resursima sa kojima raspolaže. Razlog tome su nedovoljna finansijska ulaganja, kao i nedefinisanje jasnog strateškog pravca razvoja. Cilj rada je da prikaže izvore finansiranja ruralnog turizma, odnosno ruralne turističke ponude u Republici Srbiji. U radu su korišćeni metod terenskog istraživanja, analize, sinteze, kao i statistički metod. Autorka zaključuje da je samofinansiranje dominantan izvor finansiranja ruralnog turizma u Republici Srbiji u dosadašnjem periodu. U aktuelnom trenutku većina anketiranih subjekata ne realizuje investicije usled nedovoljne akumulativne sposobnosti ruralnog turizma i poljoprivrede, kao delatnosti s kojom je povezan, ali i zbog nedostatka kvalitetnih eksternih izvora finansiranja. U cilju razvoja ruralnog turizma u Republici Srbiji potrebno je definisanje modaliteta finansiranja, koji uključuju i inovativne izvore finansiranja svih segmenata ruralne turističke ponude.

Ključne reči: ruralni turizam, izvori finansiranja, razvoj, Republika Srbija

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NEW GREEN PROFESSIONS IN BULGARIA IN THE CONTEXT OF TRANSITION TO GREEN ECONOMY¹

Zornitsa Stoyanova², Hristina Harizanova³

Summary

Transition to green economy sets new requirements and challenges for the types of jobs, skills and knowledge.

The paper analyzes and evaluates the importance of categories of green professions by sectors in Bulgaria. The main applied methodical approach for analysis and evaluation of green professions is a system approach. Assessment and analysis of the importance of categories of green professions by sectors is made on the basis of structured interviews with municipal experts from regional government structures involved in the process of implementation of green jobs in the country. According to aggregated and analyzed information are proposed policy recommendations and general conclusions related to implementation of training programs for green employment, use of the best European and world practices for the application of new green professions, improvement of consulting services, changing legal framework of green jobs, etc.

Key words: *green jobs, skills, employment, policy recommendation*

JEL: *Q01, Q58, M53*

Introduction

EU outlines a plan for maximizing employment opportunities in green sectors and relevant employees in order economy to become a “greener”. “Green jobs” - include working with technology and materials that help the environment to be sustainable. Accordingly, the agreement of the plan explicitly states that Parties must take into account “the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in

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- 1 Paper is a part of research within the project Green jobs - tool of ecologisation of Bulgarian Economy (Miteva, Doichinova, Stoyanova, Kanchev, Harizanova, Peicheva, 2014).
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accordance with nationally defined development priorities” (International Labour Office, 2016). This type of jobs is among the fastest growing in Europe over the past 10 years (Cedefop, 2015) Most often they are in sectors as career, recycling, biodiversity, insulation to increase energy efficiency, improve air quality, renewable energy technologies (European Centre for the Development of Vocational Training, 2008). In the report is stressed that every job should be entitlement to professional courses – giving to people jobs and time they need to acquire the new skills.

Even during the world economy recession, the number of jobs in the noted reports increased with 20% (OECD, 2012). EU sets economic transition to green sectors as a key element for sustainable economic growth.

In a report for social benefits and workers’ rights (European Commission, 2015) is estimated that 20 million jobs could be created in the green economy by 2020 in Europe. In the EU, 14.6 million direct and indirect jobs exist in biodiversity protection and forest and national resource rehabilitation. The renewable energy sector employs over 8 million workers globally (International Labour Office, 2016). Greening the economy will include creating new types of jobs and transforming the existing ones. This will require workers with specialized skills, knowledge and training. The EU plan is aimed at supporting the creation of jobs in green sectors and support workers. The plan includes: anticipating the skills and knowledge that will be needed in these areas and how to help workers to acquire them; shifting the burden of tax from labor to tax pollution from activities of the business.

Greening the economy will include creating of new types of jobs and transforming existing ones. It will require workers with specialized skills, knowledge and training. The necessary skills have to be developed in order to meet the demands of the future low-carbon economy, which may require adjustments in education and skills development for youth in particular (International Labour Office, 2016). In addition to changes in the number of jobs, there may be impacts with respect to changes in job quality (International Labour Office, 2016).

The creation of green jobs is one way the world to deal with many environmental problems (Martinez-Fernandez, Hinojosa, Miranda, 2010). “Green Future” also provides huge potential for employment growth in green jobs. A study explores the potential for societies to create more green jobs for the disadvantaged and research how policy instruments can support green jobs (skills) and how green jobs can support the disadvantaged (VanWynsberghe, 2016). However, without adequate skills, this potential cannot be realized (Pestel, 2013).

Today, gaps in basic skills are recognized in many countries (Germany, UK, France) as the main obstacle in many sectors for the transition to a green economy, in terms such as renewable energies and energy and resource efficiency, green building and renovation, environmental services and green production (Strietska-Ilina, Hofmann, Durán, Mercedes, 2011).

The European Union observed processes of creation of many green jobs with their specificities and requirements. To clarify how it will achieve the set objectives, future and current workforce to be with the right skills and knowledge, the European Union developed a model that shows how and range, people will be trained and retrained.

In 2016 in update is a new statement of green jobs. They are divided by “the green shade” (International Labour Office, 2016). The shades of green concept acknowledge and represent this by depicting the decency and environmental friendliness of a green job along a green colour spectrum. As the job or enterprise minimizes waste and pollution, increases material and energy efficiency, and protects and provides social benefits to workers, the darker it features on the colour spectrum and the more it contributes to a sustainable future. Countries at different stages of development have varied capacity to implement the types of changes that are necessary to green jobs and economic activities. The national context must therefore be taken into account when determining the shade of green of a particular job. Creation of jobs should have pre-phase adaptation efforts to imply a range of policy interventions including social protection and public employment programs; micro-finance and micro-insurance; skills development; local markets and enterprise development, all of which should build on strong and effective social dialogue (Kamal , Fyfe, 2015). Empirical profiling reveals that green jobs use more intensively high-level cognitive and interpersonal skills compared to non-green jobs (Consoli, Marin, Marzucchi, Vona, 2016).

A several numbers of studies depend on the matrix of green jobs (European Commission-SYSDM network, 2013). Skills needed for creation of a green job should be supported on national and international level. Support mechanisms have as well some disadvantages like complicated procedure for applying to specific funds, not motivated employees to pre-qualification, lack of information of possible future and sustainability of gained new skills, lack of professionals who to lead the trainings, insufficient interest of business to invest in new skills to already employed people etc.

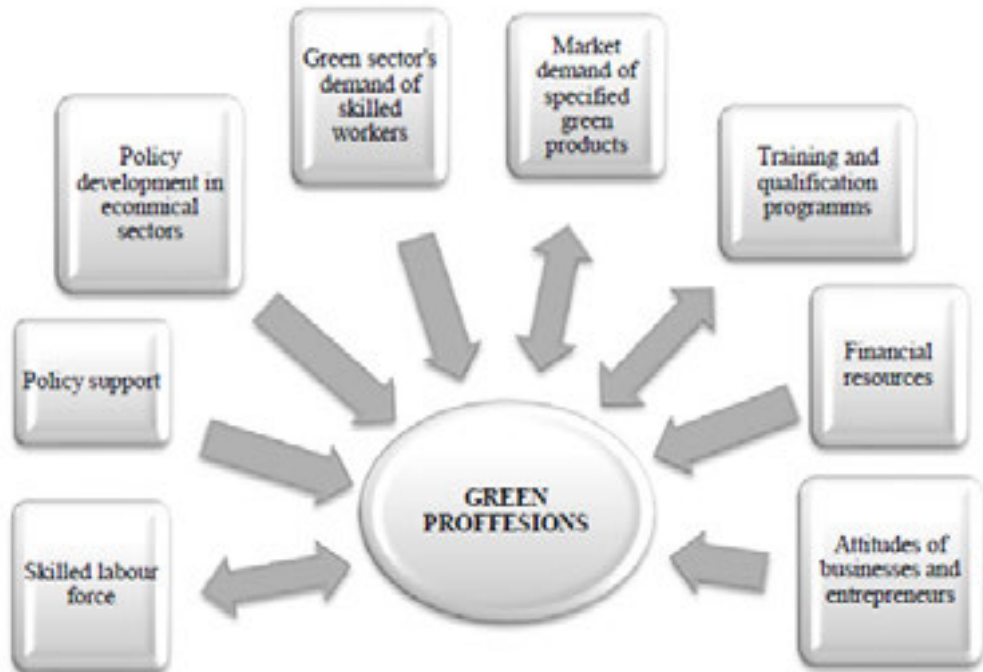
Full single model at EU level for green economy by green job employment cannot be set because the parties have different growth, different levels of implementation of green technology, different climatic characteristics, natural resources and others. The proposed model also noticed that they are deployed mainly training that will enable people to specialize. The target group takes all employed and unemployed, with any kind of education and qualifications, as well as training both within a day and over a year. In the report (30 counties were observed) (European Commission-SYSDM network, 2013) is tried to be covered the whole process of target groups that should fall into group of green jobs, who will train them for how long, which is the purpose of it and etc. Individual specifications and sub models each EU country is free to define themselves and follow.

Methodological framework

The main methodical applied analysis approach for evaluation of green jobs is a system approach. This is a methodology that examines the objects of research - green professions

as systems which is in a permanent connection with other systems. At the same time the systems are influenced both on the internal structure and the external environment (Stankov, 1997). For application of the research connected with evaluation and analysis of green jobs are taken into account the basic principles of system approach: focus group, integrity, organization, completeness, complexity. The system of green professions is presented on figure 1.

Figure 1. Green professions system



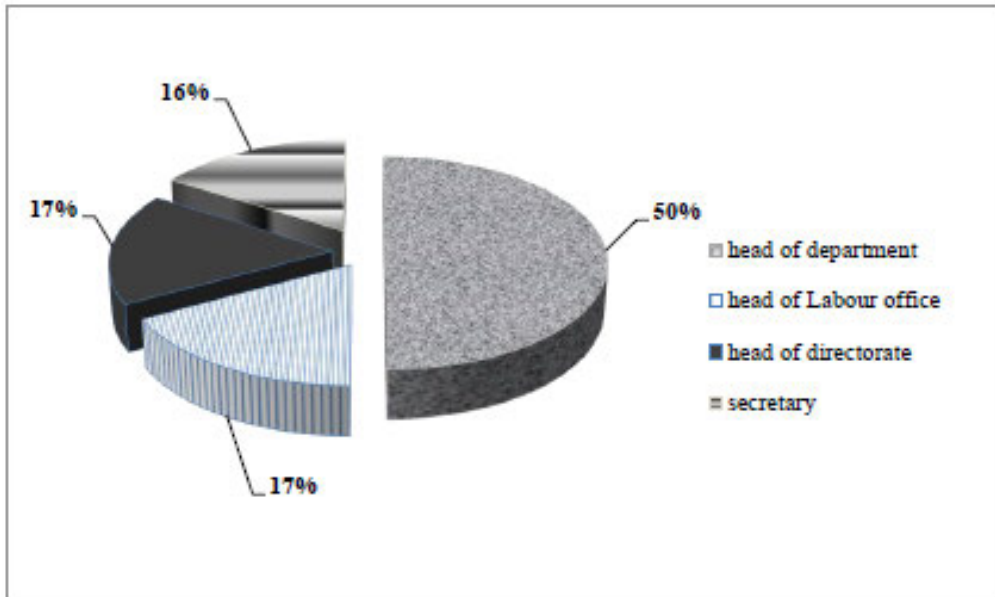
Source: own findings

The main aim of the paper is to analyze and evaluate the importance of categories of green professions by sectors in Bulgaria and on this basis to make general conclusions and policy recommendations about the created new professions which appear due to transition to green economy. Aim has the following tasks: 1) An overview of EU achievements in the field of creation and development of green professions 2) Analysis of types of green professions by sectors in EU 3) State of green professions in Bulgaria by sectors; 4) Assessment and analysis of the importance of categories of green professions by sectors 5) Based on the aggregated and analyzed information will be offered policy recommendations and general conclusions.

Findings and conclusions in the paper are part of the results of university research project “Green jobs - tool of ecologization of Bulgarian Economy”. Information is summarized on the basis of structured interviews with municipal experts from regional government structures who are involved in the process of implementation of green jobs in the country.

The survey was conducted in the period 2014-2015 in order to analyze the state of green jobs and to evaluate the categories of green professions by economic sectors in Bulgaria. The distribution of respondents according to their position in the municipal administration shows that half of them - 50% are heads of departments in the surveyed government organizations (Figure 2). Positions – “head of the Labour office” and “head of directorate” occupied by respondents by 17% each of them. Secretaries from labour offices were 16% of respondents.

Figure 2. Distribution of respondents by working positions



Source: own findings

The choice of conducting a survey among representatives of labor offices is justified by their direct involvement in the application process to “green job” measure providing green employment.

Types of green jobs at European level

Need for skills is a major challenge at all possible levels in EU countries. They might be differentiated by the sector where they are created (Esposto, 2016). The most often analysis is on industrial and enterprise level. The point is that they are connected to government by the possible help of finding skilled employees. Opportunities taken up by businesses are mostly driven by the emergence of new markets and consumer demand, which often activate new production methods and processes.

Due to the different definitions adopted by countries for green job types revealed occupations also vary. In summary, it can be suggested division by sectors and qualification. Information is based on a study of 12 EU countries for which information is available (Table 1).

From international review (European Commission-SYSDM network, 2013) of achievements in the creation of green jobs, Germany is on first place. The country is one of the leaders in developing strategies for green jobs and develops job descriptions of employees in various sectors. Green jobs in Germany represent less than five percent of the German workforce, about two million workers, i.e. 4.8% were employed in jobs related to the environment. Consequently, this leads to doubt whether it can be expected large growth in gross employment in the green sector.

Table 1. New profession / specialists in EU by sectors

Sector	A new profession / specialists	Qualification / degree of education
Renewable energy	quality control, diagnostics, auditing, developer projects engineer, consultants and researchers; coordinators, field engineers (wind energy), geothermal technicians; nuclear engineers; sales and marketing, legal experts; computer specialists	management level; require high-level qualifications
Construction sector	organization of companies or approaches to project management (in construction) coordination and testing of the product prior to commissioning, diagnosis, control and performance measurement related to regulatory requirements (energy efficiency, air quality, acoustic measurement) interdisciplinary skills (regulatory impact of lower currents, metrology and software) renewable energy systems (solar, wind, geothermal energy)	require higher level skills associated with green technologies or complete project management
Energy efficiency	engineer (ingenieur thermicien), auditing and consulting	average and high qualification
Waste	prevention and management of waste operators industrial recycling	average and high qualification
Transport	managing inflows, logistics / ICT coordination of transport systems, carbon audit.	average and high qualification
Pollution prevention and cleaning environment	environmental engineers, technicians sector training of environmental problems, waste disposal specialists, transportation and experts in recycling materials specialists in hazardous substances	average and high qualification
Construction of green buildings	Engineers, carpenters, construction workers, construction and building inspectors, insulation specialists, electricians;	low to average qualification
Agriculture and landscape	specialists in landscape architecture, hydrologists, geologists, zoologists and biologists, specialists in conservation of forests technicians, specialists in fish and game	low to average qualification

Source: multiple authors and own findings

Green professions in France are related to waste and water management account for nearly half of green jobs, followed by the sector of renewable sources of energy. In subsequent periods France began to report numerous problems with green jobs such as lack of adequate skills, particularly in the construction industry where many are entering as new green jobs, which in turn hinders increasing the employment. Some findings show inability of firms to hire qualified personnel, as graduates (secondary or higher) are rarely trained in energy efficiency; lack of specialists familiar with new technologies that deal with personnel training etc.

These findings in France can be compared with Belgium, Austria, the Netherlands and Denmark, where initially there was an increase in the number of green jobs, then due to various problems this number began to decline.

In Italy is recognized the importance of green jobs and environmental politicians and economists start to think how appropriate is the disclosure so many green jobs. Based on an Italian study of labor costs by sectors, it is estimated that a green workplace equivalent of 6.9 jobs in the industry or an average of 4.8 economic sectors.

Czech Republic, Slovakia, Poland and Bulgaria at this stage have not reached the required performance for their transition to a green economy in most of their sectors, which resulted in a small number of jobs but in most cases the data are unofficial.

State of green employment by sectors at national level

The analysis of the sectors connected with created green jobs in Bulgaria shows that the highest share is in the sector water supply, sewerage, waste management and recovery (*Table 2*). The share of employers in this sector for the period 2011-2015 varies from 92.3% (2015) to 78.1% (2014). For the analyzed period they were average 69% of employers signed contracts under the promotion measure “Green jobs” of the sector E „Water supply, sewerage, waste management and recovery”. They vary from 55,5% (2011) to 79% (2015). The main activities where are the most signed contracts are in the sector Water supply, sewerage, waste management and recovery are collection, treatment and supply of water. Among the employers in this sector prevails also the number of these realizing activities related to collection of non-hazardous waste.

The second place by signed contracts is sector “Constructions”. The highest numbers in this sector are connected with “other specialized construction activities”. During 2011-2015 the number of signed contracts by employers in this subsector vary from 2 to 5.

For the analyzing period almost equal numbers of contracts were signed in sectors “Production and distribution of electricity, heat energy and gaseous fuels” in activities related to production of electricity, sector “Manufacturing” with activity “Production of devices for management and distribution of electricity” and also sector “Administrative and support services”, including activities related to “Formation and maintenance of green areas”. For all these sectors and subsectors the number of signed contracts varied from 1 to 3 for different years per sector.

Regardless of opportunity and conditions of the promotion measure “Green jobs”, two of the supported sectors did not get any interest among the employers - “Transportation and storage” and “Culture, sports and entertainment.” In these sectors has not been signed any contract.

Table 2. Employers financed by measure “Green jobs” by sectors, 2011-2015

Sectors	Years				
	2011	2012	2013	2014	2015
Manufacturing, including: Production of devices for management and distribution of electricity	1 1	2 2	3 3	1 1	1 1
Production and distribution of electricity, heat energy and gaseous fuels, including: Production of electricity	3 3	2 2	3 3	1 1	1 1
Water supply, sewerage, waste management and recovery, including: Collection, treatment and supply of water Collection, disposal and treatment of sewage Treatment and disposal of non-hazardous waste Disposal of waste Recycling of sorted waste	45 10 0 4 2 3	43 7 0 7 0 1	55 1 0 6 1 6	25 3 0 3 2 1	24 2 1 2 0 1
Constructions, including: Other specialized construction activities Construction of water supply, sewage, heating and air conditioning systems	3 2 1	3 2 1	5 5 0	4 3 1	3 2 1
Transportation and storage	0	0	0	0	0
Administrative and support services, including: Formation and maintenance of green areas	2 2	1 1	3 3	1 1	0 0
Culture, sports and entertainment	0	0	0	0	0
Total	54	51	69	32	26

Source: Ministry of Environment and Water

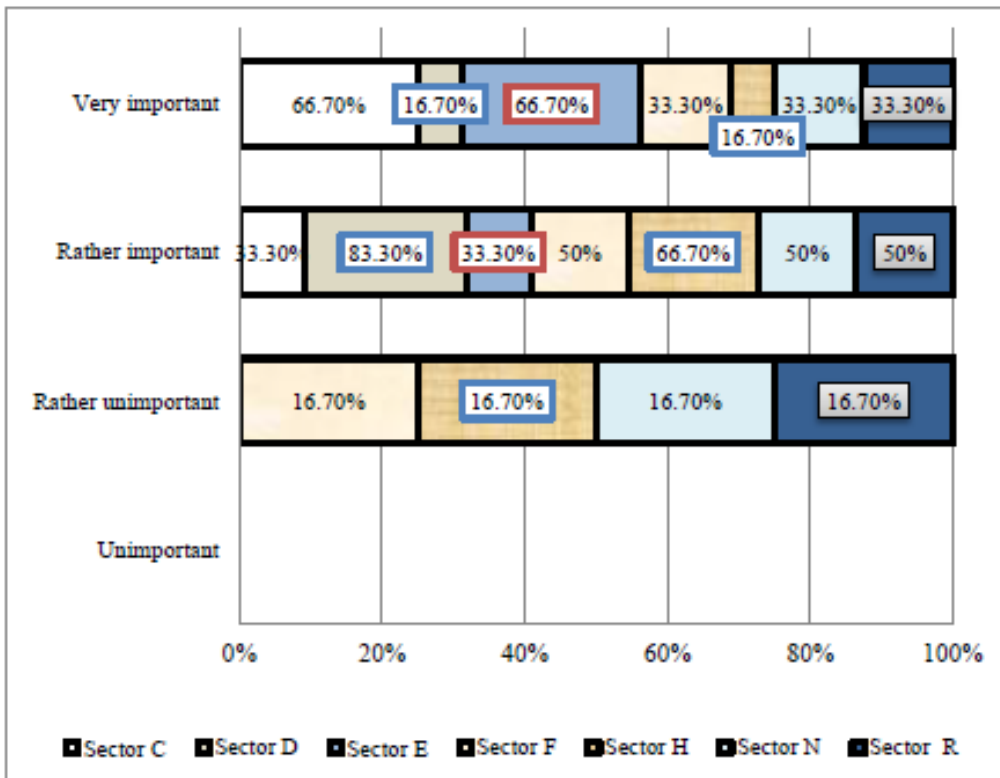
Evaluation of importance of green professions by sectors in Bulgaria

Economic activities linked to the production of goods and provision of services supporting environment are divided into seven sectors. Every sector is represented by national classificatory capital letter. Evaluation of the importance of sectors for creation of green employment is made through the ranking of each sector. Figure 3 present the ranking of the importance of the sectors (by capital letter and name) for the creation of green employment according expert’s opinion. The participant in the survey evaluated the importance of each sector and they chose importance between very important to not important divided in 4 possible ranks.

Very important for respondents are pointed sectors: C: Manufacturing and E: Water supply, sewerage, waste management. 66.7 % of the respondents believe that these are the three sectors that are rather important for the development of municipalities and one third of them (33%) believe that these sectors are the most important once (Table 3).

Sectors as D: Production and distribution of electricity, heat and gaseous fuels (83%) and H: Transportation and storage (66%) are identified from most of the experts as “rather important”. Half of the respondents - 50% believe that sectors N: Administrative and support service activities, F: Construction and R: Culture, sports and entertainment are also “rather important” for the development of green activities in the municipalities which take place in the survey. Only 17% of respondents consider that the sectors N: Administrative and support service activities, F: Construction, R: Culture, sports and entertainment and H: Transportation and storage are “rather unimportant” for the development of the municipality. There is no sector that is determined by the respondents as totally unimportant.

Figure 3. Ranking the importance of the sectors for creation green employment



Source: own findings

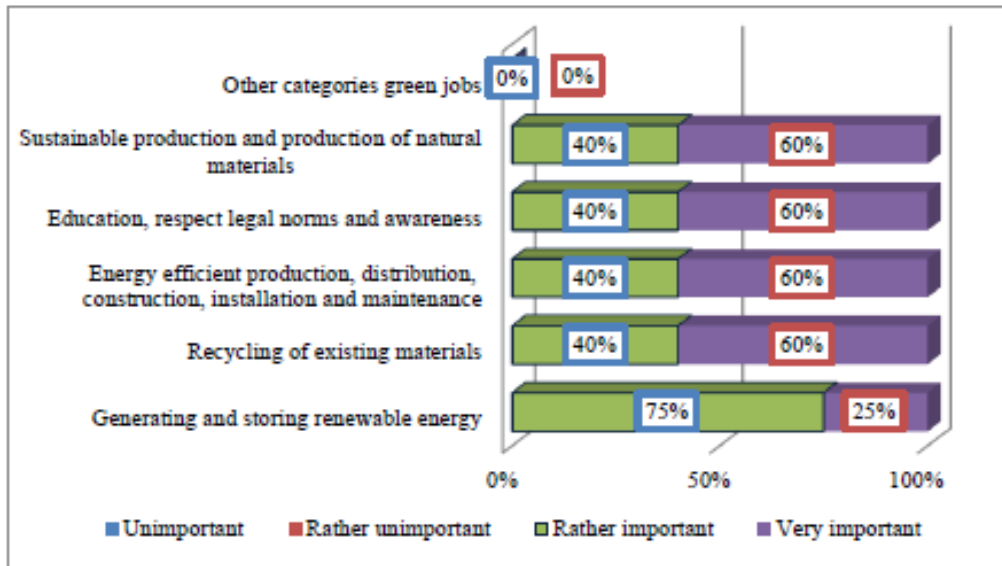
With respect to other sectors, representatives of labor offices indicate that it is important to be able to develop green jobs that operate in the tourism sector. This could contribute not only to the environment but also to better quality of service for consumers and increasing GDP for the economy. Another suggestion made by experts in municipalities is that the including of mining to sectors with an opportunity for potential implementation of environmental and/or green processes would help to neutralize the harmful effects of the industry.

In terms of defining the importance of the categories of green professions, 60% of the experts consider that the sectors related to sustainable production and production of natural

materials, energy-saving production, distribution, construction and installation, recycling such as the education sector, compliance with legal rules and information (Figure 4) are “very important”.

With respect to these categories, the rest of the respondents (40%) think they are “rather important”. Most of the experts (75%) agree that the generation and storage of renewable energy is a category that is “rather important” for municipalities.

Figure 4. Evaluation of importance of category green professions



Source: own findings

Experts are on the same opinion regarding the statements related to the labor market and the development of green professions (Figure 5). All respondents considered that the statement “the number of persons included in employment programs related to the development of green jobs is increasing every year over the previous three years” refers to the surveyed municipalities.

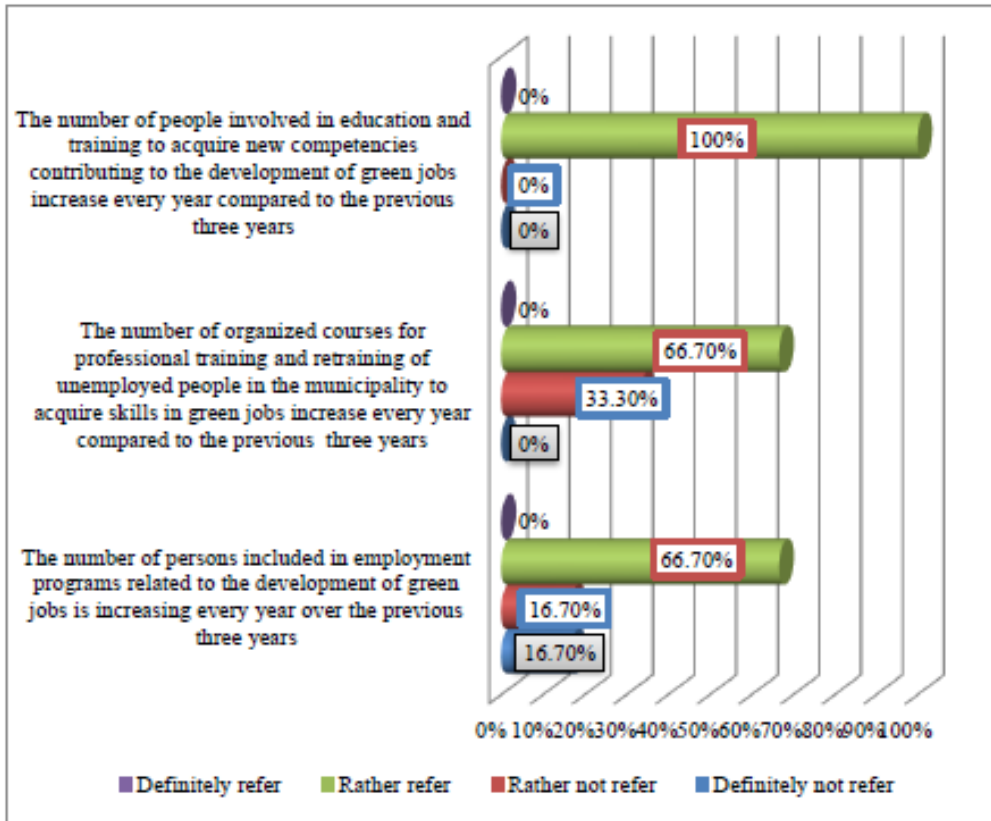
According to the statement that the number of organized courses for professional training and retraining of unemployed people in the municipality to acquire skills in green jobs increase every year compared to the previous three years. The evaluations given by the experts are distracted between the possible opinions. The data shows that 66.7 percent of respondents believe that the statement “refer rather” for the municipality and 33.3 % who believes in the opposite.

66,7% of experts consider that the number of people involved in education and training to acquire new competencies contributing to the development of green jobs increase every year compared to the previous three years. Respectively 16,7 % are on the opinion that this statement “rather not refer” and “definitely not refer” for the municipality of the

survived experts.

According to the respondents' opinion the needs of new skills and knowledge for the development of green jobs are different depending on the economic sector and the nature of the work. 75% of respondents consider that in the sectors "Waste Management", "Infrastructure", "Metal processing industry", "Landscaping" are necessary trainings regarding maintenance of vehicles.

Figure 5. Evaluation of statements related to labour market and development of green professions



Source: own findings

According the opinion 62 % of the respondents - the necessary competence is in the field of low-waste technologies and technologies to reduce and control pollution. In the sector "Tourism" due to specific activities of employees is determined the need for knowledge regarding the applicable standards and regulations (37.5%). 25% from the respondents consider that there is a need for skills in IT sector.

Conclusion and policy recommendations

Based on the analysis of the state of green professions in Bulgaria by sectors and evaluations of expert's opinion about the importance of green professions and sectors could be made conclusions and policy recommendations as follows:

Conclusions:

- ✓ The sectoral analysis of the new created green jobs shows that the highest share is in the sector water supply, sewerage, waste management and recovery. Among them prevails numerous employers realizing activities connected with collection of non-hazardous waste.
- ✓ Sectors "Transport and storage" and "Culture, sports and entertainment" are not attractive in terms of creating green jobs and the development of green professions. For the period 2011-2015 was not created any green job in these sectors.
- ✓ The sectors which have the greatest significance for the development of green professions in surveyed municipalities are C: Manufacturing, E: Water supply, sewerage, waste management and recovery and D: Production and distribution of electricity, heat and gas. At the same time there is no sector that is determined by the respondents as unimportant.
- ✓ Very important sectors for the development of green professions and categories of green jobs according experts opinion are related to sustainable production with natural materials, energy-saving production, distribution, construction and installation, recycling and education sector, compliance with legal standards and awareness.
- ✓ Regarding the statements related to the labor market and the development of green professions respondents considered that the number of persons included in employment programs related to the development of green jobs is increasing every year over the previous three years (100%), but as a nominal numbers still very low.
- ✓ The number of organized courses for professional training and retraining of unemployed people in the municipality to acquire skills in green jobs increase a lot compared to the previous three years (66.7 %) and the number of people involved in education and training to acquire new competencies contributing to the development of green jobs as well increased compared to the previous three years (66,7%).
- ✓ New required skills and knowledge that a worker must have to carry out green activities are different depending on the economic sector and nature of work. Companies from the sectors "Waste Management", "Infrastructure", "Metal processing industry", "Landscaping" need trainings regarding maintenance of vehicles, low-waste technologies and technologies to reduce and control pollution. In the sector "Tourism" due to specific activities of employees is determined the need for knowledge regarding the applicable standards and regulations.

Policy recommendations:

- ✓ The development of sectors of green professions could be realized by implementing training programs for green employment through:
 - Including the people from different age generations in education programs and trainings for acquiring new competencies for green employment in accordance with the demand of the labor market;
 - Organization of vocational training and retraining of unemployed people for green professions;
 - Specialized training courses for improvement the professional qualification and increasing the availability of qualified and experienced employment in the field of environmental protection and tourism services.
- ✓ Use of the best European and world practices from companies with similar activities, successfully applying new green professions could be defined as an opportunity for creation of new green jobs and development of new green professions in Bulgaria.
- ✓ It is necessary to improve consulting services regarding to green professions and implementing green practices. They can be carried out by Labour Offices, Regional inspectorate for environment and water and National agricultural advisory service. This will expand the competence of the applicable activities in environmental field.
- ✓ Including the mining to sectors is an opportunity for potential implementation of environmental and / or green processes. This could help to neutralize the harmful effects of industry and would promote the development of green activities and professions. This might help the municipalities to be more attractive as a place for living and residence.
- ✓ Changing the legal frame work of green jobs could bring positive effect of expanding green employment. The procedure should be more attractive and easy to apply for funding. As well if it is a possible transfer between different other employment measures could bring higher employment efficiency.

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HISTORICAL DEVELOPMENT OF ORGANIC PRODUCTION¹

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Summary

The authors are discussing the concept of organic production, its origins and development. Organic agriculture has been developed in three stages: stage of emergence (1924-1970), stage of expansion (1970-1990) and stage of growth (after 1990). In the first stage organic production faced problems in terms of its scientific recognition, acceptance by the producer, members of the wider community as well as acceptance at the national level. The second stage was defined with gradual expansion of the production system, the establishment of non-governmental organizations, the recognition and the establishment of the first legislative framework and the adoption of organic practices. In the third stage organic production is recognized and accepted around the world. Today there are laws on organic production in almost all developed countries, and in most of the developing countries. Areas under this system are increasing and the state official are acting as advocates of organic agriculture, supporting this system in the form of various premiums and subsidies for producers.

Key words: *organic production, emergence, history, development.*

JEL: *N50, Q57*

Introduction

The concept of organic agriculture developed in the early twentieth century, first in Europe and then in the United States. Pionires of Organic Agriculture Movements were motivated by a desire to resolve long-standing problems of conventional production - erosion, reduction of the production capacity of the soil, reduction in the number of varieties of plants, low quality of food and nutrients and ubiquitous rural poverty.

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They have embraced a holistic approach that the health of the nation must be built on a healthy agriculture, which depends primarily on the long-term soil fertility⁴. It was believed that the health and vitality of the soil depends on its surface layer, called humus. On this basis, a system of land management was developed called “humus farming” and it was based on the principles of maintaining soil fertility as a basis for sustainable agricultural production. Kuepper (2010) states that such production system represents a conscious management of land resources. Through this system it is possible to maintain and increase the fertility of soil and to avoid over-exploitation of natural resources. This system, according to him, is considered as a forerunner and one of the first forms of organic agriculture.

Organic farming can be defined as an approach to agriculture where the aim is: to create integrated, humane, economic and naturally sustainable agriculture with optimal utilization of renewable energy sources originating from the farm. Accordingly, organic farming requires proper management of ecological and biological processes in order to ensure acceptable levels of yield and nutrients, protection from pests and diseases and acceptable return on investment of labor and other resources (Lampkin, 1994). In other words, “... organic production creates and develops integrated, humane, environmentally and economically sustainable production systems that rely on resources within the farm, encouraging the use of renewable resources” (Lazić, Lazić, 2008). Organic farming, together with a number of other alternative production systems produces food that contributes to the overall well-being of man (Lockie, Halpin, 2005). Sustainability was an integral part of this concept from the very beginning (Stolze et al., 2000, Kasperczyk, Knickel, 2006, Pacini et al., 2003).

When considering the system of organic farming, the question that often arises is where did it begin? When and where in human history does this vague idea of organic agriculture first come to mind? In practice, and in theory (Lockeretz, 2007), one often comes to an opinion that it began centuries ago, when first hunter-gatherers finished with a nomadic lifestyle and began establishing communities and practicing agriculture. However, producers in the distant past certainly did not have at their disposal modern means of chemization. The main difference between organic farming in present terms and organic production from the past is *the intention* of the producers. Today’s production, among other things, is characterized by deliberate intention of producers to turn to this production system, which distinguishes it from the producers of the past. In the past they also produced without using chemization and other inputs, but only because they had no other choice.

During the period of the formation and development organic production was going through different stages of acceptance of this production system. Lockeretz (2007) states that in a period of time, organic production was under attack of representatives of

4 Aeberhard and Rist (2008) indicate that today’s motives are more connected with the economic benefits of organic agriculture, expressed through a premium price, which under certain conditions can make a profit equal to or higher than in conventional production.

the profession and practice, with or without supporting evidence. Thus, at the annual meeting of the American Association for the Advancement of Science - AAAS in 1974, a panel of scientists examined the “myth of organic production”, calling this production “scientific nonsense” and blaming “pseudo-scientist” for alerting the public, forcing consumers to pay more money for their food. They also claimed that the organic myth is counterproductive for the well-being of people, as it leads to a refusal of procedures that are necessary for the production of healthy foods with maximum efficiency and that it reverses decades of prosperity in agricultural research. However, seven years later, the journal of this same association published an important research article that concluded that organic production is highly efficient and economically competitive production system, with reduced use of energy and less land degradation, compared to conventional farms.

No less important issue in the literature is: what caused the growth of organic production in the second half of the twentieth century? Lockeretz (2007) states that in the absence of fundamental analysis one can only speculate, highlighting several possible answers:

- Activists of organic movements were sufficiently successful in promoting their vision to public, researchers and creators of the macroeconomic environment;
- The problem of environmental pollution, the position of agricultural producers and small farms around the world and food safety issues - organic farming became more attractive alternative to the dominant conventional production among farmers but also among consumers;
- Over the decades the technology of organic farming changed, adapting to the audience, contrary to the narrow circle of users from previous years.

Modern organic agriculture represents a number of different schools of thought. In 1924, Austria’s philosopher dr Rudolf Steiner presented the alternative forms of agricultural production, which originate from science called (or pseudoscience, as some call it (Staudenmaier, 2013)) antroposophy. This formed the basis for the further development of biodynamic production, which today exists in many countries of the world. At about the same time dr Hans Müller from Switzerland founded the movement for agricultural reform, which explored the concept of land management and the preservation of family farms. Later, dr Hans-Peter Rusch contributed to the development of this idea, concentrating on issues of soil fertility and soil microbiology, which led to the further development of organic-biological agriculture in Central Europe (Lampkin, 1994).

Also, Lampkin (1994) states that in the UK and other English-speaking countries, scientists like Sir George Stapledon and Sir Albert Howard, were under the indirect influence of Rudolf Steiner, although his ideas were adopted later. However, Stapledon`s work with alternative systems of cultivation and Howard`s work on the role of organic matter in the soil and composting have provided impetus for the establishment of the organic movement by Lady Eve Balfour. Ideas of Howard and Balfour emphasized the role of a healthy and fertile soil to produce healthy plants and animals and their link

to human health was established by J. I. Rodale and later his son Robert Rodale in the United States.

Methodology and data sources

The aim of the research was the analysis of the origin and development of organic farming as an alternative system of agricultural production. Analysis related to the emergence of organic agriculture in theory and practice, and the formation of the organic movement as broader social construction whose base was organic farming. During the research the historical method was used and the method of description in conjunction with the method of abstraction for defining and determining the period of development. Synthesis is used in making conclusions, together with the inductive method. As data sources secondary sources of literature were used as well as primary data resulting from the research in mentioned project.

The development of the organic movement

The development of the organic movement in the last seventy years can be summarized in three main stages (Tate, 1994). According to Shi-ming and Sauerborn (2006) those three phases are classified as stage of emergence (1924-1970), stage of expansion (1970-1990) and stage of growth (after 1990).

Stage of emergence (1924-1970)

Years 1924-1970 represent a period of struggle and financial difficulties for organic agriculture in a rather hostile environment and the period in which key papers are written. Modern organic farming began to develop in Europe in 1920 and immediately incounted with a powerful chemical lobbies. During this period, organic farming has been primarily recognized as biodynamic production. As such, during development it faced with different problems. Before World War II Germany was considered as extremely favorable country for the development of biodynamic production (Staudenmaier, 2013). Staudenmaier (2013) states that “regardless of whether it is a system of production in accordance with the laws of life, the natural way of production or production method that will restore the health and fertility of the German land and German people, biodynamic production has found reliable partners in the Nazi hierarchy.” On the other hand, Tate (1994) states that in mentioned period the government was interested in maximizing output from agriculture for economic, social and political reasons; the environment was ignored. At worst case of persecution, biodynamic agriculture was banned by the Nazis in 1940, influenced by the powerful chemical industry in Germany (Tate, 1994). This rejection of biodynamic production, above all, was linked to the period from the forties onwards, when the chemical industry was in full swing (period known as Green Revolution -between 1930 and 1960).

To understand the origin and development of organic agriculture⁵ it is necessary to examine the processes and events that were current at that time (Vogt, 2007): 1) The crisis in the agricultural practice and science; 2) the emergence of science of biological control in agriculture; 3) Life and Food Reform movements; 4) increase awareness of agriculture practice in the Far East in Western countries.

Between two world wars agriculture found itself in crisis, where environmental problem and the problems of soil fertility come to the fore. Along with those economic and social problems that are related to the rural community emerged. Use of chemization and mechanization is seen either as a solution or as a cause of these problems. At that time science of biological control of agricultural land appeared. Biologically oriented agriculture is primarily related to the research focused on biological analysis and control of soil. Life Reform and Food Reform movements related to the period at the end of the nineteenth and beginning of the twentieth century in Germany and the USA. They refer to the disapproval of industrialization that was in progress, urbanization and the dominance of technology in the “modern” world. Supporters of the movement were “invited” to the “natural way of life,” which among other things included the return to land and agricultural production.

At this stage of development, the most important people who have made great contribution to the development of the concept of organic production appeared: Rudolf Steiner from Austria, Hans Müller from Switzerland, Lady Eve Balfour from Britain, J.I. Rodale in the United States, Albert Howard from Britain and Masanobu Fukuoka from Japan.

The influence of Rudolf Steiner (1861-1925) was important and deep in many areas, notably education. Steiner started the development of the earliest, and for a time the most influential forms of organic farming, biodynamic production. He was a mathematician, physicist and chemist and had no previous training in agriculture. Biodynamic movement, with its symbol of Demeter, the Greek goddess of agriculture, was created from a series of Steiner’s lecture, which was held in 1924, a year before his death. Steiner has accepted an invitation to lecture a group of German farmers in Koberwitz-u. They were concerned about a new trend in agricultural production, which they called “scientific” agriculture, which assumed increased use of chemicals. In his lectures, Steiner pointed out the shortcomings of materialistic approach to agricultural production (Steiner, 1924). He stressed the great impact of natural forces on production. Even in the early twentieth century, farmers have noticed the decline of soil fertility, reduced ability of the seed and the bad state of health of the animals. The term “biodynamic” was coined in 1925 by Erhard Bartsch (1895-1960) and Ernst Stegemann (1882-1943), as combination of two main aspects: the biological character

5 Some authors (Vogt, 2007) considered that the concept, which is now known as organic agriculture is a combination of different ideas that mostly originate from parts of the German and English-speaking countries. Accordingly, the specific analysis of the development of this movement in the German and English-speaking area is met.

of fertilization on the one hand, and the dynamic effect of natural forces on the other (Vogt, 2007).

Hans Müller (1891-1988) was a politician and farmer. He wanted to end what he saw as the exploitation of farmers by middlemen and establish a direct link between producers and consumers. In 1946, Müller founded BIO Gemuse AVG, a Swiss cooperative of small farmers that produced using organic-biological methods of production. Studenmaier (2013) states that Müller was a supporter of biodynamic production methods, issuing a series of books and pamphlets on biodynamic production in his publishing house, and strongly promoting biodynamic production in the journal he edited (*Lieb und Leben*). Also, Müller has continuously used his position in a political party urging for biodynamic producers, providing visible support to organic projects on behalf of the Nazi Party. Along with other supporters of this movement, he founded the League of the Reich for biodynamic agriculture.

Building on Müller's research, H. P. Rusch explained the theory of organic-biological agriculture in his book "Soil fertility" in 1968. Rusch emphasized the critical role of microbial activity in soil on its fertility and encouraged fertilization with fresh manure of grazed cattle. Soil tillage should be shallow and light in order not to destroy vital organisms in the soil.

Lady Eve Balfour (1899-1990) was the driving force behind the organic movement in 1946. She was among the first advocates for establishing and she helped to establish the Soil Association, Britain's leading organizations in organic production. She published her best-selling work "The Living Soil" in 1946. The basic principle that guided her research was that the health of soil is inseparable from human health. Between 1938 and 1970 she conducted what later became known as Haughley experiment on farm in Suffolk. Lady Eve cooperation with the Soil Association lasted for 44 years. Originally, the Association attracted significant international membership but it then fell into financial difficulties and internal division. In 1980, the Association appears as a highly respected organization with standards for certification. The name of Lady Eve Balfour is, before all the other, linked to the development of organic agriculture in Britain (Tate, 1994).

Albert Howard was researching several segments of agriculture - the cultivation of plants, plant protection, soil, composting, fertilizing with manure. Thanks to this he finally began to look at the farm as a closed organism. Reintegrating various agricultural disciplines he concluded that the health of soil, plants, animals and people is interconnected. Soil rich in humus is the key to successful (organic) production; soil fertility is a prerequisite for healthy plants and animals. His famous book "An Agricultural Testament" (Howard, 1940), summarized his experiments, stressing the whole farm as a starting point and a base unit of agricultural research.

In the United States, J.I. Rodale has published the ideas of Eve Balfour and Albert Howard in a successful magazine "Organic Gardening", which reached a number of 2 million copies until 1980. The success of the magazine funded the establishment of

the Rodale Institute, which was a pioneer of organic agriculture research in the United States in the seventies and eighties, and has led to the publication of the magazine “New Farm” for organic producers. His work was continued by his son Robert Rodale.

In Japan, Masanobu Fukuoka has developed a very different approach to organic agriculture, in philosophical and practical terms, that is best presented through his book “One Straw Revolution” (Tate, 1994).

Stage of expansion (1970-1990)

The basic schemes and symbols of organic agriculture have been established between 1970 and 1980. Together with growth in demand for organic products, “green” awareness was growing and retail stores with organic products grew rapidly. The last quarter of the twentieth century brought the permanent production surplus of agricultural products in the west countries and belated concern for the welfare of the planet, which has led to better recognition of organic production. The positive relationship between supply and demand in the market for organic products has enable dan increase in hectares undercertified organic production.

In 1970, William Albrecht introduced the definition of ecological agriculture by which the ecological principle of production was associated with organic farming (Shiming, Sauerborn, 2006). Since 1980, organic farming has been accepted, national and international standards were developed and governments have begun providing assistance to farmers who were in an organic production system. Tomaš Siminand Janković (2014) stated that the original motives for the transition to this production system (connection to nature, a holistic approach to life, etc.) were laterre placed by economic motives. Confirmation of newly gain respect for organic production was created in the eighties when Sweden, Denmark and German government introduced incentives that encourage farmers to engage in this production system. Shortly afterwards the legal definition of organic farming in the United States and the European Union followed.

It is believed (Kuepper, 2010) that in the seventies two key studies that have influenced the further development and acceptance of organic agriculture was published. Better known is the USDA study, published in 1980 entitled “Report and Recommendations on Organic Farming”. The study contains interviewes with a large number of organic farming patrons, promoters, journalists, writers and farmers. In the study organic farms across the worldwas investigated, the farms in Europe were visited and a conclusion of the study emphasizes the benefits of organic production, satisfactory use of resources in this production, innovations in protection against diseases and pests and stresses the need for USDA and the University to better respond to the requirements and needs of producers who are in organic system. At the same time organic agriculture was researched in the Midwest. The research was done under the control of the Centre for the Biology of Natural Systems (CBNS) in Washington, St. Louis University. This research was directed to the rational use of energy in the cornbelt, but the efforts were

focused towards organic production because it has shown that this system uses the rational energy inputs.

During this period research infrastructure in organic production was developed (Stinner, 2007). A brief overview of the development of these institutions is given in the following table (Table 1).

Table 1. Development of research institution in organic agriculture

Institution	Founding period	Main objectives and activities
Rodale Institute, Pennsylvania, USA	1947	Research is based on a thesis that healthy soil produces healthy plants, animals and humans. Although it was founded in 1947, researches at the Institute gained in importance in 1970, when 135 ha of agricultural land has been acquired, which enabled the setting up of experiments in organic production.
The Research Institute of Organic Agriculture (FiBL), Frick, Switzerland	1973	Established jointly by farmers and scientists as a private foundation. The primary reason for the establishment was the implementation of the experiments relating to organic production, since organic producers at that time were not yet supported by the federal and cantonal authorities. Their research today is conducted on a farm in Frick and on over 200 associate farms throughout Switzerland. Special attention deserves the so called DOK study that began in 1978 and compares biodynamic, organic and conventional production in various aspects.
International Federation of Organic Agriculture Movements (IFOAM)	1972	The five organizations that participated in the founding of IFOAM are Soil Association from Great Britain, Sweden biodynamic production association, Association for soil in South Africa, Rodale Press from USA and the Nature et Progrès from France. The Federation is designed as an umbrella organization at the international level, with the idea to bring together similar organizations at national and local levels. Since its founding up to 1975 it consisted of 50 members from 17 countries. Today, IFOAM has more than 750 members from over 100 countries. IFOAM members are organized at regional levels, for example, EU, Mediterranean and Asia. The goals are still the promotion and development of organic agriculture, provision of a common platform for all participants, representing the interests of organic agriculture in important institutions and bodies, etc.

Institution	Founding period	Main objectives and activities
Louis Bolk Institute, Driebergen, Norway	1976	The basic idea of founding was to link the current social problems with research in organic agriculture, nutrition and health care. The Institute defines as its main goal help to farmers in finding practical solutions to problems of farm management, help to doctors in the promotion of human health and vitality and help to researchers around the world in the application of modern achievements.
Ludwig Boltzmann Institute for Organic Agriculture and Applied Ecology, Vienna, Austria	1980	Founded as a center for research of organic production methods in a broader, multidisciplinary approach. Its sphere of interests is related to crop production, composting, agroecology and food quality.
Elm Farm Research Centre, Hampstead Marshall, UK	1980	Founded on Elm Farm, with 94 ha of organic land. Research is conducted there and on the other associated farms. It is a leading institution in the UK in the field of organic agriculture.
Chair of Organic Agriculture, Witzenhausen, Germany	1981	Establishing of this Chair at the University of Kassel is a historic moment of entry of organic agriculture in official education. In 1987, the University of Bonn also founded another Chair for organic agriculture. This trend has continued after the nineties.

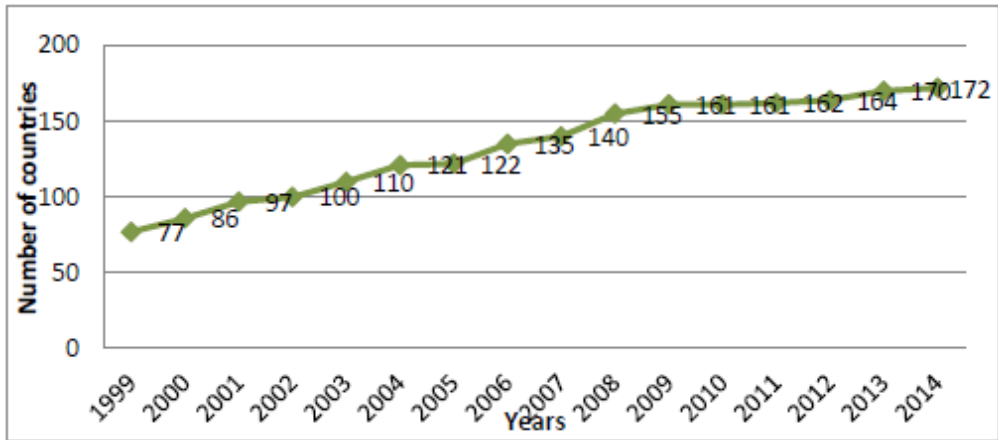
Source: Authors according to Lapmkin, Padel (1994)

Stage of growth (after 1990)

After a stage of development in which infrastructure in organic agriculture was established and developed, a growth stage of this production came to place. In this stage total areas in organic agriculture continued to grow, which led to an increase of market value of organic products. With regard to the development of infrastructure in the stage of growth more attention is paid to monitoring and analysis of organic production at international level. Thanks to this, other issues come to the fore and among biggest was the problem of lack of data, which is a problem when performing any kind of analysis.

Since 2000, IFOAM in cooperation with FiBL is trying to solve this problem and as a result annually publication the “World of Organic Agriculture”, which documents the current situation in the field of organic agriculture, was developed. From 2000 until today, the number of countries that monitor the state of organic farming in their national borders is constantly increasing, as are the areas and market for organic agriculture (Graph 1).

Graph 1. Countries with organic activities 1999-2014



Source: FIBL/IFOAM, 2016.

In 2014 43.7 million ha (including areas under conversion) was under organic agriculture. Organic share of total agricultural land makes around 0.99%. Although this is still a relatively low proportion, the rate of growth and the number of organic producers are relatively high. In comparison with 1999, the area under this system of production tripled. The current state of organic production is shown in Table 2.

Table 2. Organic agriculture in 2014

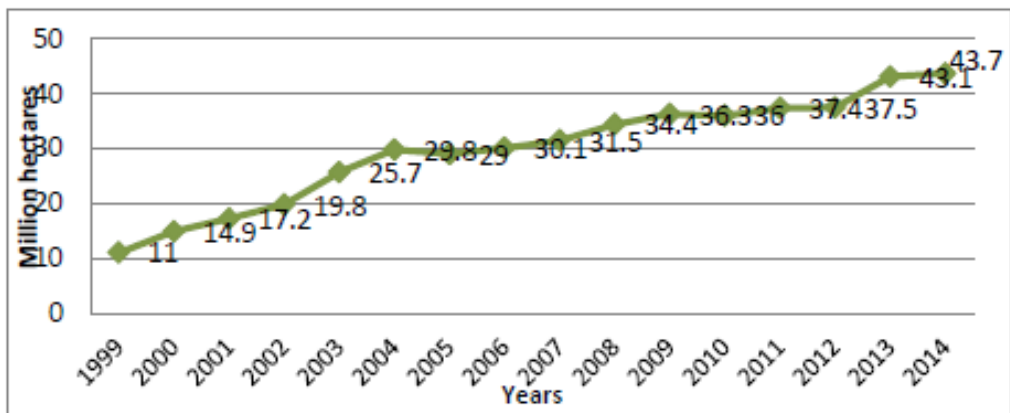
Indicator	World	Top countries
Countries with organic activities	2014: 172 countries	New countries: Kiribati, Puerto Rico, Suriname, United States Virgin Islands
Organic agricultural land	2014: 43,7 milion hectares (1999: 11 miliona hectares)	Australia (17,2 mil. ha, 2013) Argentina (3,1 mil ha) US (2,2 mil. ha, 2011)
Organic share of total agricultural land	2014: 0.99%	Falkland Island (Malvinas) (36,3%) Liechtenstein (30,9%) Austria (19,4%)
Wild collection and further, non-agricultural areas	2014: 37,6 million hectares (2012: 30,4 miliona hectares, 2010: 31,7 million hectares)	Finland (9,1 miliona ha) Zambia (6,8 miliona ha, 2009) India (4 miliona ha)
Producers	2014: 2,3 million producers (2010: 1,6 mil., 2009: 1,8 mil. producers)	India (650.000, 2013) Uganda (190.552) Mexico (169.703, 2013)

Indicator	World	Top countries
Organic market size	2014: 80 billion US dollars (1999: 15,2 billion US dollars)	US (35,9billion US dollars, 27,1 billion euros) Germany (10,5billion US dollars, 7.9 billion euros) France (6,8billion US dollars, 4.8 billion euros)
Per capita consumption	2014: 11 US dollars (14 euros)	Switzerland (221euros) Luxemburg (164euros) Denmark (162 euros)
Number of countries with organic regulations	2015: 87 countries	

Source: FIBL/IFOAM, 2016.

In addition to the agricultural land other areas are also used for organic production. Mostly these are wild collection areas, the area under pastures, beekeeping and aquaculture. They make up more than 37 million ha, so a total area under organic production is nearly 81.2 million ha (agricultural and non-agricultural areas). The growth of organic agricultural land is presented in Graph 2.

Graph 2. Organic agricultural land 1999-2014



Source: FIBL/IFOAM, 2016.

Niggli (2007) states that on the basis of the adopted concept of “naturalness” that was present during the beginning of the organic movement, the pioneers of organic farming mainly define themselves as producers who do not use chemicals in its production. This definition in the negation remained until today, although production methods of organic farming largely rely on the positive correlation between arable land, healthy crops and domestic animals.

The development of organic production in Serbia

According to Kalentić et al (2014) application of organic production method in Serbia started many years before the adoption of legal regulations. Organic production began its development in southern Serbia, around Blaca, in 1989 thanks to the initiative of the business company DenJuro which resulted in the export of first contingent of organic fruit from Serbia in 1990.

The development of the NGO sector of organic production in Serbia started in 1990 by founding of Association Terra's in the municipality of Subotica. This NGO has started its existence as part of the Open University of Subotica, and had representatives from University of Novi Sad. Terra's organization conducted a number of campaigns to promote organic production in accordance with standards of the International Federation of Organic Agriculture Movements (IFOAM). Terra's became a member of this organization in 1992, and in 1997 hosted the IFOAM Conference on Organic Production countries of Central and Eastern Europe. This organization remained the driving development force of organic sector in Serbia, while the formal and informal groups that promote this production began to appear also in other parts of the country. At the time of the Federal Republic of Yugoslavia the first Law on organic production in Serbia was passed. After the establishment of the new government in 2000 foreign investment, as well as customers, projects and donors arrived; this created an opportunity for the advancement of knowledge and export opportunities. Avalon from the Netherlands, SIDA from Sweden and Diaconia from Germany were the first foreign organizations to promote organic production in Serbia through regional projects. In 2003, GIZ supported Terra's organization in establishing cooperation with the German certification organization BCS, thereby laying the groundwork for the first certification body in Serbia.

These international organizations have recognized the potential of organic production in Serbia and facilitate the formation of new associations that are engaged in organic production, primarily at local and regional level. Moreover, several companies began to work on export oriented organic production. In 2004 GIZ has supported first participation of Serbian traders and processing companies at the international fair Biofach in Nuremberg. Together with the Green Network of Vojvodina, Terra's started the development of the local market, which resulted in the realization of first Biofest in Subotica in 2005. In the coming years, with the exception of GIZ and SIPPO from Switzerland, the US Agency for International Development (USAID) and the Ministry of Agriculture, Forestry and Water Management (MAFWM) also supported the participation of Serbian producers and businesspeople at the Biofach fair. In 2006 MAFWM joined the Network for organic production Mediterranean and soon after was followed by an international organic production project, financed by the EU and the various Mediterranean countries.

During 2007 and 2008, donors have continued through various projects to support the development of the organic sector. The Austrian Development Agency (ADA) focused

its activities on regional development of rural areas in Vojvodina and Sandzak, trying to join the small-scale organic production with the community development and the local processing of agricultural raw materials. Swiss Development Corporation (SDC) engaged in a big project to introduce food safety standards, such as HACCP and GlobalGAP. GIZ concentrated on advisory policy, coordination of donors and creation of business associations.

National Association for Organic Production “Serbia Organica” (NASO) was established in 2009 with the aim to unite the participants in the organic sector by stimulating interaction and promoting organic farming and processing. Today NASA gathers about 80% of participants in this sector that are present in other related associations and organizations. A large number of members come from primary production, processing, trade, academic and other institutions.

With the support of MAFWM, in 2011 was established five Centers for the development of organic production (Selenča, Leskovac, Svilajnac, Valjevo and Negotin), and in 2013 the Centre was established in Uzice.

History of production and processing of organic food extends back for more than 20 years. This sector is still poorly organized, although there has been a development of a number of different, locally active associations, organizations, cooperatives and interest groups (Pejanović, 2012). By 2009, the Law on Associations restricted the formation of strong interest groups or associations, it did not allow associations to do business and create capital. Favorable conditions have emerged with the entry into force of the new Law on Associations (“Official Gazette of RS”, no. 51/09), which allowed associations to a certain extent, carried out business activities and create capital reserves. During October and November 2012 there have been amendments to the current Law on Organic Production (“Official Gazette of RS”, no. 33/10) in order to further align with EU regulations. However, the new Law has not been adopted.

Conclusion

When we look at modern organic agriculture in relation to the ideas and activities of the pioneers of this production, we can conclude that many of the initial principles are relevant today. Organic production continues to potentiate the connection with the environment, the health of soil, plants, animals and people, both economically and socially sustainable agricultural production concept. However, organic production has changed and evolved over the decades, following the trends of scientific-technological achievements. As at its beginning nowadays it is also based on the latest achievements in science, which are applicable in practice and are contributing to the fundamental principles on which organic production is based. Niggli (2007) states that the development of organic agriculture in practice and science progressed surprisingly connected and in harmony.

In the beginning of organic production, market premium (in the form of premium prices) for conversion to organic production system did not exist. Due to this, the

motives for conversion were different compared to modern motives. Organic producers from this period have emphasized the animal health, problem of land and costs of chemical protection and land treatment as the main reasons for joining the process of conversion. The sixties have linked the organic movement with a broader movement of environmental protection. Rachel Carson (1962) in her book *Silent Spring* emphasized the danger - existing and expected –of the use of pesticides in agricultural production, which has made organic agriculture especially attractive. In this way, together with the production technology an entire social movement of organic agriculture was developed, which today continues its growth and development.

In Serbia, organic production is developing for about twenty years. In the beginning, producers and non-governmental sector were the initiators of the development. Later this production received the official support of government institutions, which was reflected primarily in the adoption of the Law on organic production and premiums and subsidies granted to producers who are in this system of production.

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ISTORIJSKI RAZVOJ ORGANSKE PROIZVODNJE

Mirela Tomaš-Simin⁶, Danica Glavaš-Trbić⁷

Rezime

Autori u radu razmatraju koncept organske proizvodnje, odnosno, njegove začetak i razvoj. Organska proizvodnja se razvijala u tri faze: faza nastanka (1924-1970), faza razvoja (1970-1990) i faza rasta (nakon 1990). U prvoj fazi organsku proizvodnju su pratili problemi u smislu njenog naučnog priznavanja, prihvatanja od strane proizvođača, članova šire društvene zajednice ali i prihvatanja na nacionalnom nivou. U drugoj fazi dolazi do postepenog širenja ovog sistema proizvodnje, osnivanja nevladinih organizacija, priznavanje i uspostavljanje prvih zakonodavnih okvira i usvajanje organskih praksi od strane sve većeg broja proizvođača. U trećoj fazi organska proizvodnja je prepoznata i priznata širom sveta. Danas Zakoni o organskoj proizvodnji postoje u gotovo svim razvijenim zemljama ali i u velikom delu zemalja u razvoju. Površine pod ovim sistemom se povećavaju, a države zvanično istupaju kao zagovornice organske proizvodnje, pružajući podršku ovom sistemu i u vidu različitih premija i subvencija za proizvođače.

Ključne reči: *organska proizvodnja, nastanak, istorijat, razvoj.*

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Andela Marković², Petar Petrović³, Mirko Mirković⁴

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1 Paper is a part of research within the project no. III 46006 - Sustainable agriculture and rural development in the function of accomplishing strategic objectives of the Republic of Serbia in the Danube region, financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia. Project period: 2011-2014. ***This segment is not obligatory within the paper.***

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Table 5. 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

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ŠABLON: NASLOV RADA (CENTRIRAN, TNR SIZE 12, BOLD, SVA SLOVA VELIKA, MAKSIMALNO DVA REDA)¹

Anđela Marković², Petar Petrović³, Mirko Mirković⁴

Summary

Poželjno je da rezime sadrži do 150 reči, te da sadrži sve bitne činjenice rada, poput cilja rada, korišćene metode, najvažnijih rezultata i osnovnih zaključaka autora.

Tokom pisanja rezimea treba koristiti slova Times New Roman (TNR), veličina fonta (font size) 11, Italic, ravnanje teksta Justify, a tekst rezimea pisati bez proreda (Line Spacing Single), sa razmakom od 6 pt između pasusa, bez uvlačenja prvog reda.

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Key words: *navesti, maksimalno, pet, ključnih, reči.*

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Introduction

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Tabele moraju biti formirane u tekstu rada, a ne preuzete u formi slika iz drugih materijala. Tabele unositi u sam tekst rada i numerisati ih prema redosledu njihovog pojavljivanja. Nazivi tabela moraju biti dati neposredno iznad tabele na koju se odnose. Koristite dole prikazani stil tokom njihovog formatiranja. Naslov tabela pisati sa razmakom 6 pt – iznad/before i 3pt – ispod/after, u fontu TNR, font size 11, ravnanje Justified. Tekst unutar tabela pisati fontom TNR, font size 9. Tekst u zaglavlju tabela boldirati. Izvor i potencijalne napomene pisati sa razmakom 3 pt ispod tabela (before). Izvore i napomene pisati u fontu TNR, font size 10,

ravnanje Justified. Naredni pasus početi na razmaku od 6pt od izvora tabele ili napomene (after). Tokom pisanja rada u originalnom tekstu treba markirati poziv na određenu tabelu (Table 5.). Trudite se da se sve tabele u radu veličinom uklapaju u zadati format strane (Table properties – preferred width – max 97% - alignment: center). Sav tekst u poljima tabele treba unositi u formi (paragraph – spacing: before/after 0pt, line spacing: single). U slučaju da se tabela lomi na narednu stranicu, molimo Vas da prelomljeni deo tabele na narednoj stranici bude propraćen zaglavljem tabele.

Table 5. 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;

Note: Values within the table are calculated without Value Added Tax (VAT)

Grafike, dendrograme, dijagrame, šeme i slike treba unositi u sam tekst rada (ne koristiti opciju Float over text) i numerisati ih prema redosledu njihovog pojavljivanja. Njihovi nazivi se moraju pozicionirati neposredno iznad grafika, dendrograma, dijagrama, šeme ili slike na koju se odnose. Kod navođenja naslova, izvora i napomena koristiti isti stil koji je predhodno prikazan za formiranje tabela. Tokom pisanja rada u originalnom tekstu treba markirati pozive na određeni grafik, dendrogram, dijagram, šemu ili sliku (*Graph 2.*). Svi grafici, dendrogrami, dijagrami, šeme i slike u radu se svojom veličinom moraju uklapati u zadati format strane, te moraju biti centralno postavljeni. Fotografije nisu poželjne u predmetnom radu, a ukoliko se one ne mogu izbeći molimo Vas da koristite optimalnu rezoluciju (preniska rezolucija dovodi do pikselacije i krzavih ivica, dok previsoka samo povećava veličinu fajla bez doprinosa čitljivosti rada).

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