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## ECONOMIC IMPORTANCE OF USE OF PESTICIDES IN WHEAT PRODUCTION<sup>1</sup>

*Adriana Radosavac<sup>2</sup>, Desimir Knežević<sup>3</sup>*

### Summary

*Quality and productivity determined by genotypes and application of scientific farming measure in wheat production. The pesticides are contributing to achieving high yield of wheat which application. The aim of this work is economic analysis of pesticides application in wheat production. For analysis used collected data from 32 wheat producers in rural area of Republic Serbia. The results in included farms in this investigation showed that average area of wheat production was 1.6 ha with achieved average grain yield 3621 kg ha<sup>-1</sup> and average costs 563.15 € per hectare. The average use of pesticides active ingredients was 892.5 g. Wheat producers applied the different amount of pesticides active ingredients: 646 g (72.44%) of herbicides, 231.7 g (25.96%) of fungicides and 14.3 g (1.60%) insecticides. The average plant protection costs by used pesticides were 70.30 euros ha<sup>-1</sup>, which was 12.48% of wheat production. The gain threshold computed was 319.54 kg ha<sup>-1</sup>. For achieving high economic output in wheat production is necessary apply right dose of pesticide, decrease costs of production and continuously provide education of farmers.*

**Key words:** *wheat, economic analysis, pesticides, toxicity, farm*

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### Introduction

Wheat (*Triticum aestivum* L.) is one of the important cereal crops and staple food as well source of proteins for about 70% human population in the world. The weeds, pests, diseases and insects are the major source of crop damage, yield and quality reduction in the world. The economic production of wheat depends from scientific measure of farming which contribute prevention of loses of yield (Knezevic et al., 2015). In wheat

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production the application of pesticides is one of important measure in plant protection of attack of pests and diseases that can cause of yield lose. For production of safe food is very important develop new technology of pesticide application, new pesticides with less hazardous for health (Delcour et al., 2015). Pesticides effects of suppressing pathogens on the plants contribute to the higher yield and quality (Aktar et al., 2009). Behind of use of pesticides, other factors that influence to economic production are genotypes, fertilizer and machines. The control of weeds contributes to prevent losses of yield varied depends of crops from 10% to 50%. The economic impact of insect infestation can be significant which cause serious damage of yield and quality of wheat. The bug (Sunn pest [SP] *Eurygaster* spp.) damaged wheat grain endosperm due to injected proteinase that cause disruption of protein structure and caused reduced flour quality, dough properties low bread volume and texture (Torbica et al., 2007; Dizlek, 2017).

Also, attack of cereal leaf beetles (*Oulema* spp.) cause reduction of assimilation between 10% (attack of the single larva) to 80% (massive attack of larvae) what indicated economic threshold of larva per stem and losses of grain. The intensity of attack of cereal leaf beetles are different depends of season and regions (Tanaskovic et al., 2012). In Serbia, cereal leaf beetles sporadically affected cereals wheat, without significant economic damage. However, in the period 1988-1992, it becomes economically the most important pest in cereals, and up to 28% of cereals were chemical treated. However, during 1992-1998, cereal leaf beetle's populations decreased, and only 2-2.5% of wheat area was sprayed (Stamenković, 2000; Jevtić et al., 2002).

Application of herbicides has economic benefit through yield increasing and decline expenses of labour. For the sustainable rural agriculture is necessary develop technology of crops production with achieving economic profitability, social and economic equity and environmental and food security. In conventional farming, from the period of Green revolution the enormous amount of chemicals were used to protect crop damages due to weed, pests and diseases, control, which connected with environmental pollution as well unsafe food products. However, sustainable agriculture need based by use pesticides with the least toxicity, decreasing of energy expenses and increasing yield and profit (Sexton et al., 2007). Modern handling methods, clean technology, can lead to decline presence of contaminated matter and pest attack to seeds or plants. The very important is choice of right type of pesticides and its application of recommended dose at the right time in prevention of negative effect to production costs, pest resistance to pesticides and ill effect on human and animal health, environment and sustainability of agriculture production (Khan et al., 2010). Another advance of right use of pesticides is suppression and reduction of plant pest and diseases and has key role in increasing agricultural production as well income of farmers due to crop production (Nazarian et al., 2013). In Serbia, pesticides play important role in food security due to limited arable land and requirements of user for improving food security and protecting the environment.

The aim of this investigation was evaluation of economics of pesticide use in wheat production to determine the farm-level economic cost and amount of pesticides used in wheat production for rural development.

## Material and methods

In wheat production in 2015 obtained 2418203 tons, approximately. The wheat production realized on 589922 ha approximately, what is the second large area in production among cereal crops in Serbia (source data of statistical office of government of Republic of Serbia). For our study were included 32 wheat farmers in different location of Serbia. The farm was chosen by simple random sampling method. The obtained data in structured questionnaires submitted to farmers were analyzed for farm size and structure, farmers experience and education for agricultural production, area under wheat production, applied quantity and type of pesticides, data of grain yield. By frequency presented characteristics of farmers. Toxicity of pesticides determined according to classification by WHO (2009). Economic cost of pesticides per hectare computed by formula:  $EC = Q \times P$

*Economic cost = Quantity of active ingredient of pesticide (g ha<sup>-1</sup>) x Price of pesticide (l €<sup>-1</sup>)*

The gain threshold can be calculated with the following formula:

$$\text{Gain threshold (kg ha}^{-1}\text{)} = \frac{\text{Costs of used pesticides (EUR ha}^{-1}\text{)}}{\text{Average price of wheat (EUR kg}^{-1}\text{)}}$$

## Results

The analysis of agricultural properties showed variation of size and structure household, production of agricultural plant species, type of technology of cultivation. Mainly individual farmers are produce for their own consumption and surplus for the market.

In analyzed individual farms, the average size of cultivated area was 5.8 ha of which 27.8% (1.6 ha) used for wheat production (Table 1).

In wheat production, the farmers expressed interest in optimization of technology growing practices in the aim to increase grain yield and make profit.

**Table 1.** Size of farms and its characteristics

Farm characteristics	Average (ha)	Area under cultivar production	Average (ha)
Farm size - ownership	5.8	Cultivate area	5.8
Irrigated area	-	Wheat area	1.6
Non-irrigated area	5.8	Other crops area production	4.2

Source: Work of author

In this investigation age of the farmers was 56.2 years, which in average 30.6 years were producers of wheat. In included family were 3.8 people, which in average had 8.2 years of education. In average 2.3 people per family are working on crop production (Table 2).

**Table 2.** Farmer's family characteristics

Personal characteristics	Year	Structure of family	Average
Age of farmers	56.2	Number of people in family	3.8
Experience of farmers	30.6	People in family, working on crop production	2.3
Education of farmers	8.2		

Source: Work of author

Wheat is produced in dry land farming. Pesticides used as integral part of the process for reducing losses of yield caused by weeds, diseases insect pests. The intensive infestation of weeds, particularly are in the early stage of crop development, what require use of herbicides for suppressing weed effect on grain yield i.e. providing economic benefit (Křen et al., 2017).

The knowledge and experience of how to use of pesticides, farmers learn on different way. Farmers for decision of pesticide application have numerous sources as well internet information, information from extension services advices, input dealers and pesticide labels. Mainly, farmers watched special agricultural programs 87.50% (28 farmers) while for needs of agriculture used internet about 18.75% (six farmers). About 65.6% (21) of farmers participated at some special meeting for wheat production, while 25% (eight farmers) participate at the meeting for plant protection. Instruction on the labels for pesticide application read 81.25% of producers (Table 3).

**Table 3.** Sources of farmers' taking knowledge (specialization)

Source of knowledge	Number of farmers	%
Watching Special agricultural program	28	87.50
Internet data	6	18.75
Participation at the special meeting	21	65.62
Participate at the meeting for plant protection	8	25.00
Instruction on pesticide package	26	81.25

Source: Work of author

The information on the label is very important source of knowledge for the farmers how to safe use and apply pesticides (Waichman et al., 2007).

No segment of the population is completely protected against exposure to pesticides. The high-risk groups exposed to pesticides include production workers, formulators, sprayers, loaders and agricultural workers. Especially, the high-risk groups are people that are in contact with pesticides. Exposure to pesticides linked to negative effect of immune function, liver, intelligence, cardiovascular a respiratory function, reproductive abnormality cancer (Sarwar, 2015). Among them, the farmers belong to the risk group and need take measure of preservation of pesticides toxicity. For the safety is very important method of pesticide application, use of protective equipment and cloths. In this study, the 71.87% of farmers applied pesticides by mechanical spraying and 15.62% of farmers applied manually. Among them about 46.87% of producers, used protective equipment and 25.00% used protective clothing. Most of farmers 87.50% who are prefer use more safe techniques to protect environment during agricultural production (Table 4).

**Table 4.** Method of application of pesticide

Type of equipment and behavior of farmers	Number of farmers	%
Mechanical spraying	23	71.87
Manual application of pesticides	5	15.62
Use protective equipment	15	46.87
Use protective clothing	8	25.00
Use of safe techniques for environmental protection	28	87.5

Source: Work of author

Plant protection problems such as pests, weeds and diseases are the major factors decreasing wheat production. These pests, weeds and diseases can cause economical losses in wheat crops. The controlling of pests, weeds and diseases can have carried out as mechanical control or by hand. Chemicals which used by adequate techniques are efficient to suppress wheat pests, weeds and disease. About 75.00% of farmers use pesticides against weed, 53.12% against diseases and 18.75% against the insect pests (Table 5).

**Table 5.** Farmers control of wheat crops by pesticide application

Biotic stress factor	n	%
Weed seed control	24	75.00
Diseases control	17	53.12
Pest control	6	18.75

Source: Work of author

In wheat production applied pesticides which contributed to the growth of crop productivity as well food supply. The pesticides used by the farmers in wheat production presented in table 6. Pesticides were grouped by their toxicity classification and their chemical family (WHO, 2009).

**Table 6.** Pesticides used in wheat production in research area

Type of pesticides	Trade name of pesticides	Active pesticide ingredient	Toxicity class	No. of farmers	%
Herbicides	Metmark WP	Metsulfuron methyl	U	18	56.25
Herbicides	Stockstar	Tribenuron	U	2	6.25
Herbicides	Lancelot 450 WG	Aminopyralid + Florasulam	U	1	3.12
Herbicides	Duofen plus	Thiophanate-methyl	U	3	9.38
Fungicides	Zantra	Tebuconazole	II	6	18.75
Fungicides	Akord	Tebuconazole	II	11	34.38
Insecticides	Decis Expert 2.5EC	Deltamethrin	II	4	12.5
Insecticides	Tors	Bifenthrin	II	1	3.12
Insecticides	Nurelle D	Chlorpyrifos methyl + Cypermethrin	II +III	1	3.12

*Pesticides level of hazardous-classification (WHO, 2009): Ia = Extremely hazardous; Ib = Highly hazardous; II = Moderately hazardous; III = slightly hazardous; U = Unlikely to present acute hazard in normal use; FM = Fumigant, not classified; O = Obsolete as pesticide, not classified.*

Source: Work of author

In our study wheat farmers, the nine different types of pesticides were used. Among 32 farmers the four types of herbicides: used in wheat production. Most of the farmers used herbicide Metmark WP which active ingredient is Metsulfuron methyl (56.25%). Some of wheat farmers used active herbicides ingredient Thiophanate-methyl (9.38%), Tribenuron (6.25%), Aminopyralid + Florasulam (3.12%). According to WHO classification the toxicity of all applied herbicides classified in U group (Table 6). Among the 32 wheat farmers the type of fungicide commonly used by the farmers was identified as Tebuconazole, which classified as moderately hazardous (II group of toxicity). The two trade makes (Zantra and Acord) of fungicides were used by 53.13% of the farmers as protection from fungal diseases in wheat production (Table 6).

The insecticides commonly used by the farmers were identified as Deltamethrin (12.5 %), Bifenthrin (3.12%) and Chlorpyrifos methyl + Cypermethrin used by 3.12 % of the farmers (table 6).

Results of this research show that, the average usage of pesticides is 892.5 g per hectare as an active ingredient in the wheat production. The average amount of active ingredient of herbicides usages per hectare was 646.5 g, of fungicides 231.7 g and insecticides 14.3 g.

Data of study in villages of in West Mediterranean region of Turkey, showed that average usage of pesticides were 1103.5 g per hectare as an active ingredient in the wheat production. Precisely, average amount per hectare of active ingredient 48.0 g of insecticides, 146.0 g of fungicides and 908.9 g of herbicides were used (Yilmaz et al., 2016). In addition, they reported that in another similar study in 2001 year were established that average usage per hectare as active ingredient of pesticides variate depends of region. Therefore, active ingredient of herbicides was 595.90 g (in Polatli, Ankara, Turkey) while 887.3 g (in Konya, Turkey), and active ingredient of fungicides was 78.3 g (in Polatli, Ankara, Turkey) and 40.60 g (in Konya, Turkey).

The differences of used amount of pesticides affected by weather, season, pest pressure, price of pesticides and technical equipment. Therefore, in Serbia cereal leaf beetle sprayed 28% of wheat area in period 1988-1992, while only 2-2.5% of wheat area was sprayed in period 1992-1998 (Stamenkovic, 2000).

In Serbia wheat grown on about six hundred thousand hectares per annum with total production over the 2.0 million tons. According to official report in Serbia realized the average wheat grain yield 3400 kg ha<sup>-1</sup> with expenses for application of pesticides in average 92.0 € ha<sup>-1</sup>. The amount of pesticides use in wheat production in Serbia is not significant different in comparison to European Union countries. However, in Serbia, EU and all over the world there are concerns about negative influences of pesticides on human health, food safety and environment in some regions.

**Table 7.** Pesticides used in wheat production in research area

Type of pesticides	Used amount of active ingredient of pesticides		Recommended amount (g; ml) ha <sup>-1</sup>	Pesticide + Pesticide application cost	
	(g; ml) ha <sup>-1</sup>	%		(€ ha <sup>-1</sup> )	%
Herbicides	646.5	72.44	600	10.10	14.37
Fungicides	231.7	25.96	250	30.80	43.81
Insecticides	14.3	1.60	10	29.40	41.82
Total amount	892.5	100.00	860	70.30	100.00

Source: Work of author

In wheat production in this investigation the highest share of used pesticides had herbicides 72.44% of total weight of active ingredients, then fungicides 25.96% and insecticides 1.60%. The economic costs were 70.30 € per hectare. The share in this price was 43.81%, of fungicides, 41.82% of insecticides and 14.37% of herbicides (Table 7).

By analysis were established that farmers use herbicides and insecticides more than the recommended, fungicides less than the recommended dosages extension services advices, instruction of pesticide labels. The application of inadequate amounts of pesticides (increased or decreased) can lead to inefficient, crop and economic losses and environmental hazards.

In this investigation the average costs of wheat production were established to be 563.15 euros per hectare, with share of pesticides cost 70.3 € per hectare, with portion of 12.48% of average production cost. The average yield included farms in this study, was 3621.0 kg ha<sup>-1</sup>. In this study were computed that cost of pesticide per kilogram amounted to 0.019 € and the cost of production per kilogram 0.155 € (Table 8).

**Table 8.** Cost of wheat protection and production in research area

Average grain yield kg ha <sup>-1</sup>	Average costs of applied pesticides (€ ha <sup>-1</sup> )	Proportion of pesticides cost and grain yield (€ kg <sup>-1</sup> )	Average production costs (€ ha <sup>-1</sup> )	Average costs production of wheat (€ kg <sup>-1</sup> )	Proportion of plant protection costs in average production costs (%)
3621	70.3	0.019	563.15	0.155	12.48

Source: Work of author

For decision of use pesticides, the producers conduct estimation of level of pest infestation. On the base of gain threshold can estimate does pesticide treatment economically justified. Gain thresholds are a simple way to determine the relationship between the pesticide and pesticide application costs and the value of the harvested crop. In this study in wheat production the average pesticide costs was 70.30 € and price of harvested wheat grain was 0.22 €. The gain threshold computed was 319.54 kg ha<sup>-1</sup> and it was 8.82% of wheat production per hectare. This mean that increase of grain yield has to be 319.54 kg ha<sup>-1</sup> for economically justified pesticide application.

The improvement of scientific farming measure can contribute profitability of wheat production which can estimate on the base of yield value (Pretty and Bharucha, 2014).

### **Benefits of use of pesticides**

The need of use of pesticides is to ensure and improve the yield and quality of products and industrial processes in function to provide safe food and high standard of health in society. Numerous pesticides provide protection against dangerous pest and diseases or their vectors. Some pesticides are used to preserve the perishability of the product during storage i.e., to protect the time usability of goods, food, products. Without use of targeted pesticides, many products (coating, sealants) cannot be use for consumers, but products enable placing on market without or with low content of pesticides to protect environment. The use of pesticides requires assessment of the economic feasibility and safety for human health and environment, social consciousness and International cooperation and competitiveness (Sexton et al., 2007). In recent time, political measured and demands of numerous professional and public associations directed to carefully examine impact of pesticides on environmental and human health as well pesticide benefits, risks and their application in accordance with hygienic standards.

The very important is knowledge about benefits and risks of pesticides and their rational application with the motto “as much as necessary, and as little as possible.” This way of application giving to benefits of pesticides through achieve optimal results and long-term efficacy of the treatment, reducing potential risks to health and environment, well targeted manner uses in intended fields. In European Union developed action for sustainable use of pesticides for plant protection products in the aim of harmonized social environmental and economic impact (Directive 2009/128/EC). The ecological basis needs to be put in balanced proportion to socio-economic aspects. For sustainable use of pesticides is necessary conduct education for safety data of pesticide application, poisoning incidents with provable health damage, control of tools and machine and best practice of pesticides application, monitoring of risk and benefits of appropriate use of pesticides, rules of disposal of pesticides products after their use phase and of their packaging.

### **Crop production and protection from the losses**

The significant attention in agriculture has production of crops which are major in food of human population. Among them the three crops (wheat, rice, maize) spread in production on about 40% of total cropland and are important essential resources of proteins, carbohydrates, lipids, vitamins, microelements in human nutrition all over the world. Also, soybean, cotton, sunflower, barley, rye, oat, sorghum take significant place in agricultural production for the food of human and animals. The aims of agricultural production are increasing yield and quality of crops and reducing losses (Knezevic et al., 2017). Improved crop management based on selection of high yielding genotypes, improved soil fertility by application of fertilizers, irrigation, application pesticide contributed to increasing of yield in agricultural crops (Paunovic et al. 2009; Kondic et al., 2012). However, in diverse agro-ecosystems the crop production conducted under pressure of biotic and abiotic limited factors (pests, insects, rodents, drought, frost, high and low temperature air, etc.) which cause reduced yield and quality.

Among crops the loss potential of pests worldwide varied depends of crops and in barley can achieve below 50% in sugar beet and cotton more than 80%, On the beginning of 21<sup>st</sup> century losses in wheat, barley, soybean, sugar beet and cotton are estimated at 26-30%, while for maize-35%, potatoes-39% and rice-40%, respectively (Oerke and Dehne, 2004).

The very important for wheat producers is how to recognize the economic ceiling i.e. the maximum yields that make economic sense, given by the relative prices of input and outputs, risk and other factors (Sumberg 2012). Similar in study of Loyce et al. (2012) found that agronomic optimum could differ depends to the soil-weather conditions and crop management practices but also by the degree of risk. The greater potential of costs optimization is in crop protection compared to costs of crop nutrition.

Pesticides have been a major contributor to the growth of crop productivity and food supply (Sexton et al., 2007). The weeds had the highest loss potential (32%) while the less effect have animal pests (18%) and pathogens (15%). In addition, due to viruses estimated serious problems in potatoes and sugar beets in some areas in average 6-7% and in other crops about 1-3% (Oerke and Dehne, 2004).

The measures of protection showed the highest efficacy at 53-68% and lower between 43-50% of protection in food crops. The protection depends from agro-ecological region and highest coefficient of efficacy in wheat was 28%. The control of weed can conduct by mechanical removal and herbicides and efficiency of weed control is higher (68%) than control of animal pests (39%) and diseases (32%) by using of pesticides (Oerke and Dehne, 2004). The increasing of quantity of crop production and food is possible through increasing productivity per unit area. This is possible on the base intensification of pest control in various crops. When the pest problem is managed at the proper time it improves the crop productivity. Therefore, use of pesticide of appropriate dose and time contributes to improving the crop productivity and quality (Khan et al., 2010). Using of pesticides than the recommended dose can decline protection efficacy. Considering the task of preventing negative effects on the environment the prevention of losses in crop production can achieve by integrated pest management.

### **Conclusion**

Application of pesticides can prevent losses caused by pests in agricultural production and can improve quantity and quality of the produce. In this study showed that average area of wheat production was 1.6 hectare with average yield 3621.0 kg ha<sup>-1</sup> and with average cost of wheat production was 563.15€. In average use of pesticides active ingredient was 892.5 g ha<sup>-1</sup> with costs 70.30 € what is 12.48% of wheat production costs. In analysis of use of pesticides in wheat production in the individual farms in Serbia showed that the gain threshold was 319.54 kg ha<sup>-1</sup> what is 8.80% of wheat production per hectare, what is economically justified.

In study was found that the farmers applied herbicides and insecticides more than recommended amount and insecticides less than recommended amount, what leads

losses of yield, increase of costs, economic loss and negative effect on environment. This require intensive education of the farmers related to pesticide application (methodology, legislation, equipment) to achieve the maximum benefits at minimum human, environmental and economic costs.

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## EKONOMSKI ZNAČAJ UPOTREBE PESTICIDA U PROIZVODNJI PŠENICE

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### Rezime

*Genotip i tehnologija gajenja determinišu kvalitet i produktivnost pšenice. Izbor genotipa pšenice sa visokim potencijalom za prinose i kvalitet i visoku adaptivnost na biotičke i abiotičke faktore stresa, doprinosi ekonomskoj proizvodnji kroz smanjenje upotrebe hemikalija i đubriva u toku gajenja. Takođe, vrlo je važno optimizovati dozu pesticida za primenu za zaštitu biljaka od štetočina i bolesti. Cilj ovog rada je ekonomska analiza primene pesticida u proizvodnji pšenice. Za analizu su korišćeni podaci prikupljeni od 32 proizvođača pšenice u ruralnom području Republike Srbije. Rezultati ovih istraživanja kod ispitivanih poljoprivrednika su pokazali da je prosečna površina za proizvodnju pšenice bila 1,6 hektara sa ostvarenim prosečnim prinosom zrna od 3621,0 kg ha<sup>-1</sup> i prosečnim troškovima 563,15 evra po hektaru. Uporebljena prosečna količina aktivne materije pesticida iznosila je 892,5 g. Primenjene su različite količine aktivne materije korišćenih pesticida. Ova analiza je pokazala da su proizvođači pšenice koristili 646 g (72,44%) hemijski aktivne materije herbicida, 231,7 g (25,96%) hemijski aktivne materije fungicida i 14,3 g (1,60%) hemijski aktivne materije insekticida. Na bazi primenjene doze pesticida prosečni troškovi za zaštitu bilja su izračunati i iznosili su 70,30 evra po hektaru, što je 12,48% troškova proizvodnje pšenice. Prag dobiti upotrebe pesticida je povećanje prinosa od 319,54 kg ha<sup>-1</sup>. Pesticidi doprinose postizanju visokih prinosa pšenice čija primena treba da se optimizuje u cilju smanjenja rizika pri njihovom korišćenju, zaštite životne sredine, obezbeđenja hrane i održivosti ruralnog razvoja. Ovo se može postići kroz programe edukacije poljoprivrednika, razvoj novih tehnologija primene pesticida, kao i ponudom i kreiranjem novih manje toksičnih pesticida.*

**Ključne reči:** pšenica, ekonomska analiza, pesticidi, toksičnost, farma

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## DOES CLIMATE CHANGE AFFECT PRICE OF VEGETABLES: EVIDENCE FROM TIGRAI, NORTHERN MOST ETHIOPIA

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### Abstract

*Although the agriculture economic sector in Ethiopia yet feeds enormous people, it's negatively impacted by climate change thereby contributed to the lower production and productivity. The research dealt therefore on the price effect of climate change on vegetable using time series data collected from 2009 to 2015 in Tigrai, Ethiopia. A univariate econometric analysis and finite distributed lag model were employed. In the descriptive part, due to climate change; tomato the vital vegetable consumed both in urban and rural population has recorded the highest inflation (211 percent) from 2009 to 2015 alone as compared to potato and onion. Whereas, potato and onion vegetables were rose up more than 152 and 154 percent consecutively on the same period. The average temperature increase of 1°C over the past seven years caused the price of tomato vegetable to increase more than threefold (310 percent) in 2015. Likewise, in the year 2010 as the temperature increased by 1°C, the average price of tomato increased close to 155 percent, ceteris paribus. Even the price of tomato vegetables raised 118 percent in 2011 as compared to 2009. In 2013 and 2014, a 1°C rise in the average temperature cause close to 58 percent and 23 percent increase in the price of tomato, ceteris paribus. Moreover, the price increment of potato and onion vegetables is high. So as to get healthy vegetables often at fair prices both by the poor and rich in both the rural and urban population, applying outstanding climate adaptive strategies is recommendable.*

**Key words:** *Climate Change, Temperature, Time series, Tigrai, Vegetables Price.*

**JEL:** *Q01, Q18, Q51, Q57.*

### Introduction

Globally there are more than one point five billion people who are farming on less than two hectares of land (FAO *et al.*, 2011). Around 80 percent of food consumed in some

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Less Developing Countries (LDCs), especially, in Asia and Sub-Saharan Africa (SSA) that derived from smallholder agriculture. However, mostly the smallholders in LDCs immerse to price fluctuations repeatedly. In fact, the price ups and downs might be seasonal and expected sometimes. Large staple food consumption price soar impacts negatively on poor households more as compared to the rich ones since the have-nots spend just about three-quarters of their income on food consumption (Ben, Mehroosh, 2013).

Consumption of staple foods such as wheat, rice, maize, milk powder, oilseeds, vegetable prices were doubled and more in nominal terms in 2007 production year as compared to the lower food prices history in the last 25 to 30 years (Donald, 2008; Maros, Will, 2008; Demeke *et al.*, 2009; WFP, 2011; WB, 2011; Kofi, 2012; Ben, Mehroosh, 2013). WFP and FAO (2011) stated that approximately one point zero two billion people of the World were undernourished since 2009 alone. Globally the fastest staple food consumption increments in the past years were caused social unrest or civil conflicts over 40 countries (WB, 2011). Though there are different debates on the causes of food price inflation by scholars, export bans by top wheat and rice producer countries, shifting food grains to biofuels, higher energy prices, a depreciating dollar, and increase food crops demand were the mostly agreed reasons among other factors (Donald, 2008). Moreover, global crop price and oilseed supplies deficiency due to poor harvests, change the eating habits of emerging economies because of income increase of the people were also the causes for consumption food price hikes (Tom, Joe, 2008). On the other hand, an amalgamation of both demand and supply side factors plus government policy decisions are the main causes for the staple foods of the world up (Kofi, 2012). The growing population and income in emerging economies and DCs is forecasted to cause a higher demand for food consumption in the coming decades. Unlike to the current seven billion population size of the globe, in the coming 2050 the globe's population has projected to reach nine billion people. Thus, this rapid population growth projection is predicted to bring among 70 percent to 100 percent rise in the demand of food consumption as compared to the 2007/08 world economic crisis (FAO *et al.*, 2011). Even in the coming 2019, some scientific projections of intellects revealed that there will be an increment in the prices of staple consumer items, vegetables, and livestock outputs (Demeke *et al.*, 2009; FAO, 2011). Therefore, this breaking news told the World that boosting the growth of food consumer items parallel to the present and coming demand of billion people for food is important; otherwise will outbreak food consumption hikes that lead at least to economic inequality and different social unrest in the globe continuously.

Ethiopia in the last years (2004/5 to 2007) for example, has had registered around 18 percent price rise in food and 16 percent for non-food (Jeni, Josef, 2007). The Ethiopian economy has registered extraordinary macroeconomic performance with the GDP of 11 percent for the last one decade (2004 to 2014) in the country's history (UNDP, 2014). This remarkable macroeconomic achievement is two-fold of what is in SSA and even makes Ethiopia one of the fastest emerging economies in the globe. There is no consensus on why Ethiopia experienced such dramatic food price rises yet. The Ethiopian inflation is primarily related to agriculture and food in the economy plus global

food crisis. Unlike other food consumption items, vegetable crops due to their nature of perishability and seasonality forecasting their price soars are more sensitive (Kamau, 2014). Vegetables are important outputs in improving the livelihood of the people in giving a balanced diet thereby improving the health status of the people plus serves as a cash crop in generating income to households. Though Ethiopia has a comparative advantage in horticulture agriculture in many ways, fruit processing industries are scarce and are in importing vegetables and fruits (EIA, 2012). Moreover, the national inflation on foodstuffs has increased by 13.9 percent and non-food items increased by 9.7 percent in the year 2015 as compared to the inflation rate in July 2014 (Muluken, 2015).

The Intergovernmental Panel on Climate Change (IPCC) institution revealed that by 2030 close to 0.9 to 1.1°C mean annual temperature increase will be recorded in Ethiopia; however, the range would expect to rise from 2.7 to 3.4°C in 2080 in the country opposite to the 0.37°C (EEA, 2008). *Countries in the Southern world are not the main originators of climate change; however, they may suffer the greatest share of damage in the form of declining agricultural outputs and greater frequency of extreme weather events (IMF, WB, 2011). Increased use of food crops for biofuel production would lead to more than 1.7 million undernourished children in Africa and Asia in 2050 unless the policy for is reconsidered.* Parallel to the Sustainable Development Goals (SDGs) planned to achieve by 2030 which favors the vulnerable population, requires climate adaptive interventions in various countries, otherwise negligible (FAO, 2016). Climate variability has played a top role in causing the low level of agricultural outputs even in Tigrai and Ethiopia (CEEPA, WB, 2006; Gebreegziabher *et al.*, 2014; Bezabih, Mokenen, 2014; Kassa Teka *et al.*, 2012; Gebrekiros *et al.*, 2016).

Climate change impacts negatively more on the \_agriculture-based economies like Ethiopia. Whereas, there have been scanty researches done which investigate tomato, onion, and potato vegetable inflation using time series data in terms of the dynamic causal effect of prices and temperature in the Northern most part of Ethiopia. The general objective of the study was therefore to estimate the price effect of climate change on vegetable crops using time series data in Tigrai regional state of Ethiopia. More to the point examine the causal relationship between temperature and price of vegetables and the effect of own price lag on its current value.

### **Related Literature Review**

Khan and Senhadji (2001) using a cross-country panel data have been produced the threshold level inflation for both DCs and LDCs concluded that a threshold level ranging from 11 to 12 percent for LDCs is fine for stabilized macroeconomic objectives and sustainable growth. However, above the specified inflation threshold, it can hurt the economic growth of LDCs. In the Ethiopian case, a research was done by Emerta (2010) using data 1971-2010 contended that a threshold of single digit inflation, especially 8 to 10 percent is convenient for having stabilized macro economy and economic growth (optimal inflation target policy).

The Agriculture sector in Ethiopia which represents 40.2 percent of GDP grew by 5.4 percent, the industry also covers 14 percent of GDP and expanded by above 21.2 percent, and lastly the services economic sector that holds 46.2 percent of GDP rose by 11.9 percent in the last eleven successful years. Although many factors might be hindered not to keep the pace of this fastest economic growth in the coming years in Ethiopia, the economy is forecasted to keep growing due to the underway multi-sectoral transformation and the developmental state political commitment to achieve development (Admit *et al.*, 2015). Vegetables are those plants which are consumed in relatively small quantities as a side-dish or a relish with the staple food (as cited in Seid, Yeshe, 2013). Either in the Ethiopian context or world widely, vegetables are useful at least for the following reasons. Thus, it can serve as a source of vitamins, minerals, roughage, neutralizing the acid substances, medicinal value, generating income, and food and social security. Agriculture economic sector is usually prone to climate change and worked under high risk and unpredictability condition. Furthermore, crop pricing also affects negatively the production because the prices of agricultural producers are price takers that have been determined by the interplay of demand and supply (H.Erdal *et al.*, 2009). Vegetables, the especially potato is the high yielding crop and fourth food source in the world next to rice, wheat, and corn. Potato is nutritious and easy to digest grown in many environments and consumed in various parts of the globe (Aklilu *et al.*, 2015; H.Erdal *et al.*, 2009).

Even if Ethiopia has a comparative advantage in a number of horticultural commodities because of favorable climate, proximity to European and Middle Eastern markets and cheap labor: the production of horticultural crops is much less developed than the production of food grains in the country (EIA, 2012). The total area covered by fruits and vegetables is about 12,576 hectares in 2011. Of the total land area under cultivation in the country during the same year, the area under fruits and vegetables is less than one percent (which is 0.11percent), implies that very small as compared to food crops. However, fruit processing industries are scarce. The 'Merti' processing factory is the only plant producing fruit juice for the local market. This investment gap witnessed that there is an investment motive to investors in Ethiopia (EIA, 2012). Today, large numbers of fruit juices are imported into the country because of high demand in fruit juice in homeland market. For example tomato; 951, 920 Kg with a total cost of 9,022,271 Birr in 2009; 1,509,352 Kg at a cost of 20, 671, 644 Birr; and 1,558, 240Kg with a total cost of 22,283,409 Birr tomato fruit juice has been imported to Ethiopia from abroad for juice consumption in the last 2009 to 2011. Due to lack of sufficient supply of fruit juice raw materials like tomato, orange, grape, apple, mixtures, and others at home, the country is in loosing huge hard currency. The demand for these fruit juice import items specified above is on average in an increasing direction. That demand supply mismatch also causes price up.

In the production year of Meher 2012/13, the productivity of tomato and onion vegetables per hectare of land by small farms revealed that under potential. Although there is an ample potential for the productivity of tomato and been proven that 159 to 463 quintal per hectare is the potential capacity of small farms, but in reality, small farms

are in producing it at around 90 quintals per hectare. Similarly, the small farms are actually producing onion vegetable at around 102 quintals per hectare but below what is 350 to 400 quintals per hectare the maximum productivity potential (EIA, 2012). There are kinds of incentives devised by the Ethiopian government under regulation No.84/2003 including customs duty exemption, income tax exemption, and loss carries forward to attract investors in establishing fruit juice vegetables and other new enterprises. Furthermore, there are favorable and diverse climate, irrigable land, and geographic location or export market opportunities are found; however, shortage of quality high yielding varieties, disease and insect pests, shortage of skilled personnel, poor post-harvest handling, and weak production and market chain are the challenges to be solved soon so as to increase production and productivity of fruit juice vegetables (Endale, 2013). Like many other vegetables, onion is also a valuable vegetable highly consumed worldwide. China is the first largest onion producer country in the globe. Next, to China, India is the second largest onion vegetable producer with over 15million tones produce in 2010 to 2011 production year.

Honrao (2014) made a research on vegetables like onion and tomato in India found that price volatility estimated as the predictable variance is found to have increased after 2007 production year. The agricultural output was also adversely affected by deficient rainfall in the first two months of the monsoon period of June to September. By and large, the high rate of overall inflation and particularly onion inflation caused by weather change witnessed during 2011 and 2013 production years. An increase in the price of fruits and vegetables relative to less healthy foods could reduce consumers' incentives to purchase fruits and vegetables and result in less healthy diets (Fred, Hayden, 2008).

### **Agricultural production and consequences of climate change**

A research done in 50 selected districts in diversified agro ecological zones of Ethiopia using the Ricardian model from 1000 sample farmers revealed as temperature increases, the agricultural yield reduces close to 998 US\$ in winter and 178 US\$ summer seasons in net revenue per hectare(CEEPA, WB, 2006). *“Of the world's production of fruit and vegetables, 42% is grown in China and India – more than one billion tonnes out of the total of 2.4 billion tonnes. China alone grows 38% of the vegetables and 19% of the fruit produced globally (tonnes measure). China produces 44% of the world's apple crop and 50% of the world's peaches and nectarines. India's largest volume fruit crop is bananas (27 million tonnes). This is 28% of global production in the year 2009(cited in Kamau, 2014).”* Confidently, Ethiopian vegetable production ranging from gardening smallholder farming to commercial state and private farms that are largely produced include pepper, kale (Ethiopian cabbage), onion, tomato, pepper, chilies, carrot, garlic and cabbages as the major ones. However, the overall production yet is lower than what can possibly produce given its potential (Bezabih *et al.*, 2014). Unlike other food consumption items, vegetable crops due to their nature of perish-ability and seasonality forecasting price soars is more sensitive (Kamau, 2014). Temperature has a large effect on the development of vegetables.

*“Climate change is a key concern to Ethiopia in our time and need to be tackled in a state of emergency. It has brought an escalating burden to already existing environmental concerns of the country including deforestation, serious soil erosion and loss of top soil and land degradation which in turn have adversely impacted agricultural productivity (Ayana et al., 2011).” “Over the coming decades, the global frequency and severity of drought is likely to increase as a result of climate change. Regional projections suggest that south-eastern Australia will be adversely affected by changes in rainfall patterns, as well as by rising temperatures, which increase the severity of drought. By 2070 there may be 40% more months of drought in eastern Australia, and conditions will be worse in a high-emissions scenario (John, 2007).” By 2080-2100, African agricultural output is projected to reduce 15 to 30% due to the negative impact of climate change (IMF, WB, 2011). Rain fed agriculture is the usual custom, a good rainy season means good crop production, certify food security, and a healthy macro economy in Ethiopia. However, failure of rains and occurrence of natural disasters such as floods and droughts could lead to crop failure, food insecurity, famine, loss of property and life, mass migration and negative national economic growth (WB, 2005).*

*“In the short term, unfavorable weather conditions, coupled with high world prices for commodities such as grains, will increase input costs for a wide range of fresh and processed foods. The largest price rises are likely for fruit and vegetables and we can also expect significant price increases for products that rely on grains as an input (either directly or indirectly as a feedstock) such as bread, cereals and snack foods, dairy, eggs and meat in the future. For example, the Australian Egg Corporation has warned that the price of eggs will rise by 50 to 60 cents a dozen (or at least 10%) (cited in John, 2007).” In the last 20 years many rural households perceived as the production of crop and livestock, and land productivity was declined due to the extremely unpredictable and erratic rainfall in Tigrai (Kassa Teka et al., 2012). Climate change in the past 32 years in Alamata, Tigrai negatively impacted sorghum crop production. However, the negative impact of temperature was larger than rainfall (Gebrekiros et al., 2016). For developing and initial growth of plants, a temperature of 22-24°C is the best for potato-vegetable (as cited in Seid, Yeshe, 2013). Contrary to what the world has had experienced in the 20<sup>th</sup> century with an average surface temperature increase of around 0.6 °C and 15 cm to 20 cm rise in sea level, in the 21<sup>st</sup> century some 85 years later the global average temperature will show another plus of 1.1 °C percent to 5.4 °C percent. However, these 85 years, later increase of global warming depends on how much human being will pollute the environment. Climate change has various direct or indirect negative impacts on a human being. Of which, negatively affect health and well-being of plants, pasture, rangeland, and livestock production. Globally, the horticultural crops (vegetables) such as tomatoes, onions, and fruits are more sensitive to the Earth’s climate change unlike to other grains (Seid, Yeshe, 2013).*

A research that has been done under the title “adaptation to climate change in the agriculture sector in the semi-arid region of Nigeria” an average mean temperature and rainfall data were collected from 1938 to 2007; the author (Peter, 2010) contended that in between 1938 to 1972 the temperature was 28.24°C and the rainfall amounted to

937mm. However, in the year 1973 to 2007 temperature has been increased to 29.14°C and rainfall reduced to 758mm in Nigeria. As a result, in the coming 85years Nigeria will become one member of 2.5 to 4.5°C (medium to high temperature) because of the negative effects of climate change. This increase in temperature seeks climate adaptation to curve its negative impacts. At least it will affect directly the prices of agricultural products. A research conducted under a title ‘the development and evaluation of onion and cabbage vegetables wholesale price forecasting model’ in Ethiopia using 2004 to 2014 data witnessed that onion price shows a constant price rise in 2012 and 2013 (Sohyun *et al.*, 2015). Thus, a total of 21.3 percent supply of onion output reduction was registered in these two years that has been caused by weather inconvenience to the product. As a result, causes the price of onion to increase sharply up plus motivates producers to produce more lately. Among the many factors which contribute for the consumption food inflation of the globe to increase are: Climate and weather change, increases in oil and energy prices, biofuels, and increase in global food demand (Net Comm, 2014). Stock and Watson (2000) have been introduced the distribution lag model in the context of estimating the dynamic causal effects on orange juice prices and Florida weather using monthly collected time series data of 1950 to 2000, concluded that as the weather gets cold the price of juice gets higher over time.

*Vegetable crops are very important due to their higher yield potential, higher return and high nutritional value and suitability for small land holding farmers. Vegetables provide proteins, minerals and vitamins required for human nutrition ((Anum *et al.*, 2015).*

### **Materials and Methods**

Description of the study area: Tigray is the Northern most of Ethiopia’s federal states located at 12012’ and 14032’ North latitude and between 36030’ and 40030’ East longitude. Mekelle city the northern star is the capital of the region. The state of Tigray shares common borders with Eritrea in the north, the regional state of Afar in the east, the regional state of Amhara in the south, and the republic of Sudan in the west with more than 5million populations. Although the region has a number of legends about its history, the well-known and documented history of Tigray begins in the eighth century B.C. (Yeha), and with the founding of the Aksumite Kingdom around 300 B.C.

Data type and source of data: The data of this research is taken from secondary sources. It was collected from two famous sources: first, from the National Meteorology Agency of Ethiopia Mekelle directorate branch; second, from Tigray Agricultural Marketing Promotion Agency (TAMPA) starting from 2009 to 2015.

Model Specification and Estimation: Time series data is nothing but it’s a data collected for a single entity at multiple points in time. By and large, time series regression models are relevant mainly for at least two well mentioned functions. Thus, to estimate the dynamic causal effects and forecasting future situation based on the lag values we have estimated (Stock, Watson, 2000). In the economics literature, the distributed lag models are highly useful for the consumer, producer, and government behaviors economic units that had been implemented by different researchers (Richard Roll, 1984;

Hamilton, 1994; Stock, Watson, 2000; Wooldridge, 2009). Especially, distributed lag models are essential not only in estimating the previous year (lag value) but also useful in estimating current year value of defining a variable.

In a nutshell, the dynamic causal effect of the paper is modeled as here below:

$$P_{iwt} = \beta_0 + \beta_1 P_{iwt-1} + \beta_2 P_{iwt-2} + \beta_3 P_{iwt-3} + \beta_4 P_{iwt-4} + \beta_5 P_{iwt-5} + \beta_6 P_{iwt-6} + \alpha_1 T_{iwt-1} + \alpha_2 T_{iwt-2} + \alpha_3 T_{iwt-3} + \alpha_4 T_{iwt-4} + \alpha_5 T_{iwt-5} + \alpha_6 T_{iwt-6} + \varepsilon_t \dots \dots (1)$$

Where,  $P_t$  = the current prices of tomato, onion, and potato in the specified woreda<sup>3</sup>

$i$  = number of vegetable items (tomato, onion, and potato) used in the estimation  
 $w$  = number of woreda       $\beta_0$  = constant       $t$  = time measured in years

$\beta_1$  = the immediate effect of a unit change in  $P_{iwt}$  on  $P_t$  holding constant past  $P_t$  (one period lag dynamic multiplier effect) short       $\beta_2$  = two year dynamic multiplier, ceteris paribus  $P_t, P_{t-1}, P_{t-2}, P_{t-3} \dots$

$\beta_3$  = three year dynamic multiplier effect of change in  $P_{t-2}$  on  $P_{iwt}$ , ceteris paribus  $P_t, P_{t-1}, P_{t-3}$ ,       $\beta_4$  = four year dynamic multiplier effect of change in  $P_{t-3}$  on  $P_{iwt}$ , ceteris paribus

$\beta_6$  = six year dynamic multiplier effect of change in  $P_{t-5}$  on  $P_{iwt}$ , ceteris paribus

$T$  = the average monthly temperature of every woreda       $\alpha_1$  = one year lag dynamic multiplier effect of temperature on  $P_{iwt}$ , ceteris paribus       $\alpha_2$  = two year lag dynamic multiplier effect of temperature on  $P_{iwt}$ , ceteris paribus       $\alpha_6$  = six year lag dynamic multiplier effect of temperature on  $P_{iwt}$ , ceteris paribus

$\varepsilon_t$  = includes both measurement error and the effect of omitted determinants of  $P_{iwt}$ , or stochastic term or/ and error term. A priori expectation is stated as follows: first, represent the coefficients to estimate the short term effects of variation in temperature on the dependent variable (price of vegetables) that is  $\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0$ , and  $\beta_6 > 0$ . And the long run expectation is also stated as follows:  $\alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0, \alpha_5 > 0$ , and  $\alpha_6$ .

Gujarati (2004) those parameters  $\alpha, \alpha_0, \alpha_1, \alpha_2 \dots \alpha_6$  in distributed lag models can possibly be estimated using classical least square method. However, Gujarati, 2001 criticizes certain points concerning to estimates in distributed lag models. These are: first there is a difficulty to know a pre-information in the model regarding to how long the lag period will be; second, when a data set that can estimate the lag period is not set up, degree of freedom is continuously decreased, and the last important challenge is that variables decided as defining variables are in a multiple linear relationships. Consequently, in resolving the aforementioned failures Koyck has been developed an econometric model, since 1954. Lags in an explanatory variable affect the explained variable to some extent and the weight of these lags decrease, the model is reduced and thus made to estimate the regression equation. Koyck (1954) assumed that in an infinitely distributed lag model for example, all ' $\beta$ 's had the same signs and geometrically reduced so as to obtain the reduced model. Similarly, in determining the order of an auto regression (AR) balancing the marginal benefit of including more lags against the marginal cost of additional estimation uncertainty is essential. If the order of an estimated AR is too low, show and as we were omitted valuable information contained in

3 Woreda in this context is an administrative structure of governance next to that of zone level.

the more distant lagged values. Conversely, if the order of an estimated AR is too high, revealed that as it was estimated more coefficients than necessary, which in turn creates additional estimation error into our forecast trends (Stock, Watson, 2000). When using information criterion to estimate the lag lengths two important things has to be considered. Thus: first, as is the case for the AR, all the candidate models must be estimated over the same sample that is the number of observations used to estimate the model. Time (T) must be equal for all models. Second, when there are multiple predictors, this approach is computationally demanding because it requires computing many combinations of the lag parameters (many different models). Lastly, the paper made different econometric tests such as Stationarity /random walk/ unit root, Break, Serial Correlation/ Autocorrelation, and Co-integration so as to assure the robustness of the results.

### Empirical Results and Data Analysis

Descriptive Analysis: There was a high variation of vegetable prices every year in tomato, potato, and onion items due to climate change over the past seven years, *ceteris paribus*. Tomato the vital vegetable consumed both in urban and rural population has recorded the highest inflation (211 percent) as compared to potato and onion. As it can be observed in table 4.1, the price of tomato increased from 4.5 Birr in the past seven years to 14 Birr. Whereas, potato and onion vegetables were rose up more than 152 and 154 percent consecutively. These highest vegetable inflation records were witnessed the highest climate vulnerability hence vegetables are sensitive to temperature, *ceteris paribus*.

**Table 1.** Consumable Vegetable Inflation in Tigray (2009 to 2015).

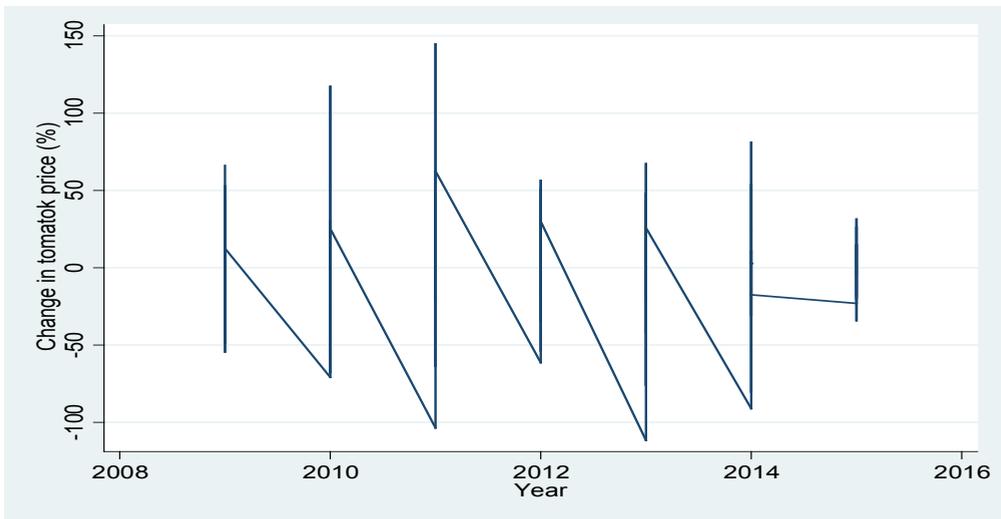
Vegetables	Budget Year	Price in (Birr)	Price in (US\$)	% increase	Unit
	2009	4.2	0.2	-	
price of potato	2010	4.56	0.21	9	KG
	2011	4.64	0.22	17.5	KG
	2012	5.42	0.25	17.35	KG
	2013	6.2	0.3	14	KG
	2014	7	0.32	11	KG
	2015	10.6	0.5	51	KG
	2009	5.34	0.24	-	KG
	2010	5.8	0.26	8	KG
price of onion	2011	6.2	0.28	7.7	KG
	2012	9.5	0.42	53	KG
	2013	10.5	0.48	11	KG
	2014	11.8	0.54	12.4	KG
	2015	13.54	0.62	15	KG
	2009	4.5	0.2	-	KG

Vegetables	Budget Year	Price in (Birr)	Price in (US\$)	% increase	Unit
price of tomato	2010	5	0.23	11	KG
	2011	6	0.27	20	KG
	2012	8.25	0.38	38	KG
	2013	9.5	0.43	15	KG
	2014	12	0.55	26	KG
	2015	14	0.64	17	KG

Source: Computed from the Collected Secondary Data, 2016.

Note: A Kilogram (KG) the unit of measurement in our case is equivalent to one kilogram. Similarly, the current official money exchange rate in Ethiopia November 2016 was taken (1US\$=22 Birr).

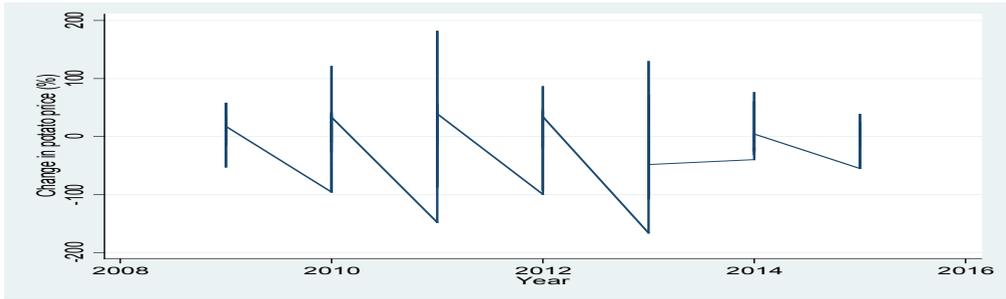
**Figure 1.** Direct Trends of Price of Vegetables and Temperature in Tigrai (2009-15)  
 Figure4.1. Direct trends of price of tomato vegetables



Source: Computed from the collected data at hand, 2016.

The direct trends of the price of tomato show a higher increase over the past seven years as compared to the climate change increased by lower than 1 degree centigrade.

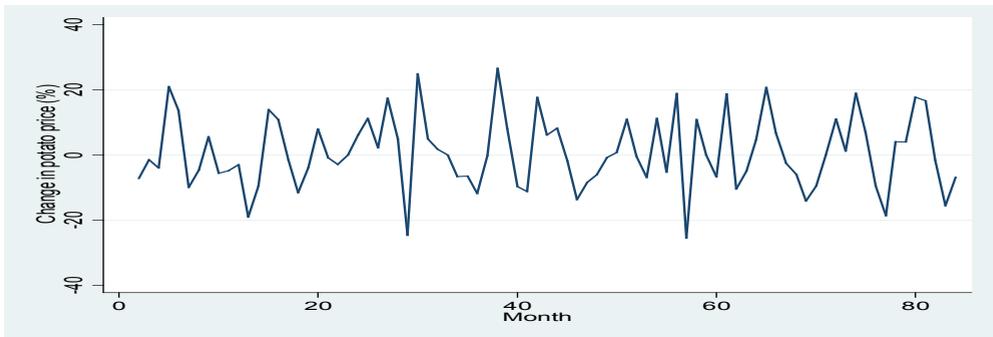
**Figure 2.** Direct trends of price of potato vegetables



Source: Computed from the collected data at hand, 2016.

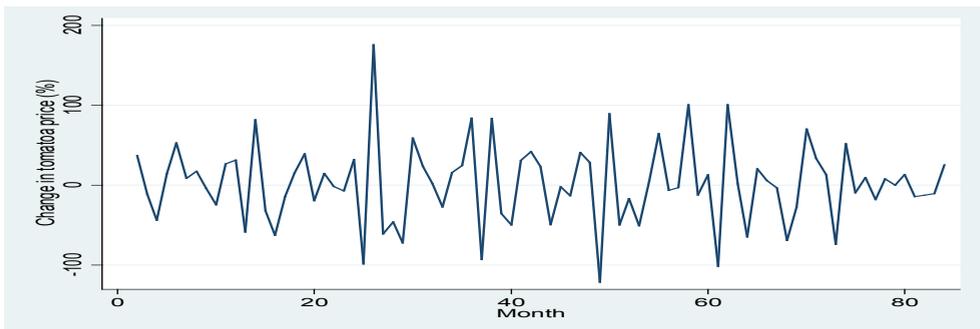
Similarly, the direct trend of the price of potato and onion show a higher increase over the past seven years as compared to the climate change increased by lower than 1 °C.

**Figure 3.** Percentage Change of Price of Vegetables and Temperature (2009 to 2015)  
Percentage change (the indirect) trends of price of potato vegetables



Source: Computed from the collected data at hand, 2016.

**Figure 4.** Percentage change (the indirect) trends of price of tomato vegetables



Source: Computed from the collected data at hand, 2016.

The percentage change and two-way change which is better measurement as compared to that of the direct trends revealed that there were price ups and downs in vegetable price similar to the direct trends, but somehow smoother. In fact, in the 25<sup>th</sup> month (January 2011) and 45<sup>th</sup> month (June 2012), the vegetable price (more of potato) was inflated in line with temperature. The prices of potato show in the last seven years almost an increasing trend every month with a slight change. Opposite to what is said, in the 24<sup>th</sup> month (September 2010); 35<sup>th</sup> month (August 2011); 55<sup>th</sup> month (April 2013); 75<sup>th</sup> month (November 2015); above 80<sup>th</sup> month (June 2015) the price of vegetables have fallen down dramatically.

### Lag Length Selection Process

After using Final prediction error (FPE), Akaike information criterion (AIC), Schwarz’s Bayesian information criterion (SBIC) and Hannan-Quinni information criterion (HQIC) to select the appropriate lag length in our study; we select the best lag length at which the values of information criterions are minimal. The result is therefore reported on the tables 4.2 to 4.4.

**Table 2.** Price of potato in Tigrai (2009 to 2015)

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-319.53				-13.04	-8.24	-8.24	-8.36
1	-237.88	-163	4	-0.00	1.78	6.39*	6.39*	6.46*
2	-234.29	7.19	4	0.126	1.89	6.36	6.36	6.58
3	-232.52	3.59	4	0.474	1.94	6.40	6.40	6.70
4	-225.14	14.55	4	0.005	1.70	6.41	6.41	6.78
5	-218.62	13.52	4	0.011	1.69	6.45	6.45	6.84
6	-213.61	10.09*	4	0.040	1.61*	6.44	6.44	6.95

Source: Computed from the collected data at hand, 2016.

The maximum selection based on the AIC criterion in the price of potato is lag six. Thus, all the lags beyond lag six are irrelevant to explain the causality of the dependent variable.

**Table 3.** Price of onion in Tigrai (2009 to 2015)

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-388.9				77.3	10.10	10.04	10.09
1	-333.5	110.7	4	0.00	20.7	8.70	8.75	8.83
2	-321.2	24.7	4	0.00	16.7	8.50	8.62*	8.75*
3	-316.4	9.6	4	0.05	16.4	8.47	8.64	8.87
4	-314.9	2.8	4	0.06	17.5	8.53	8.75	9.07
5	-308.8	12.3	4	0.02	16.6	8.5	8.74	9.11
6	-303.3	10.9*	4	0.03	16.1*	8.45*	8.76	9.26

Source: Computed from the collected data at hand, 2016.

Similarly, based on the same criterion we select lag six for the price of onion in Table 4.3. All the lags beyond lag six do not have explaining power.

**Table 4.** Price of tomato in Tigrai (2009 to 2015)

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-403.62	-	-	-	112.7	10.5	10.45	10.49
1	-370.18	66.9	4	0.00	52.9	9.7	9.48	9.90
2	-356.98	26.3	4	0.00	41.8	9.4	9.52*	9.75*
3	-354.83	4.3	4	0.35	43.8	9.5	9.68	9.85
4	-352.23	5.1	4	0.28	45.7	9.45	9.71	10.03
5	-341.42	21.63*	4	0.00	38.4*	9.31*	9.58	9.98
6	-337.93	7.12	4	0.13	38.9	9.34	9.68	10.19

Source: Computed from the collected data at hand, 2016.

We select the favorable lag length lag five; hence the AIC criterion is minimal.

**Table 5.** Augmented Dickey-Fuller Test for unit root on the price of potato

Augmented Dickey-Fuller test for unit root Number of obs = 77

-----Interpolated Dickey-Fuller -----

Test	1% Critical	5% Critical	10% Critical
Statistic	Value	Value	Value

Z(t) -5.006 -3.542 -2.908 -2.589

MacKinnon approximate p-value for Z (t) = 0.0000

D.dprpotato	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]
L1.	2.079	.404	-5.01	0.000 ***	-2.803522 -1.206057
LD.	.9172	.348	2.63	0.010 **	.2219196 1.612305
L2D.	.612	.298	2.27	0.026 **	.0812326 1.245792
L3D.	.417	.234	1.74	0.085 *	-.0590551 .8845106
L4D.	.155	.177	0.86	0.392	-.2019922 .5088638
L5D.	.072	.115	0.65	0.516	-.160065 .31569
_cons	1.63	1.276	1.30	0.198	-.8883144 4.21352

Note: \*\*\*, \*\* and\* are statistically significant at 1%, 5% and 10% respectively

Source: Computed from the collected data at hand, 2016.

According to the ADF result, the Test Statistic value (5.006) is higher than that of these three critical values ranging from 2.58 to 3.42. As a result, the lags were non-stationary at level (normal regression), but become stationary after first difference (with change (d)) equals to what is in Table 4.5 difference of the variable. One degree centigrade (°C) temperature increase caused the price of potato to increase almost by double. Similarly, in the year 2010 (LD) as the temperature increased by 1°C in Tigrai in the previous year, the average price of potato vegetable increased close to 92 percent, *ceteris paribus*. Moreover, the price of potato increased by around 66 percent in 2011(L2D) because of 1°C increase in the average temperature in Tigrai. In the L3D (2012) a 1°C rise in the

average temperature caused 41 percent rise in the price of potato. The research output is consistent and valid with the previous researches (Sohyun *et al.*, 2015; Anum *et al.*, 2015; Kamau 2014; Honrao, 2014; Bezabih *et al.*, 2014; Gebreegziabher *et al.*, 2014; Bezabih, Mekonnen, 2014; Dick *et al.*, 2013; Emerta, 2013; John, 2007; CEEPA, WB, 2006).

**Table 6.** Augmented Dickey-Fuller Test for unit root on price of onion

Augmented Dickey-Fuller test for unit root Number of obs = 74

----- Interpolated Dickey-Fuller -----

Test 1% Critical 5% Critical 10% Critical  
Statistic Value Value Value

Z (t) -5.21 -3.613 -2.76 -2.53

MacKinnon approximate p-value for Z (t) = 0.000

D.dpronion	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]
L1.	2.227	.438	-5.15	0.000***	-3.083496 -1.36165
LD.	.994	.385	2.60	0.012**	.2289833 1.753126
L2D.	.961	.323	2.91	0.005***	.3037943 1.633308
L3D.	.738	.282	2.56	0.013**	.1616442 1.305153
L4D.	.517	.235	2.20	0.031**	.0474421 .9908538
L5D.	.392	.187	2.11	0.039**	.0213952 .7686692
L6D	.167	.121	1.39	0.170	-.0732893 .4080241
_cons	2.34	3.076	0.77	0.445	-3.690435 8.312723

Source: Computed from the collected data at hand, 2016.

Similar to the price of potato above, in (2009) as an example (L1); one degree-centi- grade (°C) temperature increase caused the price of onion to increase almost more than double (220 percent) in the northernmost part of Ethiopia. Moreover, in the year 2010 (LD) as the temperature increased by 1°C in Tigrai, the average price of onion vegetables were increased close to 100 percent, *ceteris paribus*. The price of onion tuber vegetables increased by around 96 percent in 2011(L2D) because of 1°C increase in the average temperature in Tigrai holding other effects constant.

**Table 7.** Augmented Dickey-Fuller Test for unit root on the price of tomato

Augmented Dickey-Fuller test for unit root    Number of obs = 76

	----- Interpolated Dickey-Fuller -----		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.152	-3.544	-2.909

MacKinnon approximate p-value for Z(t) = 0.0000

	D.dponion	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]	
	L1.	3.19	.51	-5.51	0.000 ***	-4.242314	-1.98504
	LD.	1.54	.51	3.03	.003 ***	.532707	2.58250
	L2D.	1.18	.49	2.61	0.011 **	.2803417	2.09294
	L3D.	.98	.38	2.41	0.019 **	.1591325	1.68776
	L4D.	.71	.26	2.59	0.012 **	.1758298	1.36558
	L5D.	.54	.23	2.81	0.006 ***	.1702975	1.00191
	L6D.	.28	.14	2.01	0.048 **	.0016207	.467538
	_cons	4.05	5.84	0.69	0.493	-7.685399	15.7907
Note: ***, ** and* are statistically significant at 1%, 5% and 10% respectively							

Source: Computed from the collected data at hand, 2016.

The price of tomato in (2009) that is (L1); a single degree centigrade (°C) temperature increase in the previous year caused the price of tomato vegetable in Tigrai to increase almost more than threefold (310percent). Likewise, in the year 2010 (LD) as the temperature increased by 1°C in Tigrai, the average price of tomato vegetables was increased close to 155 percent, *ceteris paribus*. Even the price of tomato vegetables increased by approximately to 118 percent in 2011(L2D) because of 1°C increase in the average temperature in Tigrai holding other effects constant (Gebrekiros *et al.*, 2016; Anum *et al.*, 2015; Aklilu *et al.*, 2015; Emerta, 2013; John, 2007). Lastly, in the L5D (2013) and L6D (2014) only, a 1°C rise in the average temperature in the previous year in Tigrai was caused close to 58 percent and 23 percent increase in the price of tomato, *ceteris paribus*. As it can be inferred from the mentioned tables above, the price increase is higher in the tomato vegetables because of the average temperature increase by 1°C in Tigrai (2009 to 2015), unlike that of potato and onion.

### Co-integration Test

This test refers to the fact that two or more series share a stochastic trend. After we made a statistic test, therefore, found the variables are co-integrated. That mean price of vegetables has direct relationship with the average temperature increase by 1°C increase in Tigrai in the last seven years. Hence, the test statistic in the table 4.4 below witnessed that with a larger value as compared to that of the 5 percent critical value.

**Table 8.** The result of Co-integrated test

dfuller e, lags(5) ADF test for unit root Number of obs = 78				
Interpolated Dickey-Fuller				10% Critical Value
Test	Statistic	1% Critical Value	5% Critical Value	
Z(t)	-3.135	-3.537	-2.905	-2.588
MacKinnon approximate p-value for Z(t) = 0.0240				
Source: Computed from the collected data at hand, 2016.				

Similarly, the regression output witnessed that there is no serial correlation problem test.

### Conclusion and Recommendation

The research is motivated to find out a new way in the price effect of climate change on the average price inflation of vegetables using time series data collected every month from 2009 to 2015 in Tigray, Ethiopia. A univariate econometric analysis and finite distributed lag model were implemented in defining the variables and the outcome. Due to climate change in Tigray, tomato the vital vegetable consumed both in urban and rural population has recorded the highest inflation (211 percent) from 2009 to 2015 as compared to potato and onion. Whereas, potato and onion vegetables were rose up more than 152 and 154 percent consecutively. More to the point, the price of tomato in (2009), and a single degree centigrade temperature increase caused the price of tomato vegetables to increase almost more than threefold (310 percent) in 2015. In 2010, when the temperature increases close to 1°C, the average prices of tomato vegetables were increased 155 percent, *ceteris paribus*. Even the price of tomato vegetables were increased by around 118 percent in 2011 because of 1°C increase in the average temperature in Tigray holding other effects into account. Lastly, in 2013 and 2014, 1°C increase in the average temperature in Tigray were caused close to 58 percent and 23 percent rise in the price of tomato alone, *ceteris paribus*. As it can be inferred, the price increase is higher in the tomato vegetables because of the average temperature increase by 1°C in Tigray (2009 to 2015) than that of onion and potato. Although the average prices of potato and onion increment were not equal to the increment in tomato, but showed near to the tomato vegetables price rise over the past seven years. In a nutshell, applying different econometric tests confirmed us that there were high vegetable price ups and downs every year parallel to the average temperature increment in Tigray (2009 to 2015) though the degree of increment varied overtime thereby resulted in low agricultural outputs (Anum *et al.*, 2015; Aklilu *et al.*, 2015; Weldesilassie *et al.*, 2015; Kamau, 2014; Honrao, 2014; Bezabih *et al.*, 2014; Gebreegziabher *et al.*, 2014; Bezabih, Mekonnen, 2014; CEEPA, WB, 2006). The research recommended that so as to get many healthy advantages in feeding vegetables often at an affordable price by many of us, implementing due climate adaptive strategies is decisive in taking best experiences from the renewable energy innovator countries and produce surplus agricultural outputs including vegetables thereby reduce consumption price hike.

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## MULTI ATTRIBUTE ASSESSMENT APPROACH IN VEGETABLE PRODUCTION

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### Summary

*Two types of economic effectiveness and two types of economic efficiency, as well as three types of indicators as nutritional quality criteria were used in this paper for ranking certain winter lettuce growing technologies. Four certain types of growing technologies of winter lettuce in greenhouses were ranked by two multi-attribute decision making methods. Results of ranking for both methods, SAW and TOPSIS are shown. Alternatives were ranked by three different scenarios with different weight coefficients. The type of growing technology with combination of mulching + agro textile is the best ranked one according both methods and all scenarios. The SAW method showed more sensitivity on weight coefficients changes than TOPSIS.*

**Key words:** multi-attribute ranking, SAW, TOPSIS, vegetable production, method

**JEL:** Q12, Q16

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## Introduction

The lettuce falls in the group yellow- green vegetable and is particularly significant in the nutrition due to its rich mineral- vitamin contents, especially during the winter period when there is no sufficient fresh vegetable on the market.

Anyhow, the winter production of lettuce is attributed by insufficient light but also usage of high quantities of nitrogen mineral manures which results in accumulation of the pestilent nitrate in the lettuce leaves. Accumulation of nitrate largely depends on the fertilizer (especially nitrogen) and climate conditions (Cometi et al., 2011; Proietti et al., 2004; Lazic et al., 2002). Besides nitrates, ascorbic acid concentration is also considered an important quality indicator in lettuces which is also influenced by both abiotic and biotic parameters (Cometti et al., 2011; Llorach et al., 2008). Vitamin C plays multiple roles in the human organism because it increases the organisms resistance to viruses and bacterial infections including allergies (Padayatty et al., 2003).

On the other side, the early fresh vegetable is quite expensive which makes it the most economical vegetable production which provides with planned harvest during the scarce offer on the market. Lettuce is the most popular vegetable according to the highest consumption rate and economic importance throughout the world (Coelho et al., 2005).

Considering the importance of lettuce in nutrition and its economic justification, it is highly important to apply the corresponding special agro-technical measures in the production of this type. Manufacturing techniques affect growth rate, total yield, earlier yield and yield quality components (El-Shinawy and Gawish, 2006; El-Behairy et al., 2001).

By respecting many economic criteria as well as criteria of nutrition quality in the process of ranking various production technologies, a problem of multi-criteria decisioning is formed. In solving problems of this type, the most applicable methods are MADM. Numerous (multi-criteria decision making) MCDM methods have been created and utilized over the last several decades (Velasquez and Hester, 2013).

The methods of multiple attributive decisions is used in a numerous researches in the field of agriculture and similar fields. The problem spectrum in agriculture where the MADM could be applied is large. SAW method is used for a selection of strategy adaptation in SMEs (Domeova et al., 2006). Authors used 14 products upon three criterias whereas Matejcek and Brozova (2011) applied four types MADM for a selection of the optimal structure of vegetable production. Total of 9 various structures of production are used, 12 criteria and 4 MADM methods (AHP, ORESTE, TOPSIS, WSM). Eventually, the authors come to a compromise solution which took the first ranking in applying the three methods (AHP, TOPSIS, WSM), whereas under fourth method (ORESTE) the variant was placed second. In the literature, there are researches with combined methods „hard“ and „soft“ computing in the process of planning the vegetable production. Matejcek and Brozova (2012) used two types of mathematical model for multi-objective planning: multi-objective linear programming and multiple attribute analysis of variants. In first research stage they used multi-objective simplex algorithm with nine variables, twenty three constraints and

three criteria. In the second stage, for the process of choosing compromised variants, four multiple attribute analysis methods were used (AHP, ORESTE, TOPSIS, WSM). The combining multi-criteria decision-making methods can provide a whole new approach to decision analysis (Velasquez and Hester, 2013). SAW and Topsis methods, in combination with CP are applied for ranking a tractor (Blagojevic, et al., 2012). Within the paper, a final matrix is created, where the three methods are cited to be used as criteria. SAW is one of the most popular and most used MADM methods in certain research (Ginevicius, 2004, 2008, Ustinovicus, 2004, Vico at al., 2017).

### **Material and Methods**

Raw data from the experimental greenhouse at the Faculty of Agriculture, University of East Sarajevo were used for ranking four different types of growing technology of winter lettuce. For this research, data from one experiment with three genotypes and four types of technology were used (for more information about this trial see Govedarica-Lucic et al., 2014). During the experiment, data was carefully collected in terms of: mechanization and labour force use, seed, fertilizers, rest of operating supplies, yield. For this research profit calculations were created for each one of the four certain technologies. Four certain growing technologies for production of winter lettuce for genotype SANTORO RZ were used as different alterantives. The trial included four variants of soil covering: control - planting on bare soil - A1, mulching before planting with PE - black foil - A2, agro textile - covering plants after planting with agro textile (17 g) - A3, a combination of mulching + agro textile – A4. Seven different criteria were used for this research (Table 1). Two groups of criteria were used: economic indicators and nutritional quality indicators. Four economic indicators were involved: C1. revenue as the difference between total income and total costs of production (except costs of labour force); C2. profit as difference between total income and total cost of production; C3. profitability as ratio between total income/total costs; C4. labour productivity as ratio between total ammount of products / total ammount of used labour hours. Three nutritional idnicators were used: C5. contents of vitamin C (mg/100 g FW); C6. contents of nitrate (g/kg FW); C7. contents of total nitrogen (%). The alternatives were ranked through two MADM method: SAW and TOPSIS.

### **Results and Discussion**

In general, every problem of multi-criteria analyses can be solved based upon three approaches: 1. problem in ranking- with intention to rank the group of alternatives 2. problem due to selection of one alternative- only one alternative is chosen from the group – „the best“ 3. problem due to selection of many alternatives – a sub-group fom the group of alternatives is chosen. According to this approach, the number of alternatives could be determined in advance, but some conditions can also be set for each separate alternative to accomplish in order to be chosen. In this research, the approach according to which all the alternatives are ranked for application of the two MADM methods: SAW and TOPSIS is chosen.

### The SAW method

The SAW is one of the simplest, most widely used multi-criteria evaluation method and the most popular MADM method (Polednikova, 2014). This method requires from the decision maker to allocate weight coefficients upon the applied criteria. SAW method is particularly beneficial when all the criteria are numeric values, like the financial indicators. SAW method consists of few main steps. The general form of SAW method is:

$$R = \begin{matrix} & C_1 & C_2 & \dots & C_m \\ & w_1 & w_1 & \dots & w_m \\ A_1 & x_{11} & x_{12} & \dots & x_{1m} \\ A_2 & x_{21} & x_{22} & \dots & x_{2m} \\ \dots & \dots & \dots & \dots & \dots \\ A_n & x_{n1} & x_{n2} & \dots & x_{nm} \end{matrix}$$

where:

- $A_n$  – alternatives (certain types of growing technologies)
- $C_n$  – criteria (seven economic and nutrient quality indicators)
- $w_m$  – weight coefficients for criteria
- $x_{ij}$  – original values

The normalization of criteria is made as following:

For criteria which are maximized:  $r_{ij} = \frac{x_{ij} - x_j^{**}}{x_j^* - x_j^{**}}$

For criteria which are minimized:  $r_{ij} = \frac{x_j^* - x_{ij}}{x_j^* - x_j^{**}}$

where  $x_j^*$  is the best value of chosen criteria for all alternatives and  $x_j^{**}$  is the worst value.

In the next step normalized matrix is multiplied by the vector of weight coefficients:

$$\begin{bmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \dots & \dots & \dots & \dots \\ r_{n1} & r_{n2} & \dots & r_{nm} \end{bmatrix} * \begin{bmatrix} w_1 \\ w_2 \\ \dots \\ w_m \end{bmatrix}$$

and the final value is calculated through:

$$S_i = \sum_{j=1}^m w_j r_{ij}$$

The best alternative is of the biggest value.

### TOPSIS method

The TOPSIS method ranks the alternatives according to their distances from the ideal and the negative ideal solution. This method was first developed by Hwang and Yoon (Hwang and Yoon, 1981). Matejcek and Brozova (2011) present four steps within TOPSIS algorithm (according Hwang & Yoon, 1981). The steps are: 1. „the ideal solution is formed as a composite of the best performance values exhibited (in the decision matrix) by any alternative for each attribute. The negative-ideal solution is the composite of the worst performance values. 2. Proximity to each of variants to ideal and negative ideal solution is measured in the Euclidean sense (e.g., square root of the sum of the squared distances along each axis in the “attribute space”), with optional weighting of each attribute. 3. Relative closeness of variants to the ideal solution is defined as the ratio of distance from negative ideal solution and sum of distance from ideal and distance from negative-ideal solution. 4. Selection of the best variant is based on the highest relative closeness.“

The procedure of solving problems through multi-criteria ranking by applying the TOPSIS method via six steps are given in Opricovic and Tzeng (2004):

1. „Calculate the normalized decision matrix.

$$r_{ij} = f_{ij} / \sqrt{\sum_{j=1}^J f_{ij}^2}$$

where:  $r_{ij}$  – normalized values;  $j=1, \dots, J$ ;  $i=1 \dots, n$

2. Calculate the weighted normalized decision matrix.  $v_{ij} = w_i r_{ij}$

where  $v_{ij}$  weighted normalized values;  $w_i$  is weight of the  $i$ th attribute.  $j=1, \dots, J$ ;  $i=1 \dots, n$ .

3. Determine the ideal and negative-ideal solutions.

$$A^* = \{v_1^*, \dots, v_n^*\} = \left\{ \left( \max_j v_{ij} \mid i \in I' \right), \left( \min_j v_{ij} \mid i \in I'' \right) \right\}$$

$$A^- = \{v_1^-, \dots, v_n^-\} = \left\{ \left( \min_j v_{ij} \mid i \in I' \right), \left( \max_j v_{ij} \mid i \in I'' \right) \right\}$$

Where  $I'$  is associated with benefit criteria, and  $I''$  is associated with cost criteria.

4. Through  $n$ -dimensional Euclidean distance calculate the separation of each alternative from the ideal solution:

$$D_j^* = \sqrt{\sum_{i=1}^n (v_{ij} - v_j^*)^2}, \quad j = 1, \dots, J$$

The separation from the negative ideal solution is given as

$$D_j^- = \sqrt{\sum_{i=1}^n (v_{ij} - v_j^-)^2}, \quad j = 1, \dots, J$$

5. Calculate the relative closeness to the ideal solution. The relative closeness of the alternative  $a_j$  with respect to  $A^*$  is defined as

$$C_j^* = \frac{D_j^-}{(D_j^* + D_j^-)}, \quad j = 1, \dots, J$$

6. Rank the preference order.“

### Ranking alternatives

For ranking certain grow technologies SAW and TOPSIS MADM methods were used. Four alternatives and seven criteria were used. The characteristics of criteria are shown in Table 1. Five criteria should be maximized and two criteria should be minimized. All criteria are quantitative values.

**Table 1.** Specification of criteria

Criteria	Unit	Criteria group	to be max	to be min
C1	BAM/kg	Economical	+	
C2	BAM/kg	Economical	+	
C3	n/a	Economical	+	
C4	n/a	Economical	+	
C5	mg/100 g FW	Quality	+	
C6	g/kg FW	Quality		+
C7	%	Quality		+

Source: Work of author

Two economic criteria are absolute values representing effectiveness (revenue and profit), while other two criteria are relative values representing economic efficiency in vegetable production (labour productivity and profitability).

**Table 2.** The raw data for certain alternatives

Alternative	C1 (BAM/kg)	C2 (BAM/kg)	C3	C4	C5 (mg/100 g FW)	C6 (g/kg FW)	C7 (%)
A1	1,80	1,15	1,63	3,90	18,65	2196,33	3,85
A2	1,86	1,37	1,84	5,09	18,45	2412,83	3,95
A3	1,88	1,43	1,91	5,53	27,03	2526,24	4,07
A4	2,12	1,75	2,39	6,76	26,79	2519,63	3,99

Source: Work of author

Certain alternatives show differences between values within some criteria. For example, alternative A4 is the best according to the economic criteria, but the worst according C5. Alternative A1 is the worst according to all economic criteria, but it is the best according all nutritional quality criteria.

For unique ranking some MADM methods are needed to be used. Within this research we chose the two most frequently used methods: SAW and TOPSIS.

Before making the calculation, the weight coefficients must be defined.

**Table 3.** Weight coefficients for certain models

Model	Economic criteria					Nutritional quality criteria			
	C1	C2	C3	C4	Total for group	C5	C6	C7	Total for group
S1	0,125	0,125	0,125	0,125	0,500	0,167	0,167	0,167	0,500
S2	0,167	0,167	0,167	0,167	0,667	0,111	0,111	0,111	0,333
S3	0,083	0,083	0,083	0,083	0,333	0,222	0,222	0,222	0,667

Source: Work of author

In the first scenario (S1) economic criteria and nutritional quality criteria have the same values of weight coefficients, 0,500 for both. The second scenario (S2) favors the economic criteria. Economic criteria (0,667 vs 0,333 for Nutritional quality criteria). In the third scenario (S3) values are reciprocal (table 3)

**Table 4.** Results of ranking

SAW						
Alternative	S1		S2		S3	
	Value	Order	Value	Order	Value	Order
A1	0,33722	3	0,22481	4	0,44962	2
A2	0,30402	4	0,30656	3	0,30148	4
A3	0,37354	2	0,38695	2	0,36014	3
A4	<b>0,72595</b>	<b>1</b>	<b>0,81730</b>	<b>1</b>	<b>0,63460</b>	<b>1</b>
TOPSIS						
Alternative	S1		S2		S3	
	Value	Order	Value	Order	Value	Order
A1	0,17473	4	0,10601	4	0,23930	3
A2	0,29288	3	0,33831	3	0,22204	4
A3	0,57562	2	0,51615	2	0,64900	2
A4	<b>0,83390</b>	<b>1</b>	<b>0,89969</b>	<b>1</b>	<b>0,77145</b>	<b>1</b>

Source: Work of author

The type of growing winter lettuce which uses a combination of mulching with agro-textile (A4) is the best alternative (table 4.). The economic parameters of A4 are much higher than every other alternative. The difference between A4 and other alternatives is the lowest in S3 for both SAW and TOPSIS methods. The A4 has high values for C6 and C7, which is the poor, but good economic performances are contributing for the best global score. The A2 is a type of growing technology with the worst global score for both methods.

Data in Table 4 shows that SAW method is more sensitive on weight coefficients changes, than TOPSIS method. The used two MADM methods in this research can be good as terminated tools not only in agro-economic research, but also in other studies in the field of agriculture.

### Conclusion

The production of winter lettuce in greenhouses can be realized based on many technologies, upon which various production results are obtained. The choice of the most applicable technology is a process where many attributes should be respected. By applying in that process many economic criteria as well as criteria of nutrition quality, a multi-attribute problem is achieved which could be solved through some of the MADM methods. By applying of SAW and TOPSIS methods a close ranking of the alternatives is obtained. There is a wide spectrum of problems in agricultural production which are in fact a multi-criteria task and could be solved by application of some of the MADM methods.

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## PRISTUP VIŠEATRIBUTIVNE PROCENE U PROIZVODNJI POVRĆA

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### Sažetak

*U radu je korišćeno dvije vrste kriterijuma ekonomske efektivnosti i dvije vrste kriterijuma ekonomske efikasnosti, kao i tri indikatora nutritivnog kvaliteta za rangiranje različitih tehnologija gajenja zimske salate. Korišćenjem dvije metode višeatributivnog odlučivanja, izvršeno je rangiranje četiri različite tehnologije gajenja zimske salate u zaštićenom prostoru. Prikazani su rezultati rangiranja na osnovu oba korišćena metoda, SAW i TOPSIS. Alternative su rangirane kroz tri scenarija koji se razlikuju po težinskim koeficijentima. Tehnologija proizvodnje koja podrazumjeva malč+agrotekstil pokazala se kao najbolja alternativa pri korišćenju oba metoda i svih scenarija. SAW metod se pokazao kao senzitivniji na promjene težinskih koeficijenata u odnosu na TOPSIS metod.*

**Ključne reči:** *višeatributivno odlučivanje, SAW, TOPSIS, proizvodnja povrća, metod*

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## IMPACT OF DEMOGRAPHIC FACTORS ON ENVIRONMENTALLY CONSCIOUS PURCHASE BEHAVIOR

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### Summary

*Over the last years, a number of papers have been published on the topic of the influence of different factors on the environmentally conscious behavior of consumers. It can be noted that interest in the influence of demographic factors on this type of behavior in these papers is diminishing. However, the published papers did not provide a unique answer on this topic. The goal of this paper is to examine the correlation between demographic factors and environmentally conscious purchase behavior using the method of meta-analysis and CMA software. In line with this statistical method, studies that examined the influence of demographic factors on environmentally conscious purchase behavior have been taken into account. Among these, only the studies that published Pearson correlation coefficient have been selected. This way, it was possible to aggregate the samples of these studies and to repeat the testing of the hypothesis that demographic factors influence the environmentally conscious purchase behavior. Results of this analysis provide some proof of this correlation, but also call for an expanded research to deal with this topic in more details.*

**Key words:** *demographic factors, environmentally consumers behavior, meta-analysis.*

**JEL:** *M31, Q01, Q50*

### Introduction

The issue of sustainability is related to the preservation of natural resources and the environment today so that future generations will be able to meet their needs (WCED, 1986). Since the 60s of last century environmental disasters are becoming more frequent and since then arise awareness among people that the development has its limits (Ekins, 1992). Some of the problems are air pollution, soil degradation, water pollution (Marinković

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et al., 2014). To solve these problems started development of new technologies, changes in production processes, changes in strategies, modification of products and services (Kotler, 2011). Also, new international and national legislations was introduced (e.g. WCED, 1986) as well as various programs and ways to support sustainable development (e.g. Nikolić et al., 2017). The contribution of the theory lies in the development of scientific disciplines such as green marketing which “consists of all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment” (Polonsky, 1994).

In making purchasing decisions, consumers take into account the effect of this purchasing on the environment (Kilbourne, 1998). Research of the European Commission (Eurobarometer), conducted in 2012, found that 80% of citizens of the European Union takes into account the effects on the environment caused by products they buy, while a quarter buys green products (Euractiv, 2013). In the USA, sales of organic food and beverages have grown from 1 billion USD in 1990 to 24.8 billion USD in 2009 and within the organic food consumption market, organic condiments have shown the strongest overall growth: 17% in sales to account for 930 million USD of the industry’s sales (Brandongaille, 2015). Conducted survey in Serbia toward purchasing of organic food brought finding that 45.3% of respondents occasionally purchase while 13.8% of respondents are regular consumers (Vehapi, Dolićanin, 2016).

Environmentally conscious, green consumers, are buying products that come from the production processes which are not harmful to the environment, such as an organic food production, do not contain toxic substances nor substances which damage the ozone, are manufactured from recycled materials, can be recycled (Ward, 2017). For companies, these consumers are a chance for increasing its market share through production and sales of products and services that are environmentally friendly (Schlegelmilch et al., 1996).

The Greens are also interesting to scholars, and a large number of studies have been directed to study the behavior of consumers who are environmentally conscious (Webster, 1975; Van Liere, Dunlap, 1981; Straughan, Roberts, 1999; Kim, Choi, 2005). However, Diamantopoulos et al. (2003) noted that in recent years a small number scientific studies take into account or reports on demographic factors. Considering that the demographic data are collecting during each survey, this is a very interesting fact. Also, when companies are doing market research for their own purposes they always include these factors and take them into account in the analysis (Diamantopoulos et al., 2003; McDonald, Dunbar, 1998).

Based on all of the foregoing, it is interesting to examine whether there is a correlation between demographic factors and the environmentally conscious consumer behavior. One of the ways that we can come up with an answer to this question is that we start from the published papers on this topic, use reported results and use meta-analysis to re-test the hypothesis and examine whether there is a correlation between demographic factors and environmentally conscious consumer behavior or not.

### Literature review

Environmentally conscious consumers are also known as green and ethical consumers (Chan, 2001). These consumers in buying process are “consistently seek product or company information and attempt to integrate a variety of environmental and or societal influences with their buying behavior” (McEachern, McClean, 2002).

Many studies have investigated and found a connection between demographic factors and environmentally conscious consumer behavior (Webster, 1975; Straughan, Roberts, 1999; Mostafa, 2007; Florenthal, Arling, 2011). However, McEachern and McClean (2002) argued that despite the increased papers on this topic they are relatively under-researched. This is supported by the fact that the results of these studies are not consistent and the differences can obtain because of a variety of ways and methods used in research, a variety of the number of subjects, the differences between cultures, economies. Among demographic factors, most often examined are age, gender and level of education (Webster, 1975; Straughan, Roberts, 1999; Diamantopoulos et al., 2003).

Age as an independent variable was the subject of research in many studies (Abruthnot, Lingg, 1975; Ostman, Parker, 1987; Straughan, Roberts, 1999; Diamantopoulos et al., 2003). There is a general belief that younger people are more sensitive to environmental issues and therefore more likely is that they will be environmentally conscious consumers and will have positive attitudes about environmentally conscious behavior in consumption. This belief has been confirmed in some papers (Weigel, 1977; Diamantopoulos et al., 2003) while others came to the opposite conclusion (Roberts, Straughan, 1999). Also, there are studies which concluded that there is no correlation between age and environmentally conscious behavior (Ostman, Parker, 1987; Van Lier, Dunlap, 1981).

Hence, one cannot say with certainty that there is a positive or negative correlation between age and the ecologically conscious consumer behavior, nor that this correlation does not exist. For this reason, it is interesting to examine this correlation.

When it comes to education, the belief is that people with higher education are more likely to behave in an environmentally conscious manner. Some studies have confirmed positive correlations (Weigel, 1977; Ostman, Parker, 1987) while some reported that there is no significant correlation between education and green purchase behavior (Diamantopoulos et al., 2003). Therefore, on this subject, there is no unambiguous conclusion. Considering that this is another demographic factor that should be examined.

Many studies have confirmed that women are more environmentally conscious buyers compared to men and have a higher level of awareness and positive attitudes when it comes to environmental issues (Webster, 1975; Bloceker, Lee, 1997; Roberts, Straughan, 1999; Florenthal, Arling, 2011). Only Mostafa (2007) has come to opposite conclusion which is explained by cultural differences of the country where the research was conducted.

Common for all studies is the difference in samples (number of subjects, cultural differences, social differences), in used methods but also the fact that each considers different factors.

The goal of this paper is to try to overcome previously mentioned issues and to examine the influence of demographic factors on the environmentally conscious consumer behavior.

### **Method of research**

Meta-analysis is a research technique that is often used in behavioral sciences, but there is almost no area of science which cannot be applied (Morris, 2008). It is based on the analysis of the results obtained during the previous research, according to obtained results brings a conclusion on the admissibility previous findings (Bartolucci, 2009).

To get to the data that will be analyzed, a few steps need to be done. It is necessary to choose the scientific field which papers belong, to choose the criteria for selection of scientific papers. After that then it is necessary to choose reported indicator or reported result which will be further analyzed (Glass, 1976; Ilić, 2009).

The first step in this research was the selection of published scientific papers based on the subject of their research. For this purpose, we used a web browser and e-library (Kobson) and combinations of words environmentally conscious consumer, environmentally purchase, and green consumers. From results, we were selecting the published papers.

The second step we selected only papers that examined the correlation between demographic factors and environmentally consumers. The further step included a selection of those papers which reported, as a result, Pearson's correlation coefficient to have comparable results.

For data processing software Comprehensive meta-analysis (CMA) is used.

In line with correlation coefficient, selected papers examined the correlation between demographic factors, as follows age, education, and gender, as the independent variable and environmentally conscious consumer behavior (Lovrić, 2009):

$$H_0: \rho = 0$$

Since this is the method of meta-analysis heterogeneity have to be taken into account, or there is no heterogeneity (Bartolucci, 2009):

$$H_0: Q = 0$$

Where Q has a chi-square distribution and is determined depending on a critical value of a certain degree of freedom and  $p > 0.05$  (NIST SEMATECH, 2017).

### **Results**

Diamantopoulos et al. (2003) and Weigel (1977) reported a negative correlation between age and the environmentally conscious consumer behavior while Roberts and Straughan (1999) and Ostman and Parker (1987) had the opposite conclusion. The results of these studies are presented in Table 1. The results of the meta-analysis are given in Table 2.

**Table 1.** The studies used for the analysis: age as independent variable

Study	Correlation	n
Weigel (1977)	-0.24	44
Ostman, Parker (1987)	0.03	329
Roberts, Straughan (1999)	0.16	235
Diamantopoulos et al. (2003)	-0.28	1,627

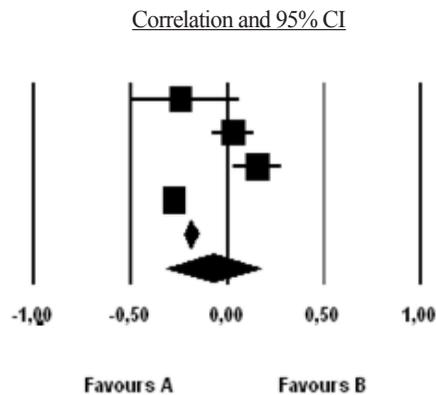
Source: Author’s computation, studies listed in table

**Table 2.** The results of the meta-analysis: age as independent variable

Model	Study name Correlation	Statistics for each study					
		Lower limit	Upper limit	Z-Value	p-Value		
	Weigel (1977)	-0.240	-0.501	0.061	-1.567	0.117	
	Ostman, Parker (1987)	0.030	-0.078	0.138	0.542	0.588	
	Roberts, Straughan (1999)	0.157	0.030	0.279	2.411	0.016	
	Diamantopoulos et al. (2003)	-0.275	-0.319	-0.229	-11.375	0.000	
Fixed		-0.188	-0.227	-0.147	-8.949	0.000	
Random		-0.077	-0.314	0.169	-0.610	0.542	
Heterogeneity and Tau-squared							
Fixed	Q-value	df(Q)	I-squared	Tau Squared	St. Error	Variance	Tau
	57.874	3	94.816	0.057	0.060	0.004	0.239

Source: Authors’ computation, CMA software

**Figure 1.** Forest plot for the results of the meta-analysis (age as independent variable)



Source: CMA software

Since the result is  $Q=57.874$  (for  $p < 0.05$  and  $df=3$ ,  $Q=7.815$ ) we reject the null hypothesis because there is a statistically significant difference among studies. The obtained sample is heterogeneous. This is indicated and by I-squared ( $I^2$ ), which means that 94.816% is the level of heterogeneity. If we consider a fixed model, we can see that the correlation is negative and weak ( $r = -0.188$ ) but statistically significant ( $p < 0.05$ ).

All studies that have examined the correlation of education (as independent variables) and environmentally conscious behavior reported a positive correlation as a result. They are presented in Table 3. The results of the meta-analysis are given in Table 4.

**Table 3.** The studies used for the analysis: education as independent variable

Study	Correlation	n
Webster (1975)	0.01	231
Weigel (1977)	0.42	44
Ostman, Parker (1987)	0.20	327
Cerjak et al. (2010)	0.14	600

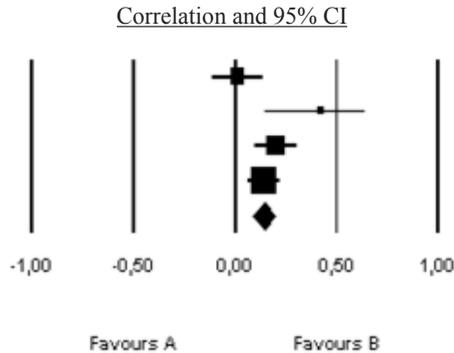
Source: Author’s computation, studies listed in table

**Table 4.** The results of the meta-analysis: education as independent variable

Model	Study name Correlation	Statistics for each study					
		Lower limit	Upper limit	Z-Value	p-Value		
	Webster (1975)	0.010	-0.119	0.139	0.151	0.880	
	Weigel (1977)	0.420	0.141	0.637	2.867	0.004	
	Ostman, Parker (1987)	0.200	0.094	0.302	3.649	0.000	
	Cerjak et al. (2010)	0.140	0.061	0.218	3.443	0.001	
Fixed		0.142	0.086	0.197	4.941	0.000	
Random		0.154	0.044	0.261	2.725	0.006	
Heterogeneity and Tau-squared							
Fixed	Q-value	df(Q)	I-squared	Tau Squared	St. Error	Variance	Tau
	8.998	3	66.659	0.008	0.011	0.000	0.089

Source: Authors’ computation, CMA software

**Figure 2.** Forest plot for the results of the meta-analysis (education as independent variable)



Source: CMA software

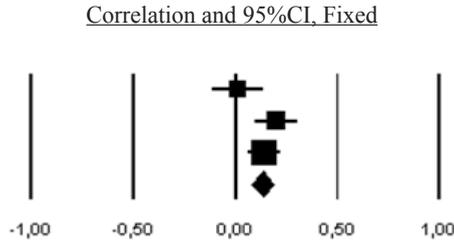
The result is  $Q=8.998$  (for  $p < 0.05$  and  $df=3$ ,  $Q=7.815$ ). However, if we see Figure 2 we will see that one study differs. Weigel (1977) has reported higher result than others ( $r=0.42$ ) but study has no great significance ( $n = 44$ ), therefore calculations will be repeated without it. The results of this analysis are given in Table 5, for clarification results are additional named as the second step.

**Table 5.** The results of the meta-analysis: education as independent variable, second step

Model	Study name Correlation	Statistics for each study					
		Lower limit	Upper limit	Z-Value	p-Value		
	Webster (1975)	0.010	-0.119	0.139	0.151	0.880	
	Ostman, Parker (1987)	0.200	0.094	0.302	3.649	0.000	
	Cerjak et al.(2010)	0.140	0.061	0.218	3.443	0.001	
Fixed		0.132	0.074	0.188	4.487	0.000	
Random		0.124	0.029	0.218	2.541	0.011	
Heterogeneity and Tau-squared							
Fixed	Q-value	df(Q)	I-squared	Tau Squared	St. Error	Variance	Tau
	5.062	2	60.489	0.004	0.007	0.000	0.066

Source: Authors' computation, CMA software

**Figure 3.** Forest plot for the results of the meta-analysis (education as independent variable) second step



Source: CMA software

The result is  $Q=5.062$  (for  $p < 0.05$  and  $df=2$ ,  $Q=5.991$ ) and we can say we have homogeneity. The correlation between education and environmental behavior exist, it is very weak ( $r = 0.13$ ) and statistically significant ( $p < 0.05$ ).

A list of studies that have been taken into account for examination of the correlation of gender (as independent variables) and environmentally conscious behavior as well as reported results are given in Table 6. In all cases result are related to female. In all cases, scholars have come to the results which indicate that women as consumers are more environmentally conscious compared to men. The results of the meta-analysis are given in Table 7.

**Table 6.** The results of the meta-analysis: gender as independent variable

Study	Correlation	n
Webster (1975)	0.01	231
Bloceker, Lee (1997)	0.13	1,557
Roberts, Straughan (1999)	0.14	235
Florenthal, Arling (2011)	0.10	101

Source: Author’s computation, studies listed in table

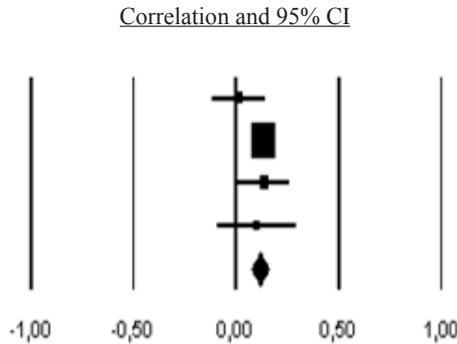
**Table 7.** The results of the meta-analysis: gender as independent variable

Model	Study name	Statistics for each study				
		Correlation	Lower limit	Upper limit	Z-Value	p-Value
	Webster (1975)	0.011	-0.118	0.140	0.166	0,868
	Bloceker, Lee (1997)	0.130	0.081	0.179	5.154	0,000
	Roberts, Straughan (1999)	0.136	0.008	0.259	2.084	0,037
	Florenthal, Arling (2011)	0.100	-0.097	0.290	0.993	0,321
Fixed		0.117	0.074	0.158	5,380	0,000
Random		0,117	0.074	0.158	5.380	0.000
Heterogeneity and Tau-squared						

Fixed	Q-value	df(Q)	I-squared	Tau Squared	St. Error	Variance	Tau
	2.974	3	0.000	0.000	0.003	0.000	0.000

Source: Authors' computation, CMA software

**Figure 4.** Forest plot for the results of the meta-analysis (education as independent variable)



Source: CMA software

The results  $Q=2.974$  (for  $p < 0.05$  and  $df=3$ ,  $Q=7.815$ ) means that homogeneity is confirmed. The correlation between the gender (female) and the environmentally behavior exist, it is a very weak ( $r = 0.12$ ) and statistically significant ( $p < 0.05$ ).

### Discussion of results

At the beginning this study we started from the question whether there is a correlation between demographic factors and the environmentally conscious consumer behavior. The results obtained in this paper, based on studies that were used, indicate that we need to be careful with generalizing conclusions.

In a case of age, first of all, the result is heterogeneity. Results obtained indicate the very high level of heterogeneity (94.816%) and suggested that samples from primary studies are very different. Based on the obtained results we cannot confirm the existence of negative correlation (as a result from the fixed model:  $r=-0.188$  at  $p < 0.05$ ) between age and environmentally consumer behavior.

Analysis of correlation between education and environmentally consumer behavior pointed out the importance of selected studies. In the second step, when one study was excluded from the analysis, we came to a homogeneous sample. On the possibility of such cases indicates the literature on meta-analysis (Bartolucci, 2009). The obtained results suggest that there is a weak positive correlation (as a result from the fixed model:  $r=0.132$  at  $p < 0.05$ ) between education and environmentally consumer behavior. To the same conclusion came Webster (1975), Ostman, Parker (1987) and Cerjak et al. (2010).

In a case of correlation between gender (female) and environmentally consumer behavior we obtain result that there is positive correlation (as a result from fixed model:  $r=0.117$  at  $p < 0.05$ ) and to the same conclusion came Webster (1975), Bloecker, Lee (1997), Roberts, Straughan (1999) and Florenthal, Arling (2011).

### Conclusion

Based on the results of this paper research, we can say that the correlation between some demographic factors and environmentally friendly consumer behavior exist but also that we need to be careful with generalizing conclusions. The advantages of this research are that the samples can be integrated and hypotheses that are tested in primary studies repeated. However, we should not ignore the limitations of the method used as well as limitations came from primary studies concerning the number of participants, used method and other specifics.

The following limitations of this study refer to the method of selection. It is possible that because of the used database or a combination of the words some studies have not been taken into account. Same refers to the selected indicator.

The obtained results indicate the need for further and comprehensive as well as well-structured research of correlation and the impact of demographic factors on the environmentally conscious consumer behavior. However, the information obtained from this paper can certainly be a starting point for future research and useful for business based on the principles of sustainable development.

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## UTICAJ DEMOGRAFSKIH FAKTORA NA EKOLOŠKI SVESNO PONAŠANJE POTROŠAČA

*Igor Trandafilović<sup>4</sup>, Vesna Conić<sup>5</sup>, Aleksandra Blagojević<sup>6</sup>*

### Rezime

*Poslednjih godina, veliki je broj objavljenih radova na temu uticaja različitih faktora na ekološki svesno ponašanje potrošača. Ono što se može primetiti jeste da se sve manje ispituje uticaj demografskih faktora na ovo ponašanje. Do sada objavljeni radovi ne daju jedinstven odgovor po ovom pitanju i radi toga cilj ovog rada jeste da ispita korelaciju između demografskih faktora i ekološki svesnog ponašanja potrošača koristeći metod meta-analize i CMA program. U skladu sa ovom statističkom metodom, odabrane su studije koje su ispitivale uticaj demografskih faktora na ekološki svesno ponašanje potrošača. Među njima su odabrane one u kojima je kao rezultat objavljen Pirsonov koeficijent korelacije. Na ovaj način omogućeno je da se objedine uzorci iz prethodnih istraživanja i da se ponovi testiranje hipoteza o uticaju demografskih faktora na ekološki svesno ponašanje potrošača. Rezultati istraživanja ukazuju da ove korelacije postoje ali i da je potrebno opsežnije istraživanje koje bi obradilo ovu problematiku.*

**Ključne reči:** demografski faktori, ekološki svesno ponašanje potrošača, meta-analiza

**JEL:** M31, Q01, Q50

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## STUDY ON THE POTENTIAL OF SUBCONTRACT PALINKA DISTILLATION

*Imre Milán Harcsa*<sup>1</sup>

### Summary

*Hungary has a centuries-long palinka distilling tradition. Palinka is prepared by the traditional method of “Kisusti” or the more economical single-step technology. Methods for the improvement of the quality and cost-efficiency of palinka preparation will include investments into an up-to-date technology, the focal point of my investigation in the present paper in terms of economic indicators (net present value), internal rate of return, profitability index and discount rate time. The calculations assessed several (optimistic, realistic and pessimistic) scenarios. Legislative changes have exerted a considerable impact on the turnover of palinka distilleries, and the re-introduction of the excise tax for subcontract distilling has resulted in frequent changes since 2010 and indicated an unpromising tendency. A further problem concerns dependence on agricultural source material production (fruit production) and the existence of home distilling. In conclusion, beneficial economic conditions will be the key elements in the implementation of the investment mentioned above.*

**Key words:** *palinka, investment economic benefits, net present value, single-step distillation, scenario analysis.*

**JEL:** O13

### Introduction

What is palinka? Palinka is a traditional Hungarian fruit spirit prepared exclusively by the distillation of fruit mash or fruit pulp. The production of Hungarian palinka is regulated by Hungarian local law LXXIII of 2008, often referred to as “palinka law”, which is based on the regulation of generic fruit spirits of the European Union. An alcoholic beverage may be called palinka if:

1. it is fermented exclusively from fruit (excluding concentrates and dried fruits) grown in Hungary, and free of additional ingredients.

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2. is grown, distilled and bottled in Hungary,

3. is not rectified higher than 86% and is bottled with at least 37.5% ABV.

In 2004 the European Union accepted palinka as a Hungarian speciality, and hence its production is limited to Hungary (and four provinces of Austria for palinka made from apricots) (Harcsa *et al.*, 2014).

Subcontract distillation means that experts rectify distillates out of mash prepared by individuals in the course of one or two distillations, using copper or acid-resistant distillery equipment. Under this subcontract the volume of authorized pálinka is 43 Hfl (V/V %) per household and the products shall not be marketed and sold.

Hungary has a long tradition in palinka distillation. The two methods of palinka preparation, the Hungarian “Kisusti” and the German “columnar” technologies differ substantially. The Hungarian “Kisusti” method processes the mash by phased distillation, whereas the “columnar” system uses only a one-step distillation and the applied method in this case is rectification. Palinka distillation is a time and energy-intensive process. It is especially true of the traditional, “Kisusti” technology, where heating and cooling are carried out twice (Bánvölgyi *et al.*, 2013; Harcsa *et al.*, 2014).

“Everywhere, producers seek to produce the highest possible volume of best quality products with the least possible input, offering a sustainable supply at a low price (once these conditions are fulfilled, profit is reasonable)” (Szűcs, Nagy, 2004).

Being the head of the Hun-Dest Drink Kft., it is especially important for me to meet the demands of subcontract distillers for high-quality palinka. The history of our palinka distillery looks back to more than 30 years: my father established it in 1983 and operated it until 1997. After his death, the production unfortunately ceased and then re-started in 2001; however, due to its high costs (paid employees) it was not economically feasible and was closed again. Having obtained the required qualifications I set up a company with my sister in 2010 and we endeavored to re-start the distillery and acquire the necessary authorizations. All these activities lasted for a year. Promising economic conditions induced a massive surge in production, but the introduction of the excise tax on subcontract distillation from 2015 resulted in a setback of demand and our company suffered losses.

To limit and minimize the losses, we considered the purchase of a modern, single-step distilling equipment. Investment efficiency calculations were carried out to explore the potential of this investment as it is introduced in the following part of the study.

My research will hopefully provide assistance to micro-enterprises engaged in similar developments in their overview of the given situation and decision-making.

### **Investigation objectives**

On the leading edge of my research is the investigation of the development potential of a palinka distillery with the traditional equipment, by investment viability calculations. My research is aimed at addressing the question of internal rate of return for a modern,

single-step distilling device. My calculations assessed several (optimistic, realistic and pessimistic) scenarios. These will be discussed in the following chapter. Investment is expected to pay off in the accounting period of asset depreciation, i.e. within 7 years. My baseline hypothesis asserts that the operation of the single-step palinka distilling equipment is profitable and it pays off within a short period of time. My research approach is not merely theoretical as its focal point is support for a real-life investment and the results obtained lend themselves to their utilization for other subcontract distilleries with the same business profile and objectives. It must be noted, however, that significant differences may occur in the cost-benefit conditions of distilleries due to their geographical locations, the main sources of fruit supplies, customers, supply chains and applied technological solutions.

### **Research methodology** **Assumptions, standard base line data**

#### 1. Conditions of the quantity of subcontract distillation

The base line for the examination of the optimistic scenario is the distillate quantity produced in 2013, for each year in the research period. This allows standard high turnover and approximately full capacity utilization. In the year mentioned above 7.712.9 hld distillate was prepared for 338 subcontract distillers in the plant of Hun-Dest Drink Kft, which equals to 15.425.8 litres of 50% palinka.

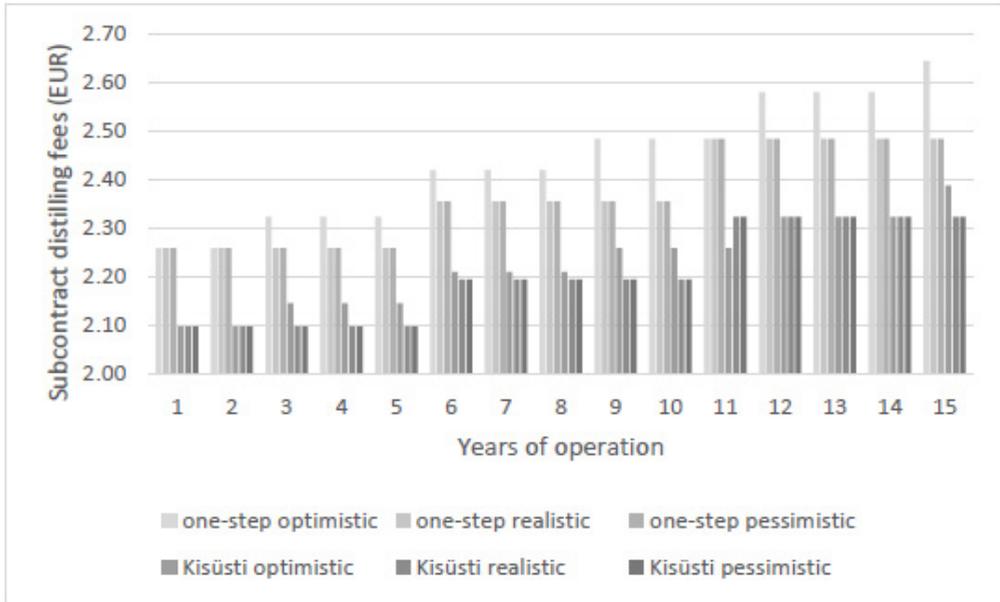
In case of the realistic and pessimistic scenarios, I drew the baseline data from the turnover of my own enterprise in 2015. Willingness to subcontract distillation was considerably influenced by the excise tax enacted from January 2015, and by the purchase price, quantity and quality of fruits. Another reason for the declining trend in subcontract distillation is stocks accumulated earlier, in addition to legal and illegal home distillation. In the year mentioned above 2.346 hld distillate was prepared for 107 subcontract distillers in the plant of Hun-Dest Drink Kft, which equals to 4.692 litres of 50% palinka. According to the realistic scenario, the turnover is expected to grow by 10% from the second year of production.

Based on the pessimistic scenario, distillation will stagnate in the first three years of operation. Subsequently, from the fourth year, willingness to subcontract distillation (therefore, the volume of palinka) will be expected to grow by 3% annually.

#### 2. Conditions of subcontract distillation fees

Subcontract distillers, like every Hungarian consumer, are highly price sensitive. This is partly the reason why palinka distilleries with the traditional technology and typically lower subcontract fees seem to be attractive for them. My calculations were based on the following operational subcontract distillation fees on the following bar graph.

**Figure 1.** Movements of subcontract distillation fees according to the optimistic, realistic and pessimistic scenarios, depending on the technology used (EUR/litre, palinka of 50%)



Source: Author’s development

According to the optimistic scenario, prices would rise in the third year of operation, and consequently in the 6., 9., 12., 15. years, adjusting to rising operating costs.

In the realistic and pessimistic cases subcontract distillation fees are left unchanged for five years to preserve the loyalty of the few customers or to attract new ones. Prices will be risen in the 6. and 11. years. Consequently, cost increases will be difficult to keep up with.

### 3. Assumptions on the revenue and costs in the first year of operation

From the second year, costs are expected to rise by approximately 3% annually (based on the Author’s data).

**Table 1.** Development of varying revenues and costs depending on different technologies used according to the optimistic scenario, in the first year of operation (EUR)

	Kisusti technology	Single-step technology
Revenue	32.344.42	34.832.45
Labor costs and social contributions	7.741.94	7.741.94
Depreciation expense	0	2806.45

Material costs, of which	6.528.77	5.021.94
- Firewood	4.361.29	3.270.97
- Electric energy costs	929.03	774.19
- Cooling and washing water need	915.87	654.19
- Cleaning and washing liquids	161.29	161.29
- Protective clothing	161.29	161.29
Services received	4.903.23	4.806.45
- Transport of mash	1.032.26	1.032.26
	<b>Kisusti technology</b>	<b>Single-step technology</b>
- Marketing costs	967.74	967.74
- Internet, telephone bills	774.19	774.19
- Banking costs	580.65	580.65
- Maintenance and repair costs	580.65	483.87
- Accounting fees	580.65	580.65
- Safeguarding and security costs of the plant	387.10	387.10
Other costs	161.29	161.29
- Costs of representation	161.29	161.29

Source: Author's development

**Table 2.** Development of varying revenues and costs depending on different technologies used according to the realistic and pessimistic scenario, in the first year of operation (EUR)

	<b>Kisusti technology</b>	<b>Single-step technology</b>
Revenue	9.838.06	10.594.84
Labor costs and social contributions	7.741.94	7.741.94
Depreciation expense	0	2.806.45
Material costs, of which	1.990.97	1.538.71
- Firewood	1.308.39	981.29
- Electric energy costs	278.71	232.26
- Cooling and washing water need	274.84	196.13
- Cleaning and washing liquids	48.39	48.39
- Protective clothing	80.65	80.65
Services received	4.180.65	4.083.87
- Transport of mash	309.68	309.68
- Marketing costs	967.74	967.74
- Internet, telephone bills	774.19	774.19
- Banking costs	580.65	580.65
- Maintenance and repair costs	580.65	483.87
- Accounting fees	580.65	580.65
- Safeguarding and security costs of the plant	387.10	387.10
Other costs	80.65	80.65
- Costs of representation	80.65	80.65

Source: Author's development

#### 4. Factors taken into consideration in the calculation of the discount rate

As Nábrádi and Szöllösi (2007) suggest, the following factors will be integrated in the discount rate:

- risk-free interest rate: equal to the Central Bank base rate, 1.35% (since October 2015)
- risk premium: 200% of the corporate loan interest rate (2.5%), 5%
- surplus premium 2%

Therefore, the value of the discount rate is 8.35%.

#### **Methods of calculation**

When an enterprise assesses the financial feasibility of its investment decisions, due consideration will also be given to the time value of money. As static indices fail to take account of it, my research carried out profitability calculations.

The interest rate, i.e. the discount rate used for the representation of the time value of money:

- expresses the return on the investment and
- makes it possible to add up the incoming and outgoing sums of varying volumes, at different dates" (*Tétényi, 2001:17.p.*)

The discount rate often refers to the minimum expected return on an investment. Its value is sometimes set in relation to alternative investments (e.g. bonds or money market funds).

Return on an investment is a key issue for entrepreneurs, i.e. generated cash flows should exceed the amount of invested money. (Anthony et al., 1992) Investments are analyzed by multiple methods, as the related expenses and returns occur at different times. (Kay, Edwards, 1994) The internal rate of return and net present value are the most often used methods by large companies for the evaluation of their investments. In the calculation, incoming money is regarded as a positive, whereas outgoing money, including the initial investment, a negative cash flow. In case the net present value of all cash flows is positive, taking account of the postulated internal rate of return, the actual rate of return obtained will exceed the expected one. However, if the net present value of cash flows is negative, the actual rate of return will be lower than the expected one. (Budnick, 1988)

The history of net present value calculation goes back as far as the XIX. Century. Karl Marx studied the rate of return, but it was Irving Fisher, who spread the use of the method. (Bóta, 2006) Net present value calculation is one of the basic methods of dynamic investment profitability assessments. Investments usually begin with an initial investment and require lesser or higher sums invested until the recovery phase. However, various inputs and returns fail to occur at the same time, making the traditional methods unsuitable for adding them up. Net present value calculation eliminates this

problem by taking account of the time value of money, to enable the calculation of all the returns in relation to the expected inputs and returns. The formula is the following:

$$NPV = -C_0 + \sum_{t=1}^n \frac{C_t}{(1+r)^t}$$

Where

$t$  - the date of the given cash flow (e.g.: 3 if in the third year)

$n$  - the length of the whole time period

$r$  – rate of interest

$C_t$  - net cash flow (amount of money) at  $t$  point of time

$C_0$  – the amount of money invested at 0 point of time ( $t = 0$ )

Evaluation

Assuming  $NPV > 0$ , the investment is feasible

Assuming  $NPV < 0$ , the investment is not feasible as it incurs the losses of assets.

Assuming  $NPV = 0$ , return on our investment is generated once

Nábrádi and Szöllösi (2007) discussed the special features of NPV calculations in their study. They claimed that inflation, risk and other factors would be reasonably included in the calculation of the interest rate.

Net present value in itself is not sufficient to bring investment-related decisions. Net present value can be expressed on the basis of the internal rate of return. The internal rate of return (IRR) is equal to the discount rate where the net present value is zero. This method is suitable for ranking the investments with different life cycles and initial investment costs. In this case, the alternative with the highest IRR is recommended. (Kay, Edwards, 1994) IRR is the rate of interest that makes incoming and outgoing cash flows precisely equal. Thus we can obtain the value where the net present value is zero. (Helfert, 2001) The IRR method encompasses the discounting principle and it determines the percentage of return on the invested capital. (Warren, 1982) IRR is also called the marginal efficiency of capital.

$$-C_0 + \sum_{t=1}^n \frac{C_t}{(1+IRR)^t} = 0$$

If IRR is above (or equal) than the selected discount rate ( $r$ ) then the investment is reasonable.

The Profitability Index (PI) indicates the present value for a unit of investment. The investment is acceptable, if  $PI > 1$ . In those cases, when the amount of available capital is limited, the profitability index proves to be a useful means of ranking several projects that are independent from each other. (Lee et al., 1980), (Brealey et al., 2006).

$$P = \frac{\sum_{t=1}^n \frac{C_t}{(1+r)^t}}{-C_0}$$

The Discounted Payback Period (DPP) addresses the number of years needed for the initial capital investment to result in returns on the discounted cash flow of the investment.

**Table 3.** Correlations of economic efficiency indicators of investments

Net present value (NPV)	Discount rate (“r”)	IRR Internal Rate of Return (IRR)	Profitability index (PI)
Zero	Equals to IRR	Equals to “r”	1 (one)
Above zero	Below zero	Above “r”	Above 1
Negative	Above IRR	Below “r”	Below 1

Source: Nábrádi, Felföldi, 2007.

In decision-making, all the methods listed above will be taken into consideration, as each of them has its strengths and weaknesses. Table 4 illustrates this.

**Table 4.** Strengths and weaknesses of economic efficiency indicators of investments

Method	Strengths	Weaknesses
NPV	<ul style="list-style-type: none"> <li>- considers all relevant information</li> <li>- it is directly connected with the strategic objectives of most enterprises</li> <li>- NPV is additive, thus it can be easily supplemented with alternative evaluations</li> </ul>	<ul style="list-style-type: none"> <li>- it shows the absolute, and not the specific increase in the assets</li> </ul>
IRR	<ul style="list-style-type: none"> <li>- illustrates the internal rate of return in invested capital %</li> <li>- in most cases, its result is equal to NPV</li> </ul>	<ul style="list-style-type: none"> <li>- with mutually exclusive programs it may lead to fallacious results</li> <li>- it is not available for use if cash flows are irregular</li> <li>its manual calculation is cumbersome</li> </ul>
PI	<ul style="list-style-type: none"> <li>- indicates specific changes in assets</li> </ul>	<ul style="list-style-type: none"> <li>- with mutually exclusive programs it may lead to fallacious results</li> </ul>
DPP	<ul style="list-style-type: none"> <li>- if solvency is uncertain, it is unavoidable</li> <li>- it takes the time value of money into account</li> </ul>	<ul style="list-style-type: none"> <li>- it fails to consider the cash flows following the returns</li> <li>- it encourages the launch of hazardous investments</li> </ul>

Source: Author’s development based on Reference 15.

In the literature on the calculation of the economic efficiency of investments the majority of authors recommend the calculations with after tax cash flows. Factors to be taken into consideration include investment loans and depreciation. Credit interest increases expenses, therefore it decreases taxable income. Depreciation is not used in cash flow calculations, as it is not a financial expenditure. However, depreciation reduces taxable income and thus the amount of corporate tax. (Kay, Edwards, 1994), (Lee et al., 1980)

## Results and their evaluations

### 1. Retaining the “Kisusti” system without using it.

The traditional “Kisusti” system should be retained for subsequent refurbishment and modernization, as the purchase price of a complete, new distilling equipment is over 32.000 EUR.

**Table 5.** Economic efficiency indicators of investments in the 7. year of operation, retaining the “Kisusti” system without using it.

	NPV (EUR)	IRR (%)	PI	DPP (year)
optimistic	2.947.03	12.52	1.152	5.95
realistic	-10.629.48	-9.58	0.451	15.65
pessimistic	-12.253.85	-14.43	0.367	There's no return

*Source:* Author's development

According to the optimistic scenario, the investment will pay off due to the amount (considered average from subcontractor perspective) of palinka distillate produced during 6 years.

According to the realistic scenario, if the investment is implemented in the conditions presented above, losses would occur for 7 years, i.e. over the full depreciation period of the equipment. In the 8th year, however, low cost operation and high available turnover will have beneficial effects and result up to 300% profit after tax (1.019.35 vs 3.248.39 EUR) compared to the Kisusti Technology. The single-step technology will retain its considerable advantage subsequently and lead to a surplus of approximately 3.200 EUR annually. The examination of the discount payback time suggests that the investment (19.400 EUR for a 15 year study period) would not yield returns over 15 years, so the option is unacceptable.

In the pessimistic case modest turnover growth is insufficient to offset the operating costs and leads to loss-making operation in the long term. In this case neither the investment, nor the retention of the traditional technology are economical.

### 2. Retaining and using the Kisusti system

#### 2.1. Optimistic scenario

Customers may stick to the taste of the traditional Kisusti and find it difficult to accept the new product. The old technology may also be useful when the new equipment needs to be repaired, to prevent downtime and to continue production.

Once the traditional equipment will be retained, it is worth making use of it, even if on a limited scale. My calculations addressed the question what combination would be needed to ensure a short payback time.

My first hypothesis establishes that the two technologies can be used in 50-50%. In this case the discount payback time will be 13.87. The net present value of surplus cash

flows compared to the use of the Kisusti system will yield positive results only in the 14th year. In this case:

NPV (EUR)	IRR (%)	PI	DPP (year)
120.45	8.45	1.006	13.87

Consequently, the proportion of the Kisusti system was decreased to 30%. In this case the discount payback time will be 8.94 years. If so, in the 9th year of operation:

NPV (EUR)	IRR (%)	PI	DPP (year)
104.63	8.48	1.005	8.94

The scenario is optimal if the significant part of the production is carried out by the modern technology and the Kisusti system is merely used to meet demands if the customers expressly so request, or under the maintenance of the single-step equipment. Given this, the traditional technology would be merely applied to produce 10% of the palinka output. In this case the discount payback time will be 6.66 years, i.e. the investment would already result in a return in the depreciation period. In the 7th year:

NPV (EUR)	IRR (%)	PI	DPP (year)
861.22	9.6	1.044	6.66

## 2.2. Realistic

According to the realistic scenario, subcontract distillers are less inclined to accept the product development, a part of them continue to stick to the traditional taste and odour of Kisusti palinka. If this is so, the following combinations may be used:

If the two different distillation methods are applied in 50-50%, DPP will just be within the remaining useful life of the asset.

NPV (EUR)	IRR (%)	PI	DPP (year)
788.72	8.82	1.041	14.6

As long as customers can be gained by the new type of palinka with more intensive odour but less characteristic taste, an increasing number of them will opt for the single-step technology. If this proportion is shifted in favor of the modern technology by 10%, we will get the following figures:

NPV (EUR)	IRR (%)	PI	DPP (year)
341.08	8.57	1.018	13.83

The investment will result in a return not much sooner, in 13.11 years if the proportion of Kisusti technology is merely 30% in production. Then the economic efficiency indicators of the investment in the 14th year shall be as follows:

NPV (EUR)	IRR (%)	PI	DPP (year)
1.858.11	9.54	1.096	13.11

### 2.3. Pessimistic

Subcontract distillers tend to refuse the application of the modern technology. A significant method of production is the Kisusti technology. According to this scenario, the investment will not result in a return during the useful life of the asset. If 60% of the palinka output is produced by the single-step method, the generated surplus cash flows set against the pessimistic scenario examined above will guarantee the return in the 10th year of operation. The results of the calculations shall be the following:

NPV (EUR)	IRR (%)	PI	DPP (year)
1.685.81	9.63	1.087	9.58

### 3. Sale of the Kisusti system, use of the single-step technology

Assuming that customers will accept the new method of distillation, selling the Kisusti equipment of high operating costs may come as a logical decision at the price of 9700 EUR. The initial cash flow required for investment purposes will be cut by 50% accordingly, and it will lead to a faster payback period. Therefore the investment will pay off within 15 years even in the pessimistic case.

**Table 6.** Economic efficiency indicators of investments in the 7. year of operation, after the sale of the “Kisusti” system

	NPV (EUR)	IRR (%)	PI	DPP (year)
optimistic	12.624.45	39	1.305	2.93
realistic	-952.061	5.65	0.902	7.81
pessimistic	-2.576.43	0.15%	0.734	10.35

Source: Author’s development

### 4. Following the depreciation and sale of the Kisusti system

The old technology and the old equipment will be sold at the end of the 7-year depreciation period at the price of 6.500 EUR.

**Table 7.** Economic efficiency indicators of investments in the 7. year of operation, following the sale of the “Kisusti” system and the single step equipment, after depreciation.

	NPV (EUR)	IRR (%)	PI	DPP (year)
optimistic	14.464.52	40.53	2.495	2.78
realistic	3.060.78	16.69	1.316	6.02
pessimistic	3.634.19	20.44	1.376	4.97

Source: Author’s development

In this case, all the three investigated scenarios ensure returns.

### Summary notes, conclusions and recommendations

The investment is worth putting into practice:

- in the optimistic case, retaining the Kisusti system, without using it
- in the optimistic case, retaining the Kisusti system, using it in 10%
- in the optimistic case, selling the Kisusti system
- in the optimistic, realistic and pessimistic cases, after the sale of the Kisusti system and the single step equipment following the depreciation period.

Although the optimistic scenarios may seem to be attractive, having regard to the actual economic situation, it is worth being realistic as from January to October 2015 (almost all the year) the volume of the distillate produced in our plant approximated that of produced in October 2014. Willingness for subcontract distillation dropped significantly due to the re-enacted palinka tax as of 1 January 2015 on legal and illegal home distilling. There is a strong probability that it may be true of other palinka distillers as well.

In the realistic case the investment would result a return on condition the assets are put on sale. If the discount rate is decreased, the equipment would pay off its price even if it remains unsold and merely the Kisusti technology is discarded. However, it poses the risk of losing customers, as some of them were attracted specifically by our technology and disliked the distillate prepared by the modern technology, saying: “For good work tradition is needed”. Consequently, traditional technology and heating are the main attractions for subcontract distillers in the Kisvárdá small region.

The discussion of the potential modernization of the present, traditional technology is beyond the scope of this study (e.g. replacing the traditional heating method with a fast steam generator), but it represents an alternative to cut costs and decrease the distilling time.

The list of costs clearly indicates that the highest ones are the wages and employers' contributions (per person). Unfortunately, enterprises cannot change this situation, but working hours can be better exploited if two distilling equipment will work simultaneously and the scope of activities will be extended. As an alternative, commercial palinka distillation is to be continued, as its excise deposit in the case of a limited amount is approx 6.500 EUR.

In conclusion, a beneficial economic condition will be the key element in the implementation of the investment mentioned above. The current situation seems to be fluid: home-made palinka distillation has become actually taxable since January 2016 (In 2015 3.2 EUR flat rate contribution was imposed on those who sent their distilling activity statements to the tax office.) The excise duty on 1 litre home-made palinka is 2.3 EUR, whereas that of subcontract palinka distillate is 2.7 EUR. In my work I frequently meet the officers of National Tax and Customs Administration who reported that some distilleries remained closed from the 2015 season. I consider that

the professional experience gained in the next few years will still be essential before implementing investments for the development of the distilling plant.

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## IMPACT OF TAKEOVER PROCESSES ON EMPLOYEES – EVIDENCE FROM FOOD, RETAIL AND FINANCIAL SECTOR

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### Summary

*Takeover processes imply integration of different organizational cultures, especially in case of crossborder takeovers. Using a survey questionnaire, authors conducted a research to examine the changes and satisfaction with all interest groups in taken over companies operating in fields of food industry, retail sector and financial activity in the Serbian market. Method applied to process the data is discriminant analysis, and research results are presented tabular form as well as graphically in form of ellipses. The aim of the study is to examine the differences of impact of takeover processes on various interest groups of production company, retail chain and financial institution and assessment of their satisfaction. Study's contribution is an informative support for managers of both company acquirer and target company in future acquisition processes, because analysis of differences, change and satisfaction of employees provides a concrete answer regarding elements influencing success of takeover process in terms of management of human.*

**Key words:** *food industry, retail industry, financial institution, takeover, employees*

**JEL:** *G34, F66*

### Introduction

In the initial phase of transition, takeover processes were done in a form of acquisition of assets – privatization of the existing state-owned companies and social enterprises.

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The largest number of foreign investments came to Serbia through the privatization of social enterprises and state-owned companies operating in telecommunications, banking, food industry and trade. In the period from 2001, four fifths of the total 20 billion USD of foreign investments came from European Union countries.

Foreign direct investments play a significant role in the Serbian economy according to Đurić, Ristić and Đurić (2016). Foreign direct investments had a growth trend from year 2001 and reached their maximum in 2006, when they amounted to 14.3% of the GDP. Onset of the World economic and financial crisis in the summer of 2008 led to a rapid decline in investment activity worldwide and in Serbia as well. Another growth of foreign direct investments was recorded in 2011: wholesale and retail trade sector (38%), processing industry (21%) and financial activity (11%) of the total foreign investments in 2011 (Chamber of commerce and industry of Serbia, 2017).

In the period from 2001-2011 growth rate of production industry was 0.7%, where processing industry dictates growth pace to a significant extent 0.4% (food production amounts to 1.6%, while beverage production amounts to 0.5%). Food industry accounts for 18.6% of the total Industry, which is the highest percentage share according to the Chamber of commerce and industry of Serbia, 2017. Contribution of food industry to GDP is 3.3%. According to Jakšić et al. (2015) transitional processes, lasting up to two and a half decades along with the effects of the global economic crisis, are characterized by the decline in economic activity in Serbia which increased the relative importance of the agriculture in the total economy. Arrival of big multinational companies to the Serbian market in the trade sector led to a higher concentration of market share. Contribution of trade to the gross domestic product is 11.7%. Trade accounts for 34.4% of the total number of companies in Serbia and for 19.7% employees in relation to the total number of employees in Serbia in 2015 according to the Chamber of commerce and industry of Serbia (2017). As far as banking sector of Serbia is concerned, the greatest number of foreign banks entered Serbian market in the period from 2003-2006. In 2001 there were 86 banks operating in the Serbian market, and in 2003 that number was 49, while today there are 30 banks operating in the Serbian market, 23 thereof being foreign owned banks. Takeover processes led to an increase in concentration in the banking sector, so the first 10 banks ranked by the size of balance sheet sum have 72% of the market share according to the Chamber of commerce and industry of Serbia (2017).

Integrating different organizational cultures represents an important part of crossborder mergers and acquisitions. Organizational culture encompasses a set of values, reasoning and believes of one group of people, and connecting organizational cultures of two companies, that were previously separate entities, represents a very important instrument influencing the efficiency of the overall business performance of the integrated company. The decision of management to include a company into an acquisition process surely affects company's human resources of both company acquirer and target company. Transactional theory is based on the possibility of reducing transaction costs of management, adjustments and other expenses that arise at the internationalization of the company (Demirbag, Glaister, & Tatoglu, 2007; Chen & Hennart, 2004; Yin &

Shanley, 2008). One of the main tasks of managers is to understand the environment in which it operates to make decisions based on the statements of accounts were in order to improve organizational competitiveness (Lima et al. 2016).

In that regard, the authors did the research on the effect of takeover processes on human resources of target company post takeover. The analysis was done using a survey questionnaire. Research sample includes 101 respondents from three fields which are affected by the takeover processes to the greatest extent in the Serbian market: production company from food industry, bank from financial sector and retail chain from trade sector. The aim of the study is examining differences regarding the effects of takeover processes on various interest groups of production company, bank and retail chain. This analysis should provide a concrete answer regarding the success of the takeover process and its effect on the employees' satisfaction in the Serbian market post takeover. Study provides an informative support to managers, as it encompasses three industries and all interest groups of companies in the Serbian market, thus satisfaction analysis of the previous period can be useful in preparing due diligence for future acquisition processes. Managing organizational climate and culture is an important part of due diligence affecting the success of takeover process, as confirmed by numerous empirical studies.

### **Literature Review**

Human resources, organizational culture and business climate imply the analysis of prevailing values and norms especially in case of crossborder acquisition. Study of human resources includes the analysis of working conditions, salary and compensation system, improvement and advancement opportunities, adjustment of managerial approach, etc.

There are numerous examples of unsuccessful acquisitions due to managerial incompetence to solve the problem of integration of two companies with different organizational culture and climate. Effect of cultural differences on success of takeover process was subject of empirical studies done by many authors, Denison, 2011; Shook and Roth, 2011; Lodorfos and Boateng, 2006; Lin et al. 2006; Chakraberti, 2009, Rottig et al. 2014.

In more recent times, there is an emphasis on learning theory as stated by Zollo, Reuer, & Singh (2002) and choice of investment type. Studying the correlation between organizational learning, i.e. previous experiences with M&A activities and future M&A activities, authors arrived at a conclusion that experience increases probability for further M&A activities. There is an especially positive correlation between a positive experience in a certain country and repeated investment in that country as stated by Collins et al. (2009).

Companies with experience often create a position – integration manager whose job is to ease the process of adjustment of human resources of previously two separate companies according to Ashkenas and Francis (2000). Some companies hire consultants

to help managers by providing advice and assistance in bringing together organizational cultures and creating work environment that enhances business efficiency according to Fubini, Price, Zollo (2007).

In their study, Shook and Roth (2011), suggest the significance of the active role of experts in the sphere of human resources management in integration processes.

Crossborder acquisitions often produce unintended consequences on employees in terms of downsizing workforce after the integration of companies. This finding is confirmed by Mylonakis (2006), who studied taken over banks in the European market in the period from 1998-2003, and by Siegel and Simons (2006), who studied production companies in the Swedish market.

Birkwshow et al. (2000) researched the effect of takeover process on human resources through a questionnaire, surveying both shareholders of the target company and shareholders of the company acquirer. They claim that success of acquisition depends on two parallel processes: operative integration (through operative and financial synergy) and human resources integration.

Acquisition adjustment process greatly depends on employees' readiness for change according to Holt, 2007; Jensen, 2000; Wanberg, 2000. Jones (2005) came to a conclusion that the stronger employees' perceptions of the organizational culture the greater their readiness for change.

Large number of authors dealt with studying cultural distance of country acquirer and target country, as well as choice of entrance model of a foreign investor.

Authors Contractor et al. (2014) analyzed 1389 acquisitions in 33 countries of India and China during eleven years' period and arrived at a conclusion that form of corporate restructuring through full, fractional and low ownership is determined by three groups of factors: (a) institutional factors, (b) cultural factors and (c) industry relatedness. Regarding cultural distance (Hofstede, 1991) measured by uncertainty avoidance index, the authors determined that with higher aversion toward risk and uncertainty, investors prefer low-level ownership through entrance models: joint ventures and strategic alliances. Regarding industry relatedness, when an acquisition of target companies in developing countries is performed in related industries (compared to unrelated or loosely related industries) there is greater probability of full over low-level ownership or majority over minority ownership.

Authors Ang and Michailova (2008) analyzed 628 crossborder alliances in 64 developing countries in the period from 1995-2004 and reached a conclusion that higher uncertainty, bigger restrictions and greater cultural distance increase the probability of choosing strategic alliance as restructuring form.

Authors Demirbag, Glaister and Tatoglu (2007), studied, on a sample of 6838 companies in Turkey, determinants that affect the choice of internationalization model between full and fractional ownership. Combining determinants of transaction cost theory

and integration theory; they arrived at a conclusion that fractional ownership was a preferred model in countries with following institutional determinants: high political risk, high level of corruption, greater cultural distance and greater language distance.

Authors Somlev and Hoshino (2005) studied entrance of 751 Japanese companies into the European market by analyzing numerous variables. They concluded that: competitiveness, cultural distance and industry growth are the most important determinants in choosing investment type.

These studies are in accordance with authors Estrin, Baghdasaryan, and Meyer, 2009; Peng, 2003; Ang and Michailova, 2008; Brouthers and Keith, 2002; Pothukuchi, Damanpour and Choi, 2002; Kaufman and O'Neill, 2007, who also researched institutional and cultural distances and confirmed these hypotheses.

### Data

Study of effects of takeover processes on human resources was done through a survey questionnaire. The study sample includes 101 respondents from three fields that were mostly affected by the biggest takeover wave in the Serbian market: production company from food industry, bank from financial sector and retail chain from trade sector.

Survey questionnaire was used to study changes in company's human resources after the ownership change, i.e. after the completion of the takeover process. The whole study was done in 6 thematic units. Analysis of differences between industries (production company, retail company and financial institution) was done in regard to analysis of general data, analysis of working conditions and workload, analysis of structure of interest groups, analysis of employees' salaries, analysis of employees' professional development and analysis of employees' satisfaction.

Questionnaire is conceived in such a manner as to find out whether there are any changes concerning the employees in the target company after the change in ownership structure (Milojević, Zekić, 2015). The questionnaire was handed out to employees on all position levels: management, administrative workers, workers behind the counter and fieldworkers. The analysis of *general data* included general information about respondents: occupation, gender, marital status, work position, qualifications and age. Questions within *working conditions and workload* unit referred to examining whether there are changes in workload, working conditions, interpersonal relations and position changes post takeover. Within the unit *Structures of interest groups* questions referred to management changes post takeover and whether takeover brought about any reduction or increment in number of employees. The unit *Employees' salaries* contained questions about changes in employees' salaries and whether there was a post-takeover introduction, increase or reduction of bonuses and compensations for the employees. Within the unit *Professional development* analysis focused on employees' motivation, whether tasks are performed in a team and whether there are opportunities for employees' advancements. The last unit *Employees' satisfaction* rated feelings of satisfaction on a scale of five, by comparing periods prior to and after the takeover

in order to have an overall result of the research – whether takeover processes had a positive or negative effect on target companies’ employees.

### Methodology

Analyzed determinants have nonparametric characteristics, and thus the analysis was done using a nonparametric method based on frequency of modalities through multivariate statistical analysis - Discriminant analysis. Of univariate methods Roy’s test, Pearson’s contingency coefficient ( $\chi$ ) and multiple correlation coefficient (R) were used. Calculating discrimination coefficient allowed for characteristics to be differentiated between those that determine subsample specificity and those that are to be excluded from further processing, i.e. the observed area was reduced. Following thresholds for statistical significance were used in the study:  $p < 0.05$  (there is a significant difference),  $0.05 < p < 0.1$  (there is a difference and a higher risk for drawing conclusions) and  $p > 0.1$  (there is no significant difference among analyzed determinants).

Research results are shown in form of ellipses in the study appendix. In case of two or more subsamples, differences or similarities between them are shown visually. If two ellipses overlap there is no difference between them, when they are separated and don’t have any points in common there is a significant difference between subsamples for observed parameters, and when the ellipses overlap partially conclusions are drawn on the basis of the analyzed data.

### Research results

Data was processed using discriminant analysis. Discriminant analysis is a more complex analysis compared to multivariate analysis MANOVA, since calculating discrimination coefficient and contribution of determinants to the overall study makes the overall study complete and allows for more complex conclusions to be drawn.

**Table 1.** Significance of difference among analyzed units for three groups of industry

Units	F test	sig.
General data	8.997	.000
Working conditions and workload	7.554	.000
Structure of interest groups	77.718	.000
Employees’ salaries	17.146	.000
Professional development	1.730	.145
Employees’ satisfaction	7.737	.000

Source: Author’s calculation

Based on the given table it can be concluded that there is a substantial difference and a clearly defined limit ( $p < 0.05$ ) with five analyzed units: general data (.000), working conditions and workload (.000), structure of interest groups (.000), employees’ salaries (.000) and employees’ satisfaction (.000). There was no substantial difference with the determinant professional development (.145).

**Table 2.** Significance of difference between respondents’ industries compared to the general data analysis

General data	c	R	F	p	k.dsk
age	.248	.224	2.591	.080	.101
gender	.326	.345	6.609	.002	.128
marital status	.096	.076	.281	.756	.035
qualifications	.462	.472	14.075	.000	.314
occupation	.510	.556	21.896	.000	.437

Source: Author’s calculation

Legend: *k.dsk* is discrimination coefficient. Threshold for statistical significance:  $p < 0.05$  (there is a significant difference),  $0.05 < p < 0.1$  (there is a difference and a higher risk for drawing conclusions),  $p > 0.1$  (there is no significant difference)

Based on the analysis of general data, it can be concluded that there is a significant difference with the following determinants: gender (.002), qualifications (.000) occupation (.000), and age (.080). However, no significant difference was observed with marital status determinant (.756).

Discrimination coefficient indicates that contribution to discrimination among respondents’ industry in regard to general data analysis was the biggest with: occupation (.437), qualifications (.314), gender (.128), age (.101), marital status (.035). Latent determinant is: marital status (.756). Latent determinant is the one which did not show difference among industries, but discriminant analysis included it into the structure according to which there is a substantial difference among industries.

**Table 3.** Significance of difference between respondents’ industries in regard to working conditions and workload analysis

Conditions	c	R	F	P	k.dsk
Working conditions	.414	.449	12.370	.000	.216
Workload	.269	.278	4.105	.019	.116
Position	.355	.361	7.365	.001	.051
Interpersonal relations	.429	.424	10.741	.000	.191

Source: Author’s calculation

Discrimination coefficient indicates that contribution to discrimination among respondents’ industries in regard to working conditions and workload analysis was biggest with: working conditions (.216), interpersonal relations (.191), workload (.116), and position (.051).

Based on the given table a significant difference can be observed among all analyzed determinants: working conditions (.000), workload (.019), position (.001) and interpersonal relations (.000).

**Table 4.** Characteristics and homogeneity of respondents' industries in regard to working conditions and workload analysis

Conditions	Retail company	Financial institution	Production company	dpr %
Working conditions	same	Worse	same, worse	37.631
Interpersonal relations	better	worse, better	same	33.275
Workload	bigge	Bigger	smaller	20.209
Position	new, better	new, better	same	8.885
n/m	32/36	22/31	29/34	
%	88.89	70.97	85.29	

Source: Author's calculation

Based on the given table and determinants' contribution to characteristics (dpr %) it can be concluded that the greatest contribution to creating a difference is with: working conditions (37.63%), interpersonal relations (33.28%) and workload (20.21%). Homogeneity with retail company is 88.89% (32/36), with financial institution 70.97% (22/31) and with production company it is 85.29% (29/34), meaning that respondents' within the same industry had, for the most part, the same answers when it comes to Working conditions and workload, which allows great precision in drawing conclusions.

More respondents answered that working conditions remained at the same level in the retail and production companies, whereas they worsened in the financial institution. Interpersonal relations in the retail company improved, while other changes were not significant. In the financial institution interpersonal relations worsened, workload became greater; there was an increase in number of employees and promotion of existing employees. In the production company, interpersonal relations remained the same, workload diminished and employees generally remained at their positions.

**Table 5.** Significance of difference among respondents' industries in regard to analysis of structure of interest groups

Structure	c	R	F	p	k.dsk
Change of management	.389	.421	10.671	.000	.048
Number of employees	.676	.874	159.620	.000	3.089

Source: Author's calculation

Discrimination coefficient indicates that contribution to creating a difference among respondents' industries in regard to structure of interest groups analysis was big with both determinants, i.e. they both had a big difference: number of employees (3.089) and change of management (.048).

Based on the shown table it can be observed that there is a substantial difference among respondents in regard to analyzed data with: management (.000) and number of employees (.000).

**Table 6.** Characteristics and homogeneity of respondents’ industries in regard to analysis of structure of interest groups

Structure	Retail company	Financial institution	Production company	dpr %
Number of employees	same, smaller	bigger	smaller, same	98.470
Change of management	complete, without change	partial	without change, complete	1.530
n/m	32/36	30/31	33/34	
%	88.89	96.77	97.06	

Source: Author’s calculation

Based on the given table and contribution of determinants to characteristics (dpr %) it can be concluded that the biggest contribution is with: number of employees (98.47%), management (1.53%). Homogeneity for retail company is 88.89%, for financial institution 96.77% and for production company 97.06%. Based on contribution of 98.47% for the number of employees and exceedingly high sample homogeneity, a conclusion about changes in number of employees post takeover can be drawn with an especially high certainty.

The biggest changes were observed with analysis of structure of interest groups, thus by interpreting results which are significant it can be concluded that in the retail company number of employees remained at the same level, in the financial institution that number increased, whereas in production company there was a reduction in number of employees.

In the retail company management was completely changed, in the financial institution it changed partially, whereas in the production company the majority of respondents answered that management was not changed.

**Table 7.** Analysis of difference among respondents’ industries in regard to the analysis of employees’ salary

Employee’s salary	c	R	F	p	k.dsk
Salary	.311	.325	5.863	.004	.121
Bonuses and compensations	.551	.613	29.726	.000	.566

Source: Author’s calculation

Discrimination coefficient indicates that the biggest contribution to discrimination among respondents’ industries in regard to employees’ salaries was with, i.e. the difference was the biggest with: bonuses and compensations (.566), salary (.121).

Based on the given table it can be observed that there is a substantial difference with determinants: salary (.004) and bonuses and compensations (.000).

**Table 8.** Characteristics and homogeneity of respondents' industries in regard to employees' salaries

Employee's salary	Retail company	Financial institution	Production company	dpr %
Bonuses and compensations	No	they existed	yes, they existed	82.387
Salary	Higher	higher	lower	17.613
n/m	25/36	25/31	19/34	
%	69.44	80.65	55.88	

Source: Author's calculation

Based on the given table and contribution of determinants to characteristics (dpr %) it can be concluded that there is the biggest contribution with: bonuses and compensations (82.39%), salaries (17.61%). Homogeneity for the retail company is 69.44%, for financial institution 80.65% and production company 55.88%.

Analysis of employees' salaries showed that majority of respondents in the retail company and financial institution answered that there was an increase in salaries, whereas majority of respondents in production company answered there was a reduction in salaries post takeover. Bonuses and compensations were not implemented in the retail company; they were pre-existent in the financial institution, while in the production company they were implemented post takeover.

Production companies in the Serbian market were mostly taken over by large companies whose salary systems mostly included basic salary and overachievement bonuses.

**Table 9.** Analysis of difference among respondents' industries in regard to analysis of employees' professional development

Development	c	R	F	p
Professional development	.192	.195	1.957	.147
Work motivation	.170	.168	1.445	.241
Task completion	.080	.078	.299	.742

Source: Author's calculation

The table shows no substantial difference among industries with analyzed determinants: possibilities for professional development (.147), work motivation (.241), manner of completing tasks (.742).

Based on the analysis of employees' professional development, it can be concluded that there weren't differences among employees of production company, financial institution and retail company. With all three companies, in terms of *professional development* majority of respondents answered that, after takeover, companies invest much more into employees' education, or that they don't feel a difference; in terms of post-takeover *work motivation* there are more opportunities for advancements or they

don't feel a difference; while in terms of *task completion* the majority of respondents answered that employees' suggestions are more appreciated and that more demanding tasks are performed in a team.

**Table 10.** Analysis of difference among respondents' industries in regard to the analysis of employees' satisfaction

Satisfaction	c	R	F	p	k.dsk
Satisfaction prior to takeover	.305	.316	5.373	.006	.179
Satisfaction after takeover	.372	.358	7.140	.001	.169

Source: Author's calculation

Discrimination coefficient indicates that contribution among respondents' industries in regard to employees' satisfaction analysis was biggest with, i.e. the difference was the biggest with: satisfaction prior to takeover (.179), satisfaction after takeover (.169).

The presented table shows a substantial difference with both determinants: satisfaction prior to takeover (.006) and satisfaction after takeover (.001).

**Table 11.** Characteristics and homogeneity of respondents' industries in regard to employees' satisfaction analysis

Satisfaction	Retail company	Financial institution	Production company	dpr %
Satisfaction prior to takeover	Unsatisfied with my job	Satisfied with my job	-	51.437
Satisfaction after takeover	Unsatisfied with my job, Satisfied with my job	Very unsatisfied with my job, unsatisfied with my job, very satisfied with my job	Satisfied with my job	48.563
n/m	30/36	21/31	28/34	
%	83.33	67.74	82.35	

Source: Author's calculation

Based on the given table and contribution of determinants to characteristics (dpr %) it can be concluded that the biggest contribution is with: satisfaction prior to takeover (51.44%) and satisfaction after takeover (48.56%). Homogeneity for retail company is 83.33%, for financial institution 67.74% and for production company 82.35%.

**Employees' satisfaction analysis** in the retail company shows that interest groups expressed a high level of dissatisfaction prior to takeover, whereas post takeover there was a significant change in their level of satisfaction at work. In the financial institution there was extensive worsening of employees' satisfaction, ranging from "satisfied with my job" prior to takeover to *very unsatisfied with my job*\* *unsatisfied with my job*\* post

takeover. In the production company majority of respondents answered “satisfied with my job”, while prior to takeover none of the answers stood out as significant, i.e. all answers related to employees’ satisfaction were equally present.

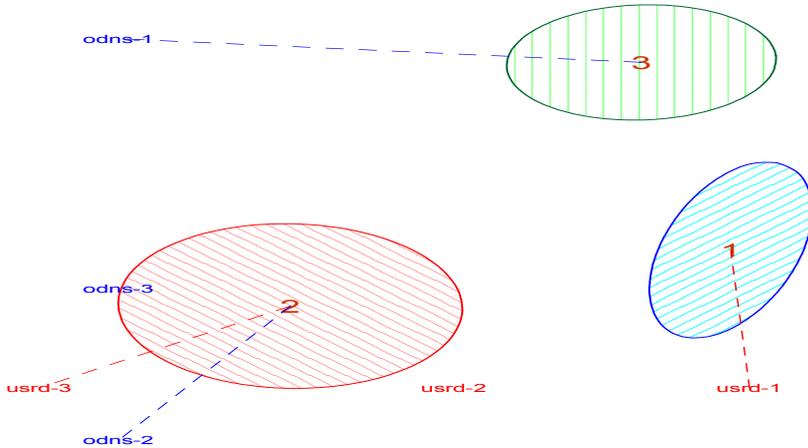
### **Conclusion**

Beside the changes they create in company’s business performances, takeover processes also lead to changes with human resources of target company and company acquirer. Regardless of whether takeover processes are motivated by creating synergy or value of control, managerial decisions lead to changes in all segments of business, and each of those changes regardless if it is directed towards profit increase or cost cuts, downsizing, increasing workload, selling unprofitable parts of company and other activities, has an effect on employees and their satisfaction. Takeover processes with all three industries had a positive impact on increasing employees’ motivation, since there are more opportunities for their advancement and companies, according to employees’ ratings, invest much more into employees’ education post takeover.

Based on research results it can be concluded that the most satisfaction post takeover was reported by production company’s employees, who confirmed that there was downsizing post takeover but on the other hand, there was an implementation of bonuses and compensations that were not existent prior to the arrival of foreign investors. This creates better involvement and dedication of employees in order to achieve higher salary. Although there was an increase in number of employees in the financial institution post takeover, employees expressed less satisfaction mostly due to worsened interpersonal relations and increased workload. Employees in retail industry did not report significant change in their level of satisfaction prior to and after the takeover. Managing organizational climate and culture represents an important segment of due diligence, affecting the success of takeover as confirmed by numerous empirical studies. One of the solutions to help with post-acquisition adjustment is hiring an integration manager whose prevailing role is to reconcile attitudes and behaviour models of employees in previously two separate companies. Also, hiring consultants experienced in acquisition processes could help managers in post-acquisition adjustment. Further research should be directed toward the initial phase – acquisition planning, where it would be necessary to review the very elements that managers consider important when planning integration, and then compare them to the results of post-acquisition assessment of impact on human resources, because such overall analysis of planning period and post-acquisition adjustment period could provide useful guidelines for future acquisition processes.

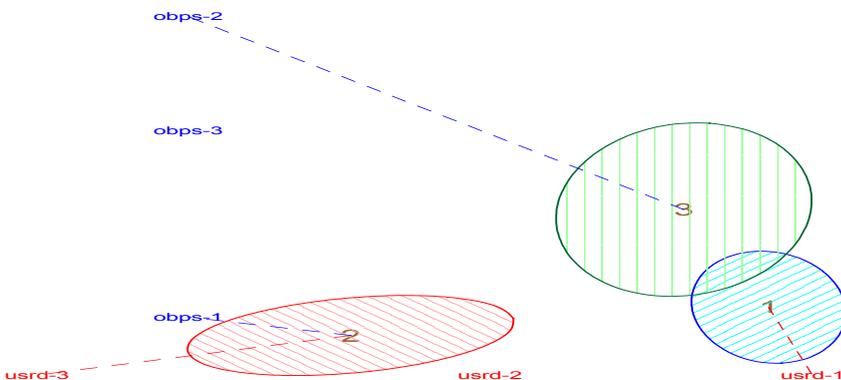
Appendix

**Figure 1.** Ellipses for chosen industries - discriminant determinants: *Working conditions and Interpersonal relations*



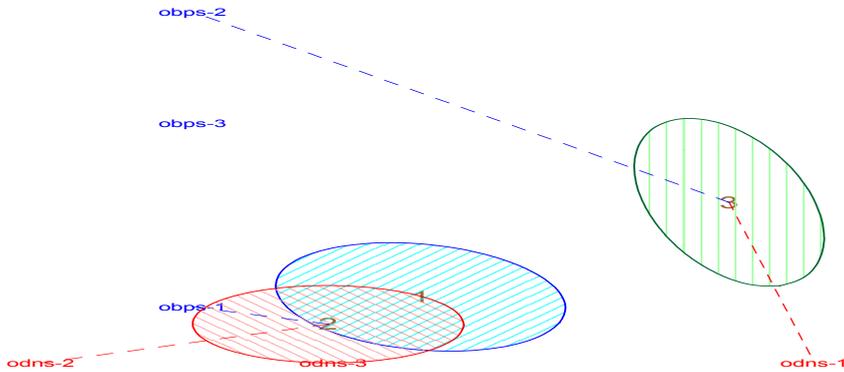
Legend: retail company (1); financial institution (2); production company (3); same (usrd-1); better (usrd-2); worse (usrd-3); same (odns-1); better (odns-2); worse (odns-3). In the graph (1) the abscissa (horizontal axis) is Working conditions (usrd), and ordinate (vertical axis) is Interpersonal relations (odns). Source: Authors' work

**Figure 2.** Ellipses for chosen industries - discriminant determinants: *Working conditions and Workload*



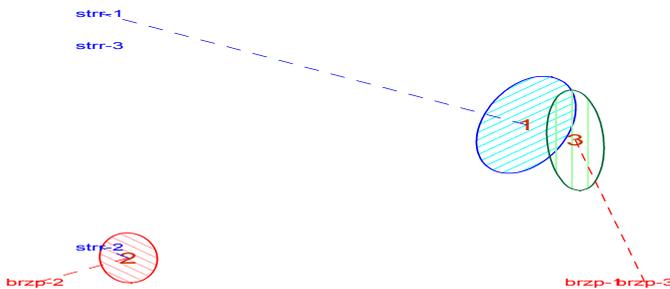
Legend: retail company (1); financial institution (2); production company (3); same (usrd-1); better (usrd-2); worse (usrd-3); bigger (obps-1); smaller (obps-2); same (obps-3). In the graph (2) the abscissa (horizontal axis) is Working conditions (usrd), and ordinate (vertical axis) is Workload (obps). Source: Authors' work

**Figure 3.** Ellipses for chosen industries - discriminant determinants: *Interpersonal relations and Workload*



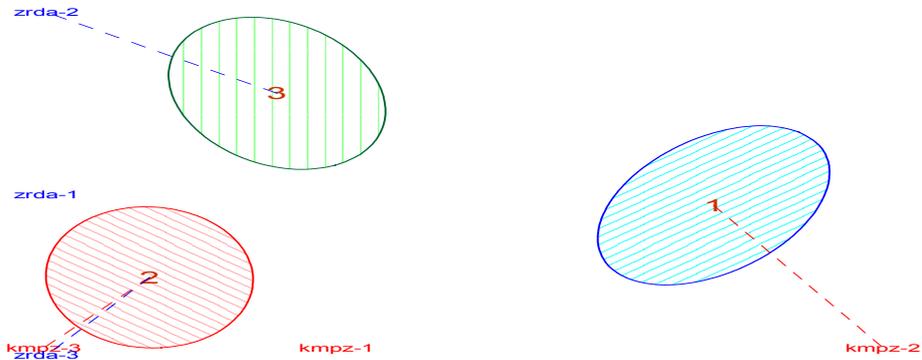
Legend: retail company (1); financial institution (2); production company (3); same (odns-1); better (odns-2); worse (odns-3); bigger (obps-1); smaller (obps-2); same (obps-3). In the graph (3) the abscissa (horizontal axis) is Interpersonal relations (obps), and ordinate (vertical axis) is Workload (obps). Source: Authors' work

**Figure 4.** Ellipses for chosen industries - discriminant determinants: *Number of employees and Change of management*



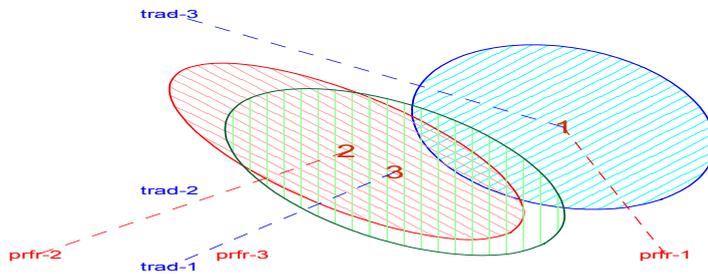
Legend: retail company (1); financial institution (2); production company (3); same (brzp-1); bigger (brzp-2); smaller (brzp-3); without chane (strr-1); partial (strr-2); complete (strr-3). In the graph (4) the abscissa (horizontal axis) is Number of employees (brzp), and ordinate (vertical axis) is Change of management (strr). Source: Authors' work

**Figure 5.** Ellipses for chosen industries - discriminant determinants: *Bonuses and compensations and salary*



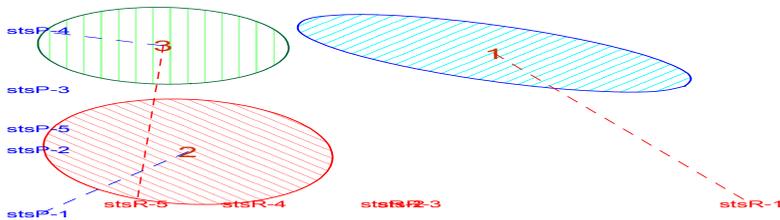
Legend: retail company (1); financial institution (2); production company (3); yes (kmpz-1); no (kmpz-2); they existed (kmpz-3); same (zrda-1); lower (zrda-2); higher (zrda-3). In the graph (5) the abscissa (horizontal axis) is Bonuses and compensations (kmpz), and ordinate (vertical axis) is Salary (zrda). Source: Authors' work

**Figure 6.** Ellipses for chosen industries - discriminant determinants: *Professional development and Task completion*



Legend: retail company (1); financial institution (2); production company (3); bigger (prfr-1); smaller (prfr-2); same (prfr-3); team (trad-1); own (trad-2); without change (trad-3). In the graph (5) the abscissa (horizontal axis) is Professional development (prfr), and ordinate (vertical axis) is Task completion (trad). Source: Authors' work

**Figure 7.** Ellipses for chosen industries - discriminant determinants: *Satisfaction prior to takeover and Satisfaction after takeover*



*Legend: retail company (1); financial institution (2); production company (3); Very unsatisfied with my job (stsR-1); unsatisfied with my job (stsR-2); not satisfied or unsatisfied (stsR-3); Satisfied with my job (stsR-4); Very satisfied with my job (stsR-5); Very unsatisfied with my job (stsP-1); unsatisfied with my job (stsP-2); not satisfied or unsatisfied (stsP-3); Satisfied with my job (stsP-4); Very satisfied with my job (stsP-5); In the graph (6) the abscissa (horizontal axis) is Satisfaction prior to takeover (stsR), and ordinate (vertical axis) is Satisfaction after takeover (stsP). Source: Authors' work*

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## UTICAJ PREUZIMANJA NA ZAPOSLENE - NA PRIMERU PREHRAMBENOG, TRGOVINSKOG I FINANSIJSKOG SEKTORA

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### Rezime

*Procesi preuzimanja podrazumevaju integrisanje različitih organizacionih kultura, naročito ako su u pitanju prekogranična preuzimanja. Na osnovu anketnog upitnika, sprovedeno je istraživanje autora, kako bi se ispitale promene i satisfakcija kod svih interesnih grupa preduzeća koja su preuzeta iz oblasti prehrambene industrije, trgovinske delatnosti i finansijske delatnosti na tržištu Srbije. Metod koji je primenjen prilikom obrade podataka jeste diskriminativna analiza, a rezultati istraživanja su pored tabelarnog prikaza predstavljani i grafički, putem elipsi. Cilj istraživanja jeste ispitivanje razlika o uticaju procesa preuzimanja na različite interesne grupe proizvodnog preduzeća, trgovinskog lanca i finansijske institucije i ocena njihove satisfakcije. Doprinos istraživanja je u informativnoj podršci menadžerima i preduzeća sticatelja i ciljnog preduzeća u budućim akvizicionim procesima, jer analizom razlika, promene i satisfakcije zaposlenih pruža se konkretan odgovor o elementima koji utiču na uspešnost procesa preuzimanja sa stanovišta upravljanja ljudskim resursima.*

**Ključne reči:** *prehrambena industrija, trgovinska delatnost, finansijska institucija, preuzimanje, zaposleni*

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## ECONOMIC PERFORMANCES OF AGRICULTURE OF CEFTA AND FORMER CEFTA COUNTRIES<sup>1</sup>

*Jelena Birovljev<sup>2</sup>, Danilo Đokić<sup>3</sup>, Bojan Matkovski<sup>4</sup>, Žana Kleut<sup>5</sup>*

### Summary

*All CEFTA countries had very similar stages of economic development after World War II. Many of them were centrally-planned socialist economies and the political changes that have occurred in these countries in the late 20th century caused changes in the whole economic system, as well as in the agricultural sector. Aim of this paper is to compare economic performances of agriculture of these countries with former CEFTA countries (Poland, Czech Republic, Slovakia, Hungary, Slovenia, Bulgaria, Romania and Croatia) which joined EU after 2004. The development performances of agriculture are considered according to the production and export performances of this economic sector, using a comparative approach. The results showed that there is a gap in development of agriculture between CEFTA countries and selected EU countries, so performances of agricultural sector are far from EU.*

**Key words:** *Agriculture, Promethee method, Cluster analysis, EU, CEFTA.*

**JEL:** *Q17, Q18, F15*

### Introduction

The economic performance of the agricultural sector is difficult to define precisely and comprehensively. Many authors have considered a variety of indicators to explain this term. Some studies use partial labour productivity, capital productivity and land productivity (Van

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1 The paper presents a part of research on the project: Sustainable Agriculture and Rural Development in terms of the Republic of Serbia strategic goals implementation within Danube region (III 46006), finances by Ministry of Education, Science and Technological Development of Republic of Serbia.

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Passel et al., 2007). In order to evaluate position of Slovakian agriculture in EU (European Union), Szabo and Grznar (2015) used the following indicators – agricultural production for the evaluation of effectiveness, intermediate consumption, fixed assets, labour force, levels of livestock, and supports/subsidies for the rendition of the level of inputs. In their study of the agriculture sector of the Western Balkans, Nikolic et al. (2017) used share of agriculture in total employment, net production index number, balance of agriculture product trade, agricultural gross value added as variables that describe importance of agricultural sector. Usually, unavailability of some data for all observed countries has influence on the selection of variables.

The Central European Free Trade Agreement (CEFTA) is a trade agreement between non-EU countries, members of which are now mostly located in Southeastern Europe. Founded in 1992 by Poland, Czechoslovakia and Hungary, CEFTA has been significantly transformed (Table 1). Its essential purpose, as contained in the founding Treaty signed in Cracow in December 1992 was to liberalize their mutual trade in a timescale which paralleled trade liberalization with the EU (Dangerfield, 2006). Today, members of CEFTA are Serbia, Bosnia and Herzegovina, Montenegro, Macedonia, Albania, Moldova and Kosovo (as UNMIK). Other countries have left CEFTA after their accession to EU.

**Table 1.** Members of CEFTA

<b>Members of CEFTA</b>	<b>Joined</b>	<b>Former members of CEFTA</b>	<b>Joined</b>	<b>Left</b>
FYR Macedonia	2006	Hungary	1992	2004
Serbia	2007	Czech Republic	1992	2004
B&H	2007	Slovakia	1992	2004
Albania	2007	Poland	1992	2004
Moldova	2007	Slovenia	1996	2004
Montenegro	2007	Romania	1997	2007
Kosovo (as UNMIK)	2007	Bulgaria	1999	2007
		Croatia	2003	2013

Source: CEFTA Portal, 2017

CEFTA is very important for Western Balkan countries. As Kikerova (2009) concluded, in only two years of implementation, the CEFTA agreement achieved noticeable positive effect in the form of significant growth of total trade in goods between these countries. On the other hand, CEFTA has played a modest, but useful role in the EU enlargement process, at no stage was there any serious intention (or possibility) that it would be anything other than an interim arrangement to serve a basic market integration function as a part of EU pre-accession (Dangerfield, 2006). Deeper integration within the CEFTA agreement, in preparation for entry into the EU, is crucial purpose of this agreement, because all countries belonging to CEFTA agreement are in different stages of the EU integration process, with the exception of Moldova (Table 2).

**Table 2.** CEFTA countries in process of EU integration

Country	Status	Year	Open negotiations
FYR Macedonia	Candidate country	2005	No
Montenegro	Candidate country	2010	Yes
Serbia	Candidate country	2012	Yes
Albania	Candidate country	2014	No
B&H	Potential candidate	-	No
Kosovo (as UNMIK)	Potential candidate	-	No
Moldova	-	-	-

Source: European Commission, 2017 (ec.europa.eu)

The aim of this paper is identification and comparison of the economic performances of agriculture in current and former CEFTA countries. First, the importance of agriculture in the overall economy will be determined in these countries by the following indicators: the share of agriculture in GDP, the share of agriculture in total employment and the share of agriculture in foreign trade. Then, this paper will provide an answer to the question of difference in economic performances of agriculture of CEFTA countries and former CEFTA countries that became members of EU. Economic performances are observed according to production performances and export performances. Also, the Netherlands, Germany and France are included in analysis as a benchmark due to their overall economic development.

### Materials and methods

Analysis of agricultural performances of CEFTA and selected EU countries is divided in two stages. In the first stage, the goal was to group selected countries by importance of agriculture in their economy. In order to achieve this goal, cluster analysis was performed. Cluster analysis is the modern statistical method of partitioning an observed sample population into relatively homogeneous classes, to produce an operational classification (Stanojević et al., 2017). The objective is to sort observations into groups called clusters so that the degree of statistical association is high among members of the same group and low between members of different groups (Berlage and Terweduwe, 1988). The grouping in cluster analysis was based on the results (scores) calculated according to the characteristic values of all the variables, separately for each observed unit. K-means method was used in this study in order to divide countries in only two groups. The goal of the K-means method is to split the total number of observations into a prearranged number of k homogenous groups based on preferred characteristics (Lattin et al., 2003). The indicators of the agricultural importance in the economic development were used as variables are:

- X1 - Share of agriculture in GDP (%);
- X2 - Share of agriculture in total employment (%);
- X3 - Share of agriculture in total export (%).

In the second stage, the goal was to rank selected countries by economic performances of their agriculture. In order to achieve this goal, the PROMETHEE method was used as

an adequate method for solving problems whose aim is multi-criteria ranking of final set of alternatives based on a number of criteria which need to be maximized or minimized (Nikolić et al., 2017). For each observed alternative it calculate its value expressed in level of preferences. Thereby, each alternative is evaluated based on the two preference flows. Positive preference flow  $\varphi + (P)$  indicate how much is given alternative better than the other (according to all criteria). Accordingly, the higher this preference flow is, the alternative is better. The negative flow of preference  $\varphi - (P)$  indicates how much a given alternative is worse than the rest, and therefore if this flow is lower, the alternative is better. After that, the PROMETHEE method accounts net preference flow  $\varphi (P)$  as the difference between these two flows (Brans, Mareschal, Vincke, 1984; Brans, Vincke, 1985). The multi-criteria analysis was conducted by using the Visual PROMETHEE software package in order to rank selected countries by their performances of agriculture. Economic performances of agriculture are described by variables given in Table 3. Variables Y1, Y2, Y3 and Y4 are indicators of production performances, while other variables are indicators of export performances.

**Table 3.** Indicators of economic performances of agriculture

Mark	Variable	Unit	Description
Y <sub>1</sub>	Structure of resources in agriculture	ha/active farmer	Represented by the relationship land/labour. In the development of agriculture, land/labour ratio is the dominant factor for selection of production technology (chemical-biological and/or mechanical), i.e. it has a crucial influence on preferences towards labour-saving or land-saving technologies.
Y <sub>2</sub>	Land productivity in agriculture	\$/ha	The ratio of value of agricultural products to the area of agricultural land in use. It can be indicator of intensification of production.
Y <sub>3</sub>	Labour productivity in agriculture	\$/active farmer	The ratio of value of agricultural products to the number of active farmers. Higher values indicate more effective absorption of the labour factor in agricultural production, and consequently a higher residual income per unit of agricultural labour
Y <sub>4</sub>	Share of livestock production in total agricultural production	%	The ratio of value of livestock production to total agricultural production. Lower level of this share indicate that agriculture is extensive i.e. the agricultural structure was dominated mainly by lower-value, plant-origin products, which were insufficiently used for conversion into livestock products with higher added values
Y <sub>5</sub>	Export of agricultural products per hectare of agricultural land	\$/ha	The ratio of export value of agricultural products to the area of agricultural land in use. This is indicator of export performances of agriculture.
Y <sub>6</sub>	Export of agricultural products per active farmer	\$/active farmer	The ratio of export value of agricultural products to import value. Higher values indicate better export performances of agriculture.

Mark	Variable	Unit	Description
Y <sub>7</sub>	The export/import coverage of the agricultural products	%	The ratio of export value of agricultural products to the number of active farmers. Values above 100% indicate positive trade balance of agricultural products.

Source: Author

The empirical research was based on the data of the Food and Agriculture Organization (FAO), especially the data related to the resources, production and foreign trade of agricultural products in the period 2011-2013. The data of share of agriculture in gross domestic product (GDP) and GDP per capita were taken from World Bank database.

### Results and discussion

Analysis of economic performances of agriculture in CEFTA and former CEFTA countries is divided in two sections. In first, economic relevance of agriculture is observed, while in second production and export performances are analyzed. Table 3 presents the economic relevance of agriculture in the CEFTA countries, as well as a synthetic indicator of socio-economic development – GDP per capita. According to Nowak and Kaminska (2016), Netherlands, Germany and France are three countries with the highest performances of agricultural sector in EU. Because of that, these countries are included in analysis as a benchmark of the level of agricultural development (Table 4). Beside these countries, the highest level of GDP per capita is recorded in Slovenia (20,729 euro), Czech Republic (17,557 euro), Slovakia (16,089 euro), Poland (12,559 euro) and Hungary (12,366 euro). All of these countries joined EU in 2004.

**Table 4.** Economic relevance of agriculture in the CEFTA countries (average for period 2011-2013)

Country	Share of agriculture in GDP (%)	Share of agriculture in total employment (%)	Share of agriculture in total export (%)	GDP per capita (\$)
Netherlands	1.78	2.30	13.39	44,290
Germany	0.85	1.53	5.62	41,178
France	1.76	2.97	12.55	36,353
Slovenia	2.15	8.47	5.82	20,729
Czech Republic	2.56	3.03	4.62	17,557
Slovakia	3.63	3.20	5.15	16,089
Poland	3.16	12.50	11.44	12,559
Hungary	4.60	4.93	8.79	12,366
Croatia	4.51	12.53	11.34	11,593
Romania	6.26	29.43	9.23	8,981
Bulgaria	5.29	6.63	16.31	6,994
Montenegro	9.44	5.67	15.52	6,408

Country	Share of agriculture in GDP (%)	Share of agriculture in total employment (%)	Share of agriculture in total export (%)	GDP per capita (\$)
Serbia	9.68	21.17	22.01	5,237
FYR Macedonia	10.97	18.23	14.98	4,853
B&H	8.01	21.42	8.37	4,249
Albania	21.71	45.80	4.60	3,945
Moldova	14.33	27.57	41.72	1,848

Source: The authors' calculations on the basis of World Bank and FAOstat. 2017

The least developed countries are current members of CEFTA and all of these countries are part of Western Balkan region, except Moldova. The transformation of the agricultural sector in these countries created a gap not only in agricultural development performances between the countries and the EU countries but also in export performances. Although agriculture's share in the economy has decreased since 2000, it is still relatively more important in the CEFTA than in the EU, both in terms of value added and employment. Rule that in the countries with a lower level of the socio-economic development, agriculture is more important for the economy is once more confirmed (Gajic et al., 2015).

Cluster analysis was performed in order to divide these countries in two groups. The analysis refers to the factors that determine the importance of agriculture in the overall economy - the share of agriculture in total employment, the creation of GDP and exports. Results are shown in Table 5. First cluster includes all countries that are members of EU, except Montenegro. In these countries, importance of agriculture in overall economy is at low level.

**Table 5.** Cluster analysis of agriculture in the CEFTA countries

Cluster 1		Cluster 2	
Country	Distance	Country	Distance
Netherlands	2.99	Romania	5.57
Germany	3.89	Serbia	4.79
France	2.43	FYR Macedonia	5.35
Slovenia	3.01	B&H	6.33
Czech Republic	3.57	Albania	14.03
Slovakia	3.20	Moldova	14.45
Poland	3.96		
Hungary	1.05		
Croatia	3.99		
Bulgaria	3.77		
Montenegro	4.62		

Source: The authors' calculations on the basis of World Bank and FAOstat, 2017

On the other hand, members of second cluster are Romania, Serbia, FYR Macedonia, Bosnia and Herzegovina, Albania and Moldova. Membership in the EU does not mean that it will necessarily get to the agricultural consolidation and the gradual disappearance of small farms. On the contrary, the number of farms with less than 2 hectares in Romania increased (Hubbard et al., 2014). Beside other factors, this probably slow downed the development of Romanian agriculture and placed it in second cluster.

The multi-criteria analysis was conducted by using the Visual PROMETHEE software package in order to rank selected countries by trade and production performances of agriculture. These performances were described by the variables presented in Table 3.

In terms of values of the analyzed variables, the individual countries are characterized by a high degree of differentiation. The variation ranges from about 33% to 275% (Table 6). The greatest diversity of the surveyed units is manifested in the case of variable Y5 – export of agricultural products per hectare of agricultural land (\$/ha) and Y6 – export of agricultural products per active farmer (\$/active farmer), both variables being indicators of export performances. This high level of variation could be expected if export performances of Netherlands (48,103 \$/ha and 467,458 \$/farmer) and Albania (80 \$/ha and 145 \$/farmer) are concerned. The smallest variation was seen in case of variable Y4 – share of livestock production in total agricultural production (%). Interestingly, in period 2004-2014, share of livestock production has declined in most of observed countries, especially CEFTA countries, while Netherlands and Germany still have high level of this share (above 64%). According to Miklos (2014) the decline of the animal sector has serious consequences for the whole sector in Hungary. Beside economic effects, as the total number of livestock units dropped to less than half of what it was in the mid-1980, the lack of enough natural manure makes it more and more difficult to improve the quality of the soils. According to this, it could be concluded that Hungarian livestock products have not be able to compete with same products from “old” EU countries.

**Table 6.** Characteristics of the variables describing the production and trade performances of the agricultural sector of the selected countries

	Y1	Y2	Y3	Y4	Y5	Y6	Y7
<b>Minimum</b>	1.8 <i>Albania</i>	421 <i>B&amp;H</i>	1,857 <i>Albania</i>	21 <i>Macedonia</i>	80 <i>Albania</i>	145 <i>Albania</i>	11 <i>Albania</i>
<b>Maximum</b>	38.86 <i>Montenegro</i>	7,191 <i>Netherlands</i>	69,778 <i>Netherlands</i>	72 <i>Netherlands</i>	48,103 <i>Netherlands</i>	467,458 <i>Netherlands</i>	187 <i>Serbia</i>
<b>Average</b>	17.1	1,262	19,327	43.3	4,145	55,804	97.6
<b>Standard Dev.</b>	12.2	1,577	20,355	14.2	11,398	112,494	55.3

Source: The authors' calculations on the basis of World Bank and FAOstat, 2017

On the basis of The PROMETHEE method, the countries were ranked by development performances of their agricultural sector. Table 7 shows the results of the analysis. Net preference flow ( $\phi$ ) takes the values from -0.6607 to 0.8125. The best rated was the

Netherlands (the value of 0.8125), followed by Germany (0.6864) and France (0.6369). According to this ranking, agricultural sector of these countries is the most developed and therefore taking them as benchmark is justified. Next group are: Hungary, Czech Republic, Slovakia, Slovenia and Poland, the countries that joined EU in 2004. Their net preference flow  $\varphi$  is still above zero. Good performance of their agricultural sector is a result of joining the EU. According to Chrastinová and Burianová (2009) the results achieved by Slovak agriculture in 2004–2007 (i.e. after the integration into the EU) suggest that the income within the sector has improved also due to the inflow of the EU subsidies. In spite of good ranking of Czech Republic and Slovakia, they have one common problem connected with export performances. Czech agricultural production covers the domestic consumption by only 60% to 70% in the case of Slovakia, the situation is even worse, as the domestic production covers the local consumption by only a little more than 40% (Bielik et al., 2013).

Experience of other new EU member states from Central and Eastern Europe shows that price, production and trade can significantly change after accession, as well as during the pre-accession period. The extent of this adjustment occurring before or after accession depends on the pre-accession policy and market adjustments. Crucial tasks for these countries during the accession process are finding niche markets or being cost competitive (Mizik and Meyers, 2013).

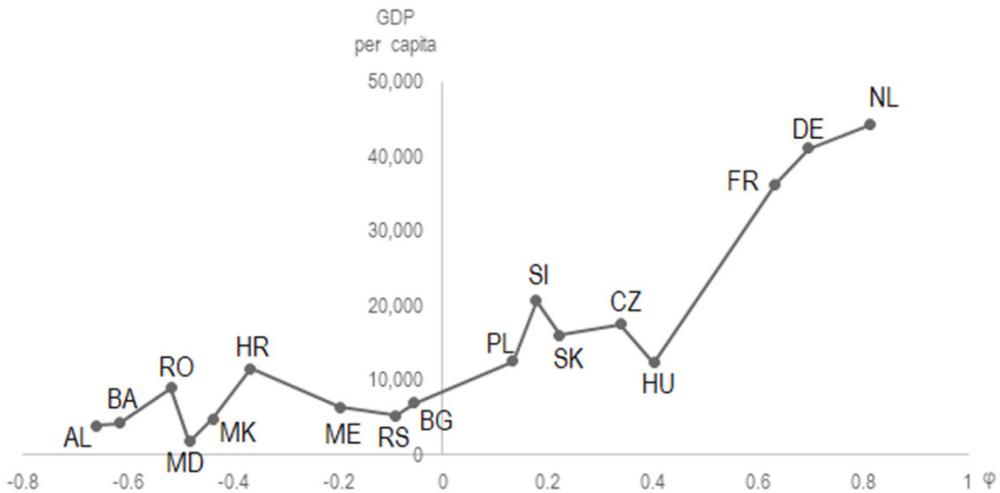
**Table 7.** The classification of the selected countries in terms of trade and production performances of agriculture

Rank	Country	$\varphi$	$\varphi +$	$\varphi -$
1	hh	0.8125	0.9018	0.0893
2	Germany	0.6964	0.8393	0.1429
3	France	0.6339	0.8125	0.1786
4	Hungary	0.4018	0.6964	0.2946
5	Czech Republic	0.3393	0.6696	0.3304
6	Slovakia	0.2232	0.6071	0.3839
7	Slovenia	0.1786	0.5804	0.4018
8	Poland	0.1339	0.5536	0.4196
9	Bulgaria	-0.0536	0.4643	0.5179
10	Serbia	-0.0893	0.4464	0.5357
11	Montenegro	-0.1964	0.4018	0.5982
12	Croatia	-0.3661	0.3036	0.6696
13	FYR Macedonia	-0.4375	0.2768	0.7143
14	Moldova	-0.4821	0.2500	0.7321
15	Romania	-0.5179	0.2411	0.7589
16	Bosnia and Herzegovina	-0.6161	0.1875	0.8036
17	Albania	-0.6607	0.1696	0.8304

Source: The authors' calculations on the basis of World Bank and FAOstat, 2017

All other countries had net preferences flow smaller than zero. Good ranking of Serbia can be explained by export performances of this country, especially positive export/import coverage that is consequences of trade agreements of Serbia with the EU, CEFTA countries and EFTA (Switzerland, Norway, Iceland and Liechtenstein) as well as with Russia, Belarus, Kazakhstan and Turkey. The dominant export market for agricultural products from Serbia is the EU market, where last year exported more than 50% of agricultural products. The second most important market of the region is the market of CEFTA agreement. This structure of exports indicates that the most important markets for Serbia are EU and CEFTA (Ristić and Obradović, 2015).

**Figure 1.** Correlation between GDP per capita and economic performances of agriculture



Source: The authors' calculations on the basis of World Bank and FAOstat, 2017

It is very important to notice that there is a strong positive correlation between the levels of development (observed as GDP per capita) of selected countries and the performances of the agricultural sector (Coefficient of correlation is 0.87). Therefore, it is possible to conclude that among other factors, the level of economic development has a significant impact on economic performance of agriculture (Figure 1).

### Conclusion

The study assesses the economic performances of agriculture of current and former CEFTA. The Netherlands, Germany and France are included in analysis as a benchmark. Two clusters of selected countries were identified, differing significantly in terms of the importance of agriculture in their economy. Importance of agricultural sector is still high in Romania. Therefore, Romania is more similar to CEFTA than EU countries. On the other hand, Montenegro was placed among EU countries. In order to rank development performances of these countries, PROMETHEE method was used. Based on this analysis, countries can be roughly divided into three groups. First group consisted of

the most developed countries that were used as a benchmark. Members of the second group are former CEFTA countries that joined EU in 2004. All other countries are members of the third group. The study showed that there is a gap in development of agriculture between CEFTA countries and selected EU countries. Among EU countries, Bulgaria, Croatia and Romania have the least developed agricultural sector. It can be assumed that effects of EU accession have yet to become visible. On the other hand in CEFTA countries performances of agricultural sector are far from EU. Among these countries, the best ranking has Serbia, and agricultural sector in Albania is the least developed. With respect to all limitations of the study related to definition of economic performances of agriculture, conclusions can be summarized as follows:

- Empirical analyses of agriculture in the CEFTA and selected EU countries indicate a large differentiation between these countries. Among other factors, the level of economic development has a significant impact on economic performance of agriculture. So, economic development of agriculture is determined by the level of socio-economic development.
- Significant difference between production and export performances of agricultural sector of the EU and CEFTA countries indicate that there is a need for adequate instruments of agricultural policy that will improve agricultural sector in these countries before EU assessment. Agricultural policy of CEFTA countries must still be oriented on increasing of productivity of agricultural sector in order to reach out EU and to get chance to compete on EU market.
- In recent years, the EU has been faced with different economic, social and political problems. In addition to the global economic crisis and migrant crisis, the new serious problem is the decision of citizens of Great Britain to leave the EU. In these circumstances, it is unlikely that the further enlargement of the EU will be soon reached. Therefore, the position of the countries that aspiring to join the EU is not favourable. This political-economic trends are forcing these countries to find temporary alternative solutions for achieving higher economic growth. One of the possible solutions is deeper integration within the CEFTA agreement, in preparation for entry into the EU.

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## EKONOMSKE PERFORMANSE POLJOPRIVREDE U CEFTA I BIVŠIM CEFTA ZEMLJAMA<sup>6</sup>

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### Rezime

Svezemlje CEFTE su se nakon II svetskog rata susrele sa veoma sličnim fazama ekonomskog razvoja. Većina ovih zemalja su bile centralno-planske socijalističke ekonomije, a političke promene sa kojim su se susrele krajem 20. veka, uticale su na promene u celokupnom ekonomskom sistemu, pa i u poljoprivrednom sektoru. Cilj ovog rada je komparativna analiza ekonomskih performansi poljoprivrede ovih zemalja i zemalja koje su ranije činile CEFTU (Poljska, Češka, Slovačka, Mađarska, Slovenija, Bugarska, Rumunija i Hrvatska), a koje su se pridružile Evropskoj uniji nakon 2014. godine. Razvojne performanse poljoprivrede su posmatrane sa stanovišta proizvodnih i izvoznih performansi ovog sektora ekonomije, koristeći komparativnu analizu. Rezultat su pokazali da postoji *gap* u razvoju poljoprivrede između CEFTA zemalja i selektovanih zemalja EU, a performanse poljoprivrednog sektora ovih zemalja su daleko od EU.

**Ključne reči:** Poljoprivreda, Promethee metod, Klaster analiza, EU, CEFTA.

**JEL:** Q17, Q18, F15

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- 6 Rad predstavlja deo istraživanja na projektu: Održiva poljoprivreda i ruralni razvoj u funkciji ostvarivanja strateških ciljeva Republike Srbije u okviru Dunavskog regiona (III 46006), finansiran od strane Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije.
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## SUSTAINABILITY OF CHEMICAL SOIL QUALITY IN SOUTHERN MORAVA RIVER VALLEY IN CORRELATION WITH THE FLOODING<sup>1</sup>

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### Summary

*Land as the main edaphic factor, plays a very important role in the production of various field crops, fruit and vine crops. Its role is reflected in the fertility and productivity. Soil fertility includes content available nutrients, such as individual elements, pH and humus. The study of soil quality leads to conclusions about what the land is suitable for cultivation of what kind of culture. This paper presents the results of investigation of changes in soil quality in the South Morava river valley, in correlation with the floods. Different results of pH, humus, nitrogen, phosphorus and potassium, are obtained in the function of time, within the research conducted. Experiment was implemented two years ago, immediately after the flood and six months after the floods, which occurred in May 2014 in the region South Serbia. The methods that were used for the analysis of the soil are: colorimetric, photometric, potentiometric and spectrophotometry. Results show a high degree of sustainability of quality of land intended for the cultivation of field crops. The conclusion is that the soil relatively quickly regenerate their properties after floods.*

**Keywords:** *South Morava river, soil, potassium, phosphorus, humus, flooding*

**JEL:** *Q17, Q52*

### Introduction

The land is diverse and represented smonitza, forest soil, podzol, and there are traces of mountain black soil. The plot is loose surface layer of the earth's crust formed as a product of the geological substrate and the participation of climatic factors (especially

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temperature, water, air movement and gravity) and living beings (particularly important as plant organisms and microorganisms). The land is an integral part of the ecosystem and is situated between the Earth's surface and the wall. It is divided into horizontal layers and different in their chemical, physical and biological characteristics. Quality land has approximately 50% solids and 45% to 5% of mineral and organic substances, and 25% containing water and air (Altieri, et al. 1995). Composition of land directly affects the anatomical structure of plants and their characteristics (Stevovic, 2010), (Stevovic et al., 2009). Depending on the amount of chemical elements present N (nitrogen), P (phosphorus) K (potassium), of humus and pH value depends on the quality of soil. Soil quality is reflected in its fertility, and thus the yield of the plants that grow on the same land, (Stevovic and Calic-Dragosavac, 2010), (Stevovic et al., 2013). If the soil is rich in nitrogen, then the plant will have a normal flowering, better fruiting and reduced yellowing leaves (Altieri, et al. 1995). In order to process the construction of nucleic acids, nucleoproteins and phytate performed properly, the land is required to be rich in phosphorus. However soil is generally low in phosphorus and subsequently carries phosphorous fertilizers (Altieri et al. 1995). To make the plants resist on steres and diseases it is necessary that the land is rich in potassium. Potassium is the essential for cell growth and division in plants (Stevovic et al., 2010). The lack of potassium in the soil causes a disruption in water balance, dry tops or curling of leaves and root rot. Successive changes, such as deficiencies of nutrients in the soil create problems. (Spooler, 2008). Sustainable agricultural intensification is defined as producing more output from the same area of land while reducing the negative environmental impacts and at the same time increasing contributions to natural capital and the flow of environmental services (Pretty, 2008; Royal Society, 2009; Conway, Waage, 2010; Godfray et al., 2010).

The increased amount of moisture in the soil also affects the poor quality of the soil. Flooding can have a very negative effect on land, these effects can be: sludge sedimentation, erosion of agricultural land, loss of nutrients in the soil, which affect fertility. This paper will discuss the sustainability of soil quality in the period before, immediately after the flood, and six months after the floods. This implies that take into account the influence of environmental factors, which comprise the complex factors influencing the land (Krnacova, et al., 2013).

Crop production includes production of all major field crops: wheat, corn, soybean, sunflower, rapeseed and sugar beet with the use of agro-technical measures and the use of latest machinery in agricultural production, with optimal use of chemical protection and respecting the agro deadlines. The cultivation of crops, except for the application of agro-technical measures and soil quality, plays a big role on wer as climatic factors.

### **Materials and metods**

For this work samples of soils, were taken from the grounds of the villages located next to the South Morava river valley. These are the villages Cukovac, Zlatokop, Ribnice and Kupinince.

**Figure 1.** Villages Cukovac, Zlatokop, Ribnice and Kupinince

Source: Online satellite images and maps Vranje, Dubnica, Bresnica, Suvi Do, Ivankovci, Toplac, Bujkovac, Vranska Banja, Katalenac, Durinci etc.

We examined the quality of the soil on which crops are sown in the period before during and after the flood to. Tests the change of the quality of the soils. Type of soil that have been tested is vertisol and sandy soil. Resin is black, clayey soil rich in humus and belong to our fertile soil. The composition and quality of the soil impacts the yield of grown crops. Soil samples that were used for the analysis were tested in the laboratory of Agricultural advisory and extension services in Vranje.

Soil samples were taken from smaller parcels. Soil samples were taken from a depth of 15 cm. Time sampling was after cereal and corn harvest. Colorimetric method is based on the fact that some of the elements in this case K and P, when dissolved in a particular solvent, give characteristically colored solutions, or the colouration arises as a result of the reaction of the given substance and the corresponding reagent. The intensity of the resulting coloration depends on the concentration of the test substance in the solution. By measuring the intensity of the coloring, the concentration of the test element in the solution can be quantitatively determined. The task of calibration is to determine how much the content analyzed of nutrients is significant for the grown crops, as well as the significance of other properties of the soil, to what extent the availability of nutrients is important for cultivated crops. Calibration should show where are the boundaries of weakness and good level of supply of some soil with phosphorus, potassium and other nutrients, (Kovacevic, 2003.). The percentage of humus content in the soil is determined by the formula:

$$\text{Humus (\%)} = \frac{A \cdot 0,514 \cdot 1,2 \cdot 100}{C} \quad [1]$$

Where

A –is the amount of 0.1n  $\text{KMnO}_4$  spent on carbon oxidation in humus  $\text{cm}^3$ ;

1.72 - coefficient for translating carbon into humus because it has been experimentally found that the content of carbon in humus is 58% ( $100: 58 = 1.724$ );

0.514 - coefficient indicating that each  $\text{cm}^3$  of 0,1n  $\text{KMnO}_4$  oxidizes 0,514 g of carbon into  $\text{CO}_2$ ;

100 - coefficient for calculation of percentages;

C - is the mass of the air of dry soil taken for analysis.

$$\text{Nitrogen (\%)} = 0,05 \cdot \text{humus} \quad [2]$$

Results of testing various samples of the soil are analyzed in the period from July 2013 to October 2014. The results are presented in tables 1.

### Results and discussion

The results obtained in this study indicate different soil quality. Table 1 shows the results of the quality of the land on which crops are sown in the period of 2012. The aim was to show the content of nitrogen, phosphorus, potassium and humus in the soil and what is the pH value of such land after harvest.

**Table 1.** The content of various parameters in the examined samples countries (K, P, humus, N and pH in %)

Soil sample	Soil type	pH	Humus, %	N, %	P, %	K, %
Cukovac						
1	Vertisol	5.43	3.58	0.2	10.21	34
2	Vertisol	6.02	2.74	0.17	15.17	11.22
3	sandy soil	5.78	3.14	0.19	12.78	31.23
4	sandy soil	6.42	5.28	0.23	>40	21.14
Zlatokop						
5	Vertisol	5.71	9.14	0.42	>40	18.79
6	Vertisol	5.31	2.45	0.13	20.15	>40
7	sandy soil	4.78	4.85	0.28	37.76	15.22
8	sandy soil	4.79	3.78	0.25	17.87	22.13
Ribince						
9	Vertisol	5.56	8.24	0.39	36.18	35.41
10	Vertisol	5.06	5.15	0.24	19.21	24.31
11	sandy soil	4.49	3.78	0.18	9.48	32.41
12	sandy soil	5.15	2.40	0.12	16.26	10.86
Kupinince						
13	Vertisol	5.09	3.34	0.14	15,24	18.64
14	Vertisol	6.75	9.17	0.46	>40	36.52

Soil sample	Soil type	pH	Humus, %	N, %	P, %	K, %
15	sandy soil	5.45	3.51	0.17	16.92	33.12
16	sandy soil	4.76	4.15	0.29	21.05	14.73

Source: Author's calculation based on the survey data

In soil samples in which K, P, Humus, N and pH were tested before flooding, it is evident that the soil is mostly acidic because the pH is in the range of 4.48-6.42, except in the sample 14 where the pH is 6.75 and that sample the soil has a neutral reaction. Before the flood, the soil was rich in nitrogen. The percentage of nitrogen was in the range of 0.12 in the Ribnice location in the sample of 12 types of soil sandwiches, up to 0.46 in the sample number 14 at the site Kupinince type on vertisol. Percentage K varied in the range of 10.86 in the Ribnice location in the sample number 12 on the sandy soil to up to 40 in the sample number 6 at the Zlatokop site on the same type of soil. Regarding P, its value was from 9.48 in sample number 11 at the Ribnice location on sandy soil, and up to 40% at the location Cukovac in sample number 4 of the same type of soil, in sample number 5 at Zlatokop and Kupininc in the sample number 14 on the vertisol. Based on the obtained results for the values of K and P, it can be said that the soil is mostly of high quality phosphorus and potassium. The percentage of humus in the samples was the smallest at Zlatokop site in sample number 6 and amounted to 2.45, while the highest percentage of humus was at Kupinince site in sample number 14 9.17, in both samples on vertisol.

Table 2 shows the results from the same land parcel located in the valley of the South Morava River, but immediately after the flood. that lasted 15 days, in May 2014. After the flood, it took a long time for land to dried out. The obtained results show a large deviation in terms of soil quality. From the results obtained, Table 2 (before floods) shows a lower level of nitrogen in soil samples at Ribince 0.12 for the sandy soil, at the site Kupinince 0.14 for the type of sand, at the site Cukovac 0.17 for the type of sandblast and ice cream and at Zlatokop, the percentage of nitrogen is 0.13, which is the case with the type of resin. It can be noticed that for the type of soil, the percentage of nitrogen is lower.

**Table 2.** The content of various parameters in the examined samples of the country immediately after the flood

Soil sample	Soil type	pH	Humus, %	N, %	P, %	K, %
Cukovac						
1	Vertisol	5.18	2.85	0.19	9.49	21.75
2	Vertisol	4.86	3.42	0.16	11.73	10.11
3	sandy soil	5.30	2.93	0.14	19.68	>40
4	sandy soil	6.04	5.12	0.18	>40	19.79
Zlatokop						
5	Vertisol	5.36	8.89	0.30	38.14	15.14
6	Vertisol	5.27	2.41	0.11	19.74	>40

Soil sample	Soil type	pH	Humus, %	N, %	P, %	K, %
7	sandy soil	4.18	4.68	0.21	34.47	14.87
8	sandy soil	4.63	3.74	0.22	17	21.74
Ribince						
9	Vertisol	5.43	8.03	0.32	30.17	30.79
10	Vertisol	5.04	5.02	0.17	19.03	23.16
11	sandy soil	4.43	3.76	0.18	12.10	30.91
12	sandy soil	5.13	2.41	0.11	16.02	11.32
Kupinince						
3	Vertisol	5.67	3.32	0.13	15.43	18.01
14	Vertisol	6.64	9.07	0.41	>40	>40
15	sandy soil	5.38	3.51	0.16	16.54	32.18
16	sandy soil	4.69	3.84	0.12	14.78	9.97

Source: Author's calculation based on the survey data.

**Table 3.** The content of various parameters in the examined samples of agricultural crops in the country between October of 2014

Soil sample	Soil type	pH	Humus, %	N, %	P, %	K, %
Cukovac						
1	Vertisol	6	3.61	0.18	10.90	32
2	Vertisol	5.78	2.62	0.13	19.18	13.33
3	sandy soil	6.05	2.54	0.13	18.94	29.87
4	sandy soil	5.82	2.16	0.11	37.97	18.54
Zlatokop						
5	Vertisol	4.82	3.83	0.19	30.28	17.94
6	Vertisol	5.18	2.31	0.12	18.37	38.49
7	andy soil	5.48	3.35	0.17	30.12	10.91
8	sandy soil	6.42	5.35	0.27	25.87	20.83
Ribince						
9	Vertisol	7.5	6.43	0.32	38.54	>40
10	Vertisol	4.92	3.01	0.15	16.86	17.84
11	sandy soil	6.41	4.61	0.23	15.96	37.42
12	sandy soil	6.99	6.02	0.30	23.12	>40
Kupinince						
13	Vertisol	4.49	7.53	0.38	12.59	10.71
14	Vertisol	4.89	3.69	0.18	35.41	34.26
15	sandy soil	4.67	4.24	0.21	20.15	28.77
16	sandy soil	5.58	3.27	0.16	18.43	21.67

Source: Author's calculation based on the survey data.

If we compare the results from Tables 1 and 2 it can be seen that there are no major changes before and immediately after the flood. This means that the land retains its own quality.

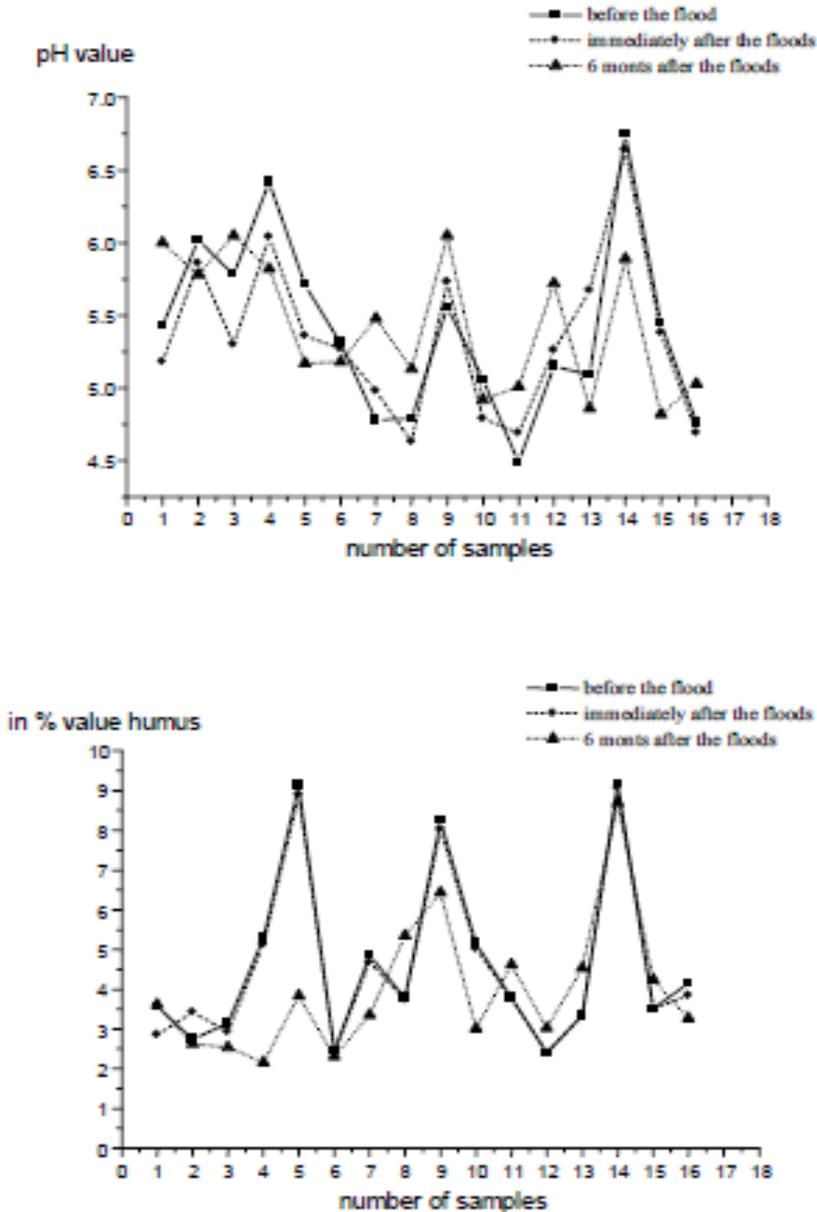
After a certain period, the land, which was flooded, was treated with fertilizers means and the results obtained in Table 3 show the quality of the soil after the application of fertilizers. The Malawi fertilizer subsidy program is a rare example of that has led to substantial changes in farm use of fertilizers and the rapid shift of the soil from food deficit to food exporter (Dorward and Chirwa, 2011).

Based on the results obtained at three periods of observation it can be said that there is a relatively high level of sustainability parameters of soil chemical quality in the South Morava valley, due to the flood occurred in May 2014. Examined soils in the valley of the South Morava river is characterized by a slightly weaker grain size composition on the north side of the study area (samples 2, 3, 4, 6). It represented that soil texture is sandy to sandy loam, while on the south side (samples 8, 9, 12, 13, 15) represented the clay loam soil samples texture. Considering pH of the samples are in the range from acidic (samples 9 and 12) to slightly acidic (samples no. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, and 16). It is believed that these soil samples appropriate acidity and that such soil are suitable for crop farming and orchardings. Studied soils are not calcareous. The humus content in all samples is high except in samples 2, 3, 4 and 6 where it records low values that do not favor the plants. Higher values indicate that the humus soil is favourable for all crops. The quantity and quality of humus in the soil is constantly being renewed, or the amount of new topsoil to replace the old and thus maintains a certain level of humus in the soil, which is intended for planting of some crops. This balance is of great importance for the creation and maintenance of soil fertility. (Altieri, et al. 1995). In this paper, humus content in the examined samples meet the expected value of around 3. The obtained values of humus content in the analyzed samples even moving through third. Changes in the chemical indicators of soil quality (K P N) does not depend only on the type of soil, and whether or not there was flooding, but also depend on the depth, as well as the location, and sampling. How would later plant absorb the amount of these elements in the soil depends on how the plants are arranged and which species are concerned. For example, in the land where he planted a pear, the percentage and the amount of N and P were higher in soil layer 0-20 cm were higher than those in the 20-40 cm soil layers and 40-60, while the percentage of K at a depth of 40-60 cm soil layer was higher than in soil layers 0-20 cm and 20-40. (Xu et al., 2013).

Total nitrogen content is at the level of provision of good, which is a consequence of adequate and appropriate application of fertilizers. Another indication of the input samples of fertilizers in the soil's balance of carbon and nitrogen, which indicates the extent of its availability to the plants. It is an important indicator, or an indicator of the speed of transformation of organic residues, the quality of humic. The nitrogen content in the analyzed samples of the soil ranges from 0.1 to 0.30 % (i.e. from 0.11% to 0.34%), which is the expected value for this area. The potassium content ranged from low values (samples 5 and 6) through the medium (samples 2, 3, 4, 7, 10, 13, 14 and 15), up to high values (samples 1, 8, 16), as well as excessively high values (samples 9, 11, 12,). Soil samples with high potassium content shouldn't be fertilized to avoid saturation that could impact yield and yield quality. Phosphorous (P) is very low in

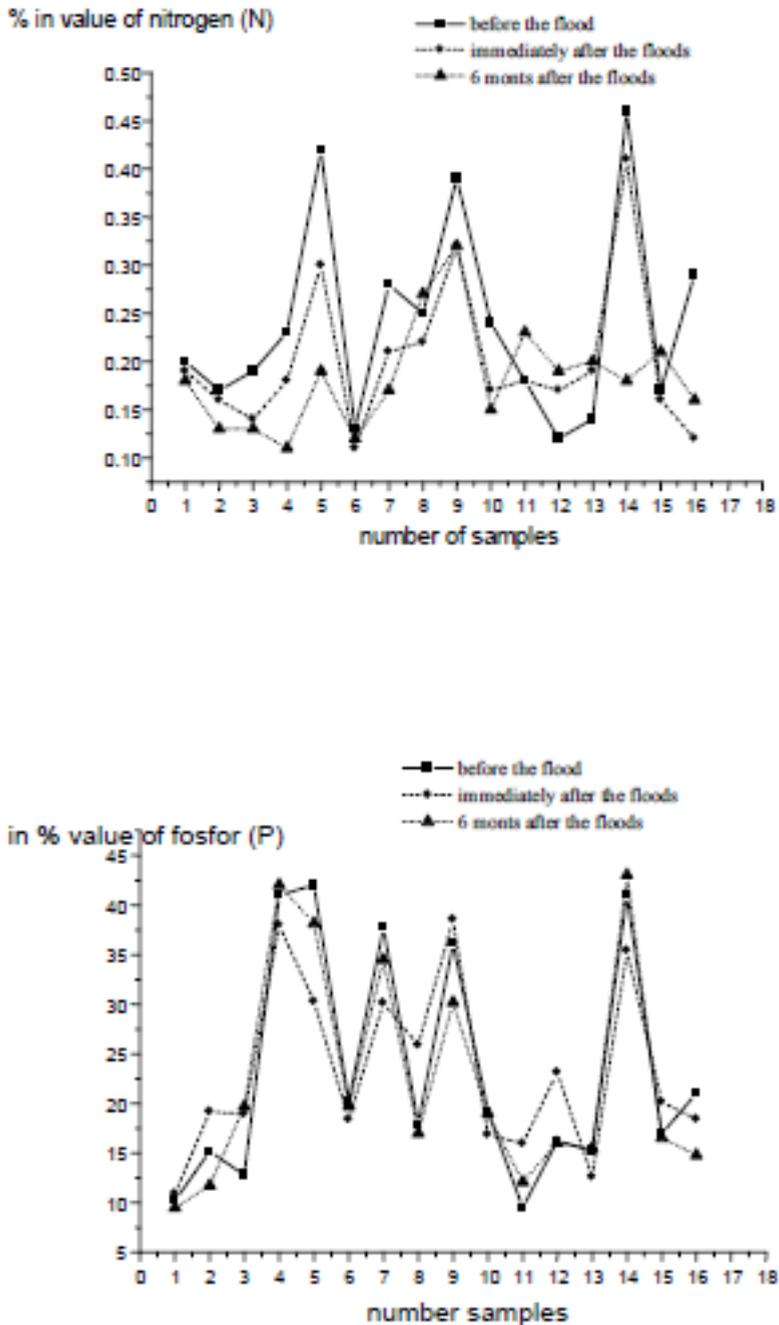
the samples 5, 14, in samples No. 1, 2, 3, 4, 6, 7, 10, 13, 15 and 16, the phosphorus content is moderately high, while in samples 8, 9, 11 and 12 showed high quantity of this element.

**Figure 2.** The contents of soil pH (left), and humus values in% (right) before, immediately after and after the floods



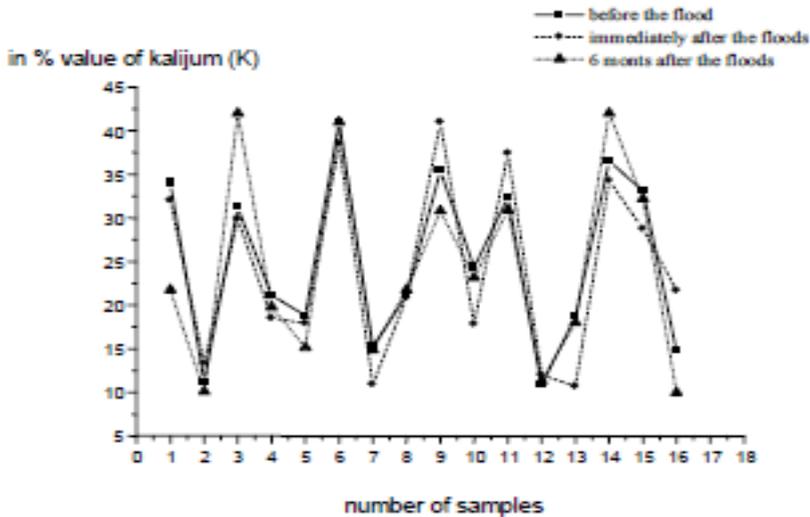
Source: Author's calculation based on the survey data.

**Figure 3.** Content of nitrogen values in % (left) and phosphorous values in% (right) before, immediately after and after the floods



Source: Author's calculation based on the survey data.

**Figure 4.** The content of kalijum values in% before, immediately after and after the floods



Source: Author’s calculation based on the survey data.

In the Figure 2 (Figure 2 left ) it can be seen that the pH value of the soil after the flood, changed the value greatly in comparison with values obtained before flooding. It can be concluded that the soil is more acidic, but not so much that could jeopardize its quality. The graphs in Figure 3 right, and 3 are approximately the same. This means that the sustainability of the nutrient quality of the soils along the valley of the River South Morava not endanger by the floods where water is retained more than 20 days.

On the basis of the results of the soil samples, it can be concluded that chemical property of the soil’s are satisfactory for growing crops, almost at all locations from which samples were taken before and after a flood. Favorable results are influenced by favorable environmental factors, as well as a good geographical position.. The influence of climatic factors in the future will significantly affect the cultivation of crops and will be of fundamental importance for the survival of people (Campbell, 2012).

### Conclusion

This paper is research about the sustainability of soil quality in correlation to flooding. Various soil samples from different locations in the South Morava River valley were examined. Samples were taken after harvest in the period before, immediately after the flood and the 6 months after the flood. The test results that were obtained showed that the samples examined in the region soil of satisfactory quality for growing crops, including even land that was flooded. The soil type is sandy and clays as well as soil type shifts, the results are good. The results showed that the samples of soil mainly with pH around 7, that are acidic; that some samples of soil do not need extra fertilization because they are rich in phosphorus and potassium (phosphorus and potassium have values greater than 40). The results showed that soil is rich in humus because in all

samples the value of humus is around 3-3.5.

On the basis of the research it can be concluded that the growing of crops and other crops are correct and viable strategy of development of the South Morava valley and the entire region of South Serbia. The analyzed region in the long-term plans can be considered good for farming because the land has a certain quality that is sustainable even in conditions of extreme floods. Due to long-term sustainability, agriculture investment in this region is feasible.

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## ODRŽIVOST KVALITETA ZEMLJIŠTA U DOLINI REKE JUŽNA MORAVA I KORELACIJA SA POPLAVAMA

*Jelena Markovic<sup>4</sup>, Svetlana Stevovic<sup>5</sup>*

### Rezime

*Zemljište kao glavni faktor, igra veoma važnu ulogu u proizvodnji raznih ratarskih kultura, voća i povrća. Njegova uloga se ogleda u plodnosti i produktivnosti. Plodnost zemljišta obuhvata sadržaj dostupanih hranljivih materija, kao što su, pH, N, K, P i humusa. U radu su prikazani rezultati istraživanja promena u kvalitetu zemljišta u dolini Južne Morave, u korelaciji sa poplavama. Istraživanja koja su sprovedena, pokazala su da su parametri pH, N, K, P, u funkciji vremena. Eksperiment je sproveden pre dve godine, odmah posle potopa i šest meseci nakon poplava, koje su se dogodile u maju 2014. godine u regionu južne Srbije. Metode koje su korišćene su: kolorimetrijske, fotometrijske, potenciometrijske i spektrometrijske. Rezultati pokazuju visok stepen održivosti kvaliteta zemljišta namenjenog za gajenje ratarskih kultura. Zaključak je da se zemljište relativno brzo regeneriše nakon poplava.*

**Ključne reči:** *Južna Morava, zemljište, kalijum, fosfor, humusa, poplave.*

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## THE CHANGES IN THE USAGE OF AGRICULTURAL LAND IN EASTERN REGION OF REPUBLIC OF MACEDONIA BETWEEN 1991 AND 2030

*Mile Peshevski<sup>1</sup>, Zoran Milovancevic<sup>2</sup>*

### Summary

*This paper will present the analysis of the degree of changes in the usage of agricultural land in Eastern region of Republic of Macedonia. The basis for this analysis is statistical data for previous 23 years (1991 - 2013). The forecast presented here will encompass period of following 17 years, i. e by the year 2030. The method used in this process is trend extrapolation.*

*Our calculations predict relatively large positive or negative changes in the future use of land. Different degree of changes can be seen among different arable crops. The usage of agricultural land shows negative changes in every category on regional level.*

**Key words:** *Eastern region, agricultural land, trend analysis.*

**JEL:** *Q01, Q15*

### Introduction

Total surface area of Republic of Macedonia is 25,713 km<sup>2</sup>. Out of that, 1.9% is water and the rest is land. Its land area has most diverse geomorphologic terrain structure. According to Markovski (2004), lowland area takes 20.3% (5,064.7 km<sup>2</sup>), highland area 30.5% (7,598.6 km<sup>2</sup>) while the remaining 49.2% are mountains. This categorizes Republic of Macedonia as mountainous country.

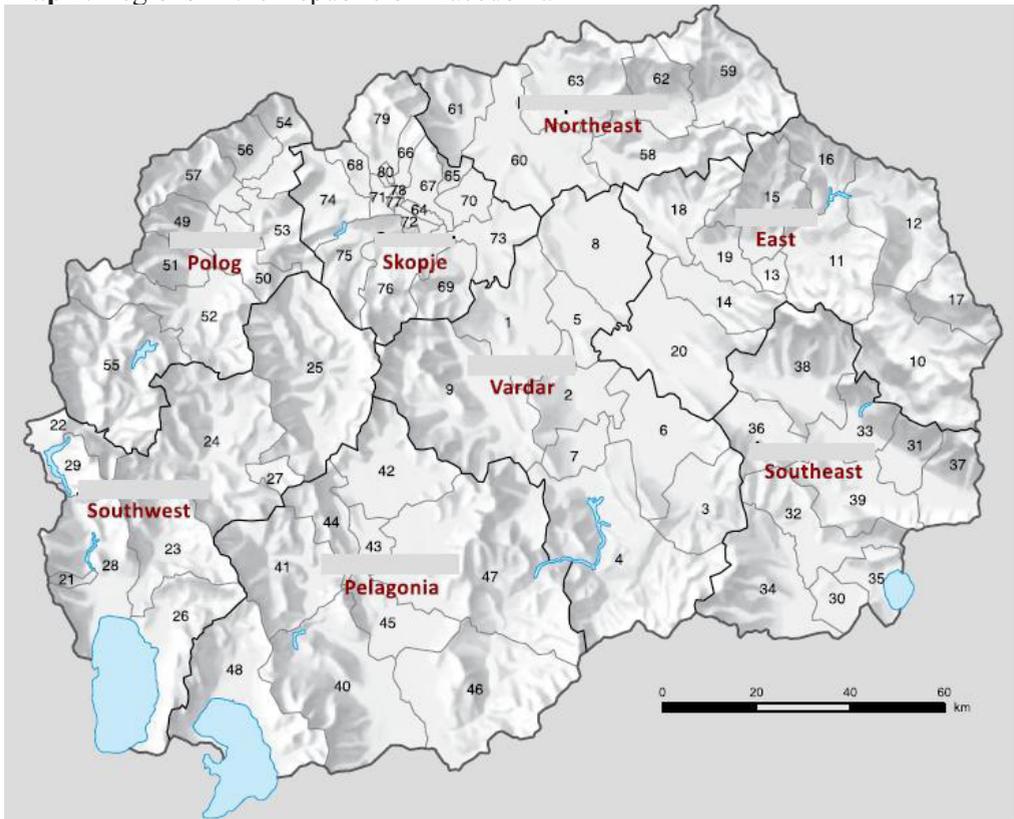
In December 2007, Government of the Republic of Macedonia adopted the Nomenclature of Territorial Units for Statistics - NTES (“Official Gazette of the Republic of Macedonia” No. 158/2007). NTES consists of 5 levels: NTES level 1 and NTES level 2 represent the whole territory of the Republic of Macedonia as an administrative unit, NTES level 3 consists of 8 non-administrative units – statistical

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regions (Map 1) that are formed by grouping the municipalities as administrative units of lower level, NTES level 4 consists of 80 municipalities as administrative units, and NTES level 5 consists of 1,767 settlements.

Eastern region encompasses 11 municipalities: Berovo, Vinitsa, Delchevo, Zrnovtsi, Karbintsi, Kochani, Makedonska Kamenitsa, Pehchevo, Probishtip, Cheshinovo-Obleshevo and Shtip with 217 inhabited places. According to estimation from SSORM (2015c), on 30.06.2014 this area had 177,700 inhabitants, or 8.6% out of country's total population (2,067,471 inhabitants). Average population density in Macedonia is 83.0 inhabitants per km<sup>2</sup>, the lowest is in Pelagonia region (49.1 inhabitants /km<sup>2</sup>) and the highest in Skopje region (339.7 citizens/km<sup>2</sup>). In Eastern region population density is 50.2 inhabitants/km<sup>2</sup>.

**Map 1.** Regions in the Republic of Macedonia



Sources: SSORM (2015a)

According to the data from SSORM (2014b) for added gross value in agriculture on country's level for 5 years (2009-2013), the South-East region had the biggest share of 30.3%, followed by the Pelagonia region with 20.0%, while the South-West region had the smallest share - 3.8%. Eastern region had 8.0% share. The South-East region had dominant share in total value of crop output in the Republic of Macedonia with 34.9%, while Eastern region had 8.6%. While the Pelagonia region was the largest contributor

to the total value of animal output with 20.3%, Eastern region contributed with 11.6%. When it comes to vegetable output, the largest value (above 50%) was produced in vegetables, then fruits (14.6%), crops (12.4%) and the last are vineyards (through wine production) with only 4.9% share in total value (average: 862.9 mil. EUR).

During previous years (2009 - 2012) there was an increase of total investments in basic funds. They grew from 1,331.2 mil. EUR in 2009 to 1,714.5 mil. EUR in 2012, i.e. 28.8% (SSORM, 2015c). The most resources (60.5%) from these funds (average of 91,243 million MKD) were invested in Skopje region, while Eastern region got only 6%. Relatively small investments were made into agriculture, forestry and fishery - only 3% of total investments (average of 2,465 million MKD). Unlike the increase of investments in total, here we can see the decline of investments, from 3,123 million MKD in 2009 to 2,221 million MKD in 2012. On the other side, the most resources from these funds were invested in Pelagonia region, while Eastern region got 9% of total investments. Although investments are small, agriculture nevertheless has relatively high share in country's GDP. For last 13 years (2000 - 2012) its share was 10.1% on average, varying between 8.9% in 2007 and 11.6% in 2004 (SSORM, 2015a).

In the Republic of Macedonia, agriculture has significant role which is supported by the fact that in 2014, over 49% (1,263,155 ha) out of total surface area was used for agriculture production (SSORM, 2015a).

The highest percentage (20.8%) of agricultural land is in Pelagonia region and the lowest in Skopje region - 6.3% out of total agricultural land. Eastern region had 14% share in total agricultural land area. The initial analysis of usage of agricultural land showed that this share is decreasing each year. The reasons for this are residential development, infrastructure facilities etc. but also emigration from rural areas.

The goal of this paper is to determine the degree of changes in usage of agricultural land in Eastern region for previous years (1991 - 2013). After that, we will present the prediction for development in agricultural land for following period (by 2030) on the basis of these changes.

### **Materials and Methods**

To realize established goal, we used secondary data published by State Statistical Office of the Republic of Macedonia (SSORM) in Statistical review: Field crops, orchards and vineyards. Starting year is 1991 - that is the year when Republic of Macedonia gained independency and left former Yugoslavic Republic - and the final year is 2013. We believe that this period of 23 years is good enough base to predict future trends for agricultural land development. Trend analysis is a mathematical technique often used to predict future events. This analysis helps to determine if the values generally increase or decrease (getting "better" or "worse"). In statistical terms this is a determination of whether the probability distribution from which they arise has changed over time. Trend analysis is a special case of regression analysis where the dependent variable is the variable to be forecasted and the independent variable is time.

Equation for a trend line,  $F = a + bt$

Where:  $F$  – forecast,  $t$  – time value,  $a$  – y intercept,  $b$  – slope of the line

$$b = (n\sum XY - \sum X\sum Y) / [n\sum X^2 - (\sum X)^2]$$

This equation describes a straight line,  $Y$  represents area and  $X$  represents time. Linear regression is slow to recognize turning points and step function shifts in land use. Linear regression fits a straight line to the data, even when the data is seasonal or better described by a curve. Forecast specifications:  $n$  equals the periods of history of land use that will be used in calculating the values for  $a$  and  $b$ .

During this research, we used several statistical methods, common for these kind of research. The information was analyzed with the help of MS-Excel (2013).

## **Results and discussion**

### **The usage of agricultural land from 1991 to 2013**

The terrain in Eastern region (3,566.7 km<sup>2</sup>) varies from lowland (26,9%) to highland area with hills 200-500 AMSL. According to Markovski (2004), out of total area, 2.300,12 km<sup>2</sup> is lowland terrain (500-1000 AMSL) and 233,07 km<sup>2</sup> is low mountain area (1000-2000 AMSL).

The terrain, according to Panov (1998), is vertically placed between 225 AMSL and 1.130 AMSL. The lowest point is cadastral municipality Cheshinovo (municipality Cheshinovo-Obleshevo). Agricultural land in cadastral municipality Zelengrad (municipality Probishtip) is on the highest point and also the area where the Eastern mountain region is. However, the Eastern region area has relatively large natural resources for agricultural production. Namely, over 51% of area is agricultural land and over 50% of that land is cultivated (Table 1). Unfortunately, distribution of land for pasturage is almost the same as for cultivation. If you add the meadow area into this correlation, then the production of crops (hay) grows to 54.5% of agricultural land. This presents good basis for livestock farming, especially for cattle, sheep and goat farming. The analysis of this category of land per municipality showed that the highest prospects for developing milk production by increasing the number of dairy animals (cows, sheep and goats) have Berovo, Shtip and Kochani municipality and the lowest Zrnovtsi municipality.

**Table 1.** Agricultural area by category of usage, 1991-2013 by municipalities

Municipalities	Agricultural land	Cultivated land					Pastures
		Total	Arable land and gardens	Orchards	Vineyards	Meadows	
Berovo	37204	14619	9249	1173	0	4197	22583
Vinitsa	15416	8322	7118	273	286	645	7093
Delchevo	22679	12534	10199	801	9	1526	9708
Zrnovtsi	1585	1514	1441	35	29	8	70
Karbintsi	7860	7161	6549	159	342	111	700
Kochani	25293	9968	9239	204	280	245	15327
Makedonska Kamenitsa	4752	3542	3162	118	0	261	1210
Pehchevo	8060	5047	3094	512	0	1441	3013
Probishtip	18483	9379	8436	128	263	552	9100
Cheshinovo-Obleshevo	7434	6468	6145	87	154	82	960
Shtip	34762	13842	12740	201	732	212	20903
<b>Total ER*</b>	<b>183528</b>	<b>92396</b>	<b>77372</b>	<b>3691</b>	<b>2095</b>	<b>9280</b>	<b>90667</b>
<b>Total RM**</b>	<b>1234160</b>	<b>585999</b>	<b>485649</b>	<b>16756</b>	<b>26806</b>	<b>56788</b>	<b>648161</b>
<b>Participation ER in RM (%)</b>	<b>14,9</b>	<b>15,8</b>	<b>15,9</b>	<b>23,6</b>	<b>7,8</b>	<b>16,3</b>	<b>14,0</b>

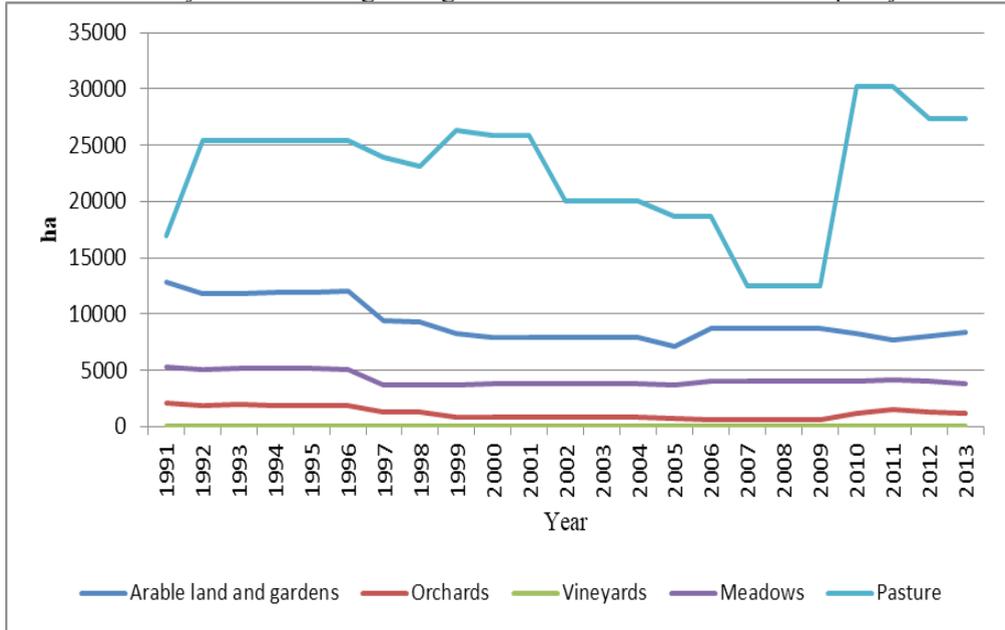
\*Eastern Region

\*\* Republic of Macedonia

Sources: SSORM (2014a)

The analysis of usage of agricultural land for previous years (1991 – 2013) showed that it has relatively large oscillations from year to year. These yearly oscillations in usage of agricultural land are the most evident for pasture land, while other categories are more stable. The intensity of yearly oscillations in usage per municipalities is different. The Chart 1 shows example for Berovo municipality, the largest one in Eastern region, and its volume of agricultural land. During researched period (1991 – 2013), the agricultural land in Berovo municipality varied between 25,784 ha (2007) and 44,713 ha (1993), or the interval of 18,529 ha and  $Cv=16.8\%$ . The meadow area had relatively stable movement ( $Cv=13.6\%$ ). On the other side, big oscillations from average value can be seen for orchards ( $Stdev=502$  ha;  $Cv=42.8\%$ ). Here, maximum was 2,132 ha (1991), and minimum was in 2006 (583 ha), after which the area grew again to 1,216 ha in 2013.

**Chart 1.** The dynamics of usage of agricultural land in Berovo municipality



Sources: SSORM (1992-2014) and personal calculations

The arable land and gardens can be seen mostly in Sthip, Delchevo, Berovo and Kochani area and rarely in Zrnovtsi municipality. This means that the first four municipalities have the best prepositions for development of vegetable, industrial and pasturage (annual and perennial) arable crops, unlike the last municipality.

### Changes in usage of land for agricultural production

The agricultural production mainly takes place in gardens, arable land, meadows and pastures. But in practice there are cases where perennial crops are uprooted. This happens when the plantation is amortised. For a year or two after, instead of new plantation, annual or bi-annual agricultural crops are planted. There are also situations when orchards and vineyards are cultivated on arable land, gardens, meadows or pasturage areas.

In any case, Eastern region has plenty annual crops. However, State Statistical Office doesn't evident every crop area but only those areas larger than 0.1 ha. Because of that, the statistical evaluation is missing 28,516 ha, that is – data encompasses only 145,803 ha out of 174,319 ha in total (Table 1). This is the reason why our research encompassed only 28 crops.

**Table 2.** The changes in crop areas (ha)

Plants	Municipalities											Change (2030 to 1991-2013), %	
	Berovo	Vinitsa	Delchevo	Zrnovisi	Karbintsi	Kochani	M. Kamenitsa	Pehchevo	Probishtip	Cheshinovo-Obleshevo	Shtip		Total
Wheat	0	0	799	288	0	0	3	414	0	727	0	2231	-82,5
Rye	135	0	0	3	0	0	3	77	0	0	0	218	-91,8
Barley	0	0	1048	448	1749	0	326	128	427	972	630	5728	-42,3
Oats	0	0	142	0	0	0	0	107	0	0	0	249	-87,7
Maize	72	352	561	426	314	0	16	76	107	1270	0	3194	-14,7
Rice	0	0	0	0	285	0	0	0	0	3211	0	3496	-13,8
Sunflower	0	0	0	0	0	0	0	0	0	0	0	0	-100,0
Tobacco	63	0	0	274	449	149	13	0	0	0	0	948	-2,3
Poppey	0	80	0	8	99	0	0	0	0	0	0	187	70,0
Potatoes	1509	0	177	178	0	365	39	430	33	233	0	2964	-6,7
Onions	23	0	0	8	0	15	0	21	0	134	95	296	-24,1
Garlic	5	0	2	6	0	57	0	7	0	12	0	89	-50,6
Beans	80	0	127	68	0	82	16	67	0	170	0	610	-54,2
Peas	0	6	0	40	0	0	0	0	0	67	0	113	28,4
Lentil	0	2	0	0	0	0	0	0	0	0	0	2	-97,0
Cabbage	32	0	32	11	0	20	0	6	0	95	0	196	-27,1
Tomatoes	28	0	20	18	0	96	2	20	5	105	0	294	-54,8
Peppers	10	0	41	70	0	174	2	15	0	402	0	714	16,3
Cucumbers	0	4	0	0	0	41	0	0	0	0	12	57	14,0
Melons and watermelons	0	0	0	12	0	0	0	0	76	20	140	248	-55,2
Clover	0	0	0	0	0	0	0	0	0	0	13	13	-93,4
Alfalfa	101	21	192	99	369	0	57	172	92	562	304	1969	-9,0
Vetches	0	0	46	1	1	0	0	53	0	161	0	262	-67,8
Fodder peas	0	17	2	0	0	0	0	0	0	0	0	19	-54,8
Fodder maize	0	0	0	0	133	0	0	0	0	0	0	133	43,0
Fodder beet	0	0	3	0	0	0	0	13	0	0	0	16	-68,6
Meadows	5028	629	831	12	0	124	293	2463	466	124	0	9970	-5,3
Pastures	20718	9938	8796	0	0	9244	1304	15586	0	0	6786	72372	-17,4
<b>Total</b>	<b>27804</b>	<b>11049</b>	<b>12819</b>	<b>1970</b>	<b>3399</b>	<b>10367</b>	<b>2074</b>	<b>19655</b>	<b>1206</b>	<b>8265</b>	<b>7980</b>	<b>106588</b>	<b>-26,9</b>

Sources: Personal calculations

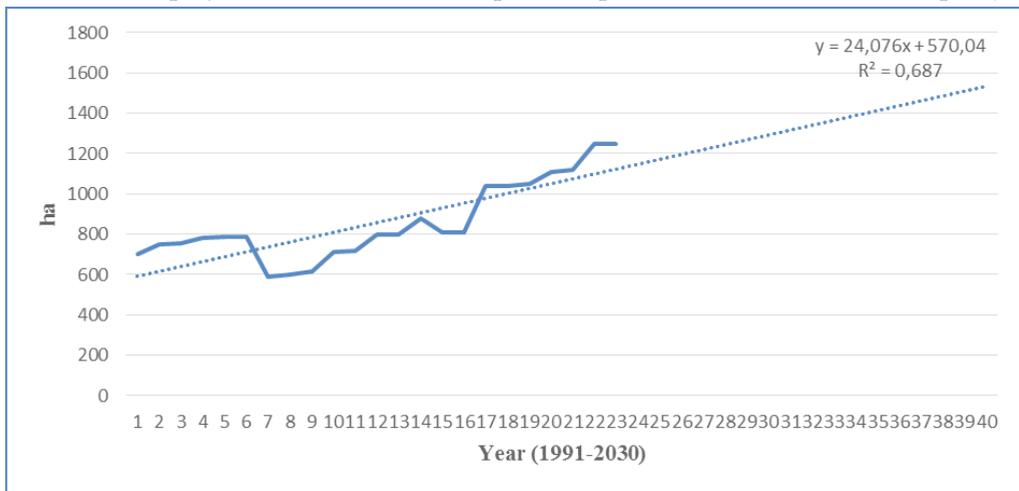
The analysis of data for last 23 years showed that every crop area has relatively high oscillations in volume of land used for its cultivation respectively. The intensity of oscillations has positive or negative impact on trend for following period by 2030. Unfortunately, for large number of arable cultures, negative impact is more expressed than positive one (Table 2). By 2030, in Eastern region the area that had been used for crops production (1991 – 2013) will decrease for 39,215 ha, or 26.9%. The results from the trend analysis showed that by 2030, there will be no sunflower production. There will be almost no rye, lentil or alfalfa. The smallest decrease is expected for tobacco (only -2.3%). On the other hand, 70%

increase can be expected for poppy, 43% for feed grain etc.

In the next part of this paper we will give an example of changes in area for potato production. In Eastern region during the previous period, potato production used average land area of 2,988 ha, or 22.2% of total land area in the country. The largest area (28.7%) was in Berovo municipality and the smallest (2.6%) in Probishtip municipality.

During previous years there was an increase in land area for potato production that happened almost each year in Berovo municipality. Out of 700 ha in 1991, the total area increased to 1250 ha in 2013, while deviations from average value (859 ha) were 22%. As a result of constant increase during researched period, the trend of positive changes will continue by year 2030 (Chart 2).

**Chart 2.** The projection for land area for potatoes production in Berovo municipality



The land area for potato production in Berovo municipality grows every year for 24 ha. As a result, the total land area in 2020 will be 1,268 ha and by 2030 it will be 1,509 ha.

### The changes in usage of land for orchards and vineyards

During the researched period (1991 - 2013) in Eastern region orchards were cultivated on 3,691 ha (Table 1) on average, or 22% of total area in the Republic of Macedonia (SSORM, 2015a). But, according to information from statistical reviews (SSORM, 2014a), there is only 972.7 ha, or less than 19.5% orchards out of total land area. The difference of 718.3 ha is the result of the fact that SSO doesn't review orchards smaller than 0.1 ha.

However, during previous time period there can be seen positive tendency in changes for large number of fruit varieties. Consequently, the same varieties will continue this growing trend for the following period until 2030 on regional level (Table 3). Other fruits on municipal level will disappear. The largest negative changes on regional level will happen for pears, and the least for plums. On the other hand, the largest positive changes will happen for cherries and the least for sour cherries.

**Table 3.** The changes for orchards and vineyards areas (ha)

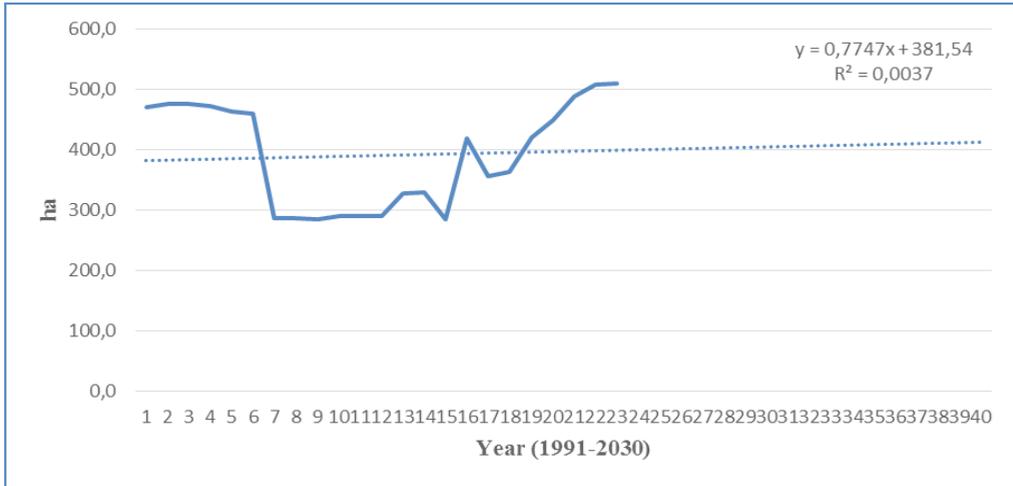
Type of orchards and vineyards	Municipalities												Change (2030 to 1991-2013), %
	Berovo	Vinitsa	Delchevo	Zrnovtsi	Karbintsi	Kochani	M. Kamenitsa	Pehchevo	Probishtip	Cheshinovo-Obleshevo	Strip	Total	
Cherries	0,0	7,9	12,2	5,4	0,2	0,0	9,5	20,2	2,3	143,1	38,5	239,3	173,17
Sour cherries	0,0	0,0	58,7	2,0	532,1	70,9	1,4	0,0	0,2	113,2	35,2	813,7	9,05
Quinces	0,2	1,9	2,6	0,2	0,0	0,6	0,6	0,0	0,2	1,3	0,1	7,7	-16,30
Apricots	0,0	4,2	4,0	2,0	8,9	0,0	0,7	0,0	4,0	5,0	9,3	38,1	32,29
Apples	25,1	9,6	0,0	0,0	1,4	18,3	8,1	32,5	5,5	6,7	2,5	109,7	-47,98
Pears	0,0	0,0	22,5	6,7	7,9	0,0	17,3	9,7	15,2	6,5	0,0	85,8	-66,38
Plums	411,8	90,5	366,2	15,9	35,0	88,9	93,9	43,1	41,8	43,1	41,9	1272,1	-4,13
Peaches	0,0	2,3	3,6	3,2	20,6	0,0	1,3	0,0	1,5	0,0	5,1	37,6	-15,88
Walnuts	0,0	41,4	95,9	0,0	27,8	33,9	40,2	50,1	86,6	16,3	29,8	422,0	60,33
<b>Total orchards</b>	<b>437,1</b>	<b>157,8</b>	<b>565,7</b>	<b>35,4</b>	<b>633,9</b>	<b>212,6</b>	<b>173,0</b>	<b>155,6</b>	<b>157,3</b>	<b>335,2</b>	<b>162,4</b>	<b>3026,0</b>	1,79
<b>Vineyards</b>	<b>0,0</b>	<b>389,7</b>	<b>4,9</b>	<b>0,0</b>	<b>464,8</b>	<b>0,0</b>	<b>0,0</b>	<b>0,0</b>	<b>225,5</b>	<b>12,8</b>	<b>0,0</b>	<b>1097,7</b>	-41,6

Sources: Personal calculations

The average size of land used for plums production during last period in Berovo municipality was 390.8 ha which coincides with 128,975 trees. For future years, on regional level, the highest increase in size of land used for plums production will happen in Berovo municipality (Chart 3). Yearly increase will amount to average of 0.8 ha. Total land area by 2020 will be 404 ha, and in 2030, 411.8 ha which is related to increase of 5.4%.

The research showed that for the last 23 years vineyards in Eastern region grew on 1,880.4 ha on average, with 2,732 trees per hectare on average. In the following period, there will be continuous decrease in size of the land used for vineyards. By 2030, there will be 1,097.7 ha, or 41.6% less than average size of the land used for vineyards.

**Chart 3.** The projection for land area for plum production in Berovo

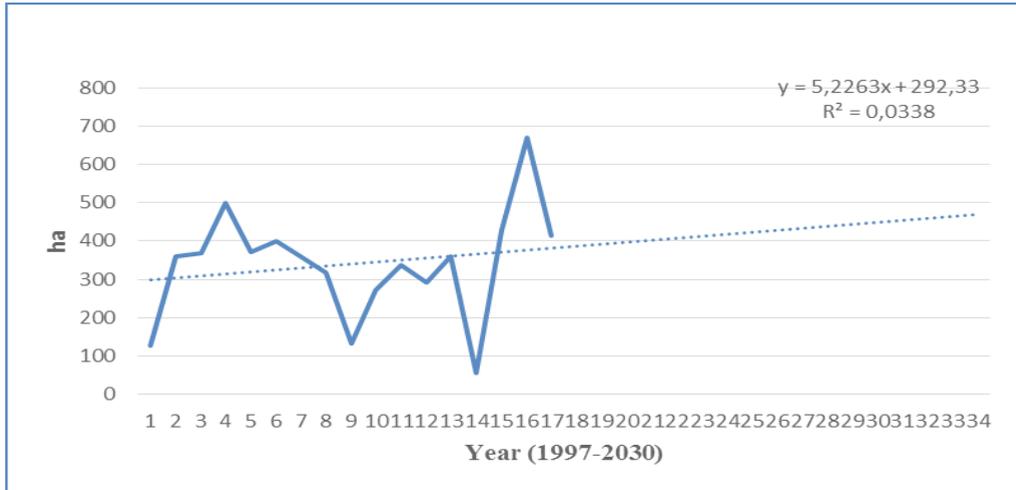


The largest size of land used for vineyard cultivation in Eastern region will be in Karbintsi municipality. Karbintsi municipality, which was part of Shtip municipality until 1997, will have dominant share in total land area used for vineyards in Eastern region (42.3%). Here, the land size used for vineyards will be increasing by 5.2 ha until it reaches 464.8 ha in 2030 (Chart 4).

### Conclusion

Due to the methodological reasons, Eastern region and the rest of the country, has differences in land surfaces which are presented according to the category of usage (Table 1) along with those land surfaces that are presented as land per arable crop (Table 2 and 3). Consequently, the land surface used for crop and vegetable production is 37.8% larger than the area categorized as arable land and gardens, while orchards are 18% and vineyards 47.6% smaller. Because of that, the calculations for trend development were made only for those arable crops that have available statistical data.

The degree of yearly changes in the land surfaces for the last period has deciding role in calculations for the following period until 2030. Due to that, different degree of changes can be seen for different arable crops. The research has shown that the least negative change will affect tobacco areas (-2.3%), while the most negative change will affect sunflower (-100%). On the other hand, by the year 2030 the area for cucumber production will be 14% larger and for poppy production 70% larger. In fruit production, the biggest decrease in land area by the year 2030 will affect pear production (66.4%) and the least for plum production (4.1%). In the same time, the most positive changes will happen for cherry (173.1%) and the least positive (9%) for sour cherry production. By 2030., the average land area for vineyards will be almost 42% smaller than the average area for vineyards between 1991 and 2013.

**Chart 4.** The projection for land used for vineyards in Karbintsi

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## PROFITABILITY AND TECHNICAL EFFICIENCY IN HOMESTEAD CATFISH PRODUCTION IN DELTA STATE, NIGERIA

*Odjuvwuederhie Emmanuel Inoni<sup>1</sup>, 'Oraye Dicta Ogisi<sup>2</sup>, Felix Odemero Achoja<sup>3</sup>*

### Summary

*The study examined the profitability and technical efficiency in homestead catfish production in the central agricultural zone of Delta State, Nigeria. Primary data were obtained from 162 homestead catfish farmers with the aid of well-structured questionnaire, using multi-stage sampling procedure. Budgetary analysis and stochastic frontier production function were used to analyse the data. Catfish production was found to be profitable with a net margin of 67.17/kg; net margin of 490.31 /m<sup>2</sup> and a net margin-total cost ratio of 29%. Maximum likelihood estimates (MLE) results indicated that pond size, feeds, fingerlings and labour positively and significantly affected homestead catfish output. The returns to scale (RTS) of 2.26 implied that the farm firms in the area exhibited increasing returns to scale. Technical efficiency of catfish farms ranged from 28% to 96% with an average of 87%. Observed inefficiency was due to age, education, credit access and household size.*

**Key words:** Profitability, Stochastic Frontier Function, Technical Efficiency, Homestead Catfish Production.

**JEL:** Q10, Q12, Q13

### Introduction

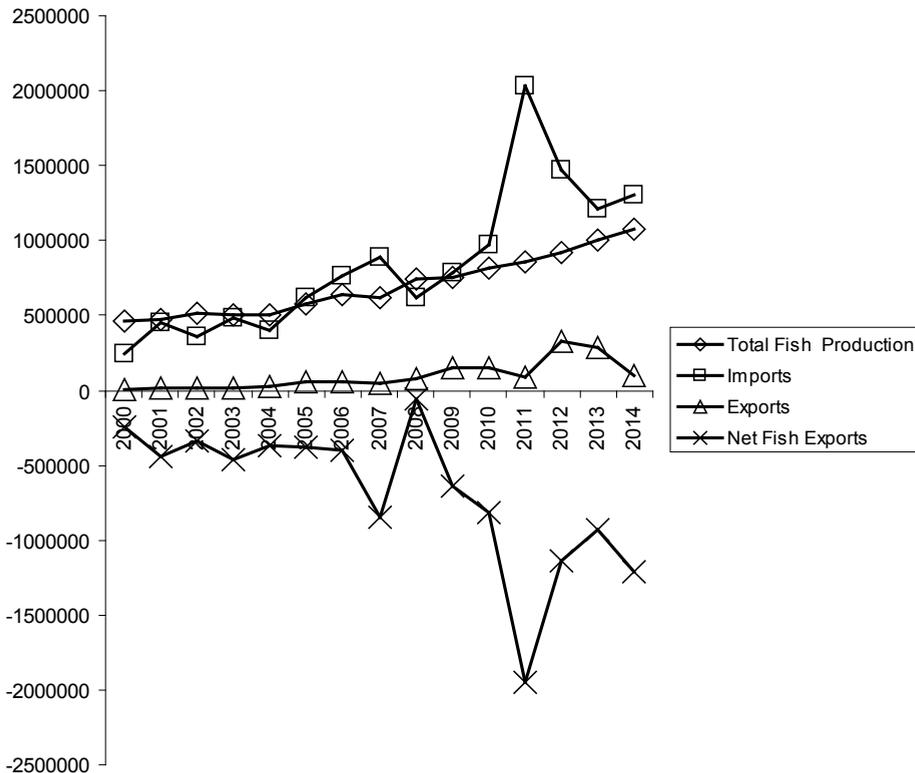
The global fish supply from both capture fisheries and aquaculture was put at 167.2 million tonnes in 2014, with 146.3 million tonnes used for human consumption and providing an estimated apparent food fish per capita supply of about 20.1 kg (live weight equivalent). The contribution of aquaculture to world fish supply reached an all-time level of 73.8 million tonnes in 2014 representing 44.14% of global fish production;

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while the values were 1.711 million tonnes and 556.9 tonnes respectively for Africa and sub-Saharan Africa (FAO, 2016). Aquaculture has continued to remain a growing, vibrant and important production sector for high protein food fish supply for human consumption in developing countries. Besides, it is a veritable source of income and employment for over 284,000 fish farmers in Africa, and many more people engaged in fish processing and marketing (FAO, 2016).

Although domestic fish production has been growing in Nigeria since the year 2005, fish supply has continually fallen short of demand due to the rapidly growing human population. The situation has led to a widening demand-supply gap which has led to huge importation of fish to augment local demand. Nigeria's fish import grew from 246,850 tonnes in 2000 to 2,027,797 tonnes in 2011, culminating in an annual average fish import of 738,308.69 metric tonnes between 2000 and 2012 (Figure 1). The nation's fish import bill gulped a whopping US 2.03 billion dollars in 2011, making Nigeria one of the largest importers of fish in the developing world (FAO, 2014). Furthermore, the value of Nigeria's import of fishery products stood at 1.31 billion US dollars in 2014, accounting for 23.4% of the value of fishery commodities import in Africa (FAO, 2016a).

**Figure 1.** Fish production, Fish Import and Net Fish Export in Nigeria



Source: FAO, Yearbook of Fisheries and Aquaculture Statistics (2006, 2008, 2012) FAO, State of World Fisheries and Aquaculture, 2016; FAO, FishstatJ, 2017

Aquaculture, the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants, is often cited as one of the means of efficiently increasing fish production in low-income, food-deficit countries. Aquaculture production has experienced a steady growth in Nigeria since the year 2000. With an output level of 24,398 metric tonnes in 2001, production reached a level of 313,231 metric tonnes in the year 2014 (Table, 1). Food and Agriculture Organisation estimates revealed that the catfishes *Clarias gariepinus*, *Clarias species* and *Clarias-Heterobranchus* hybrid appear to be the dominant cultured fish species in Nigeria, as they accounted for 61.4% of total aquaculture production in the year 2007 (FAO, 2009).

**Table 1.** Nigeria; Fish Production, Import and Export Bill

Year	Total fish production (tonnes)	Capture fisheries (tonnes)	Aquaculture (tonnes)	Catfish (tonnes)	Imports (US\$ '000)	Exports (US\$ '000)	Net Fish Exports (US\$ '000)
2000	467,095	441,377	25,718	4,067	246,850	1,572	-245,278
2001	476,544	452,146	24,398	4,387	452,770	13,786	-438,984
2002	511,719	481,056	30,663	7,134	359,997	16,979	-343,018
2003	505,839	475,162	30,677	10,015	484,423	17,733	-466,690
2004	509,201	465,251	43,950	26,750	396,535	29,891	-366,644
2005	579,537	523,182	56,355	34,582	613,497	56,827	-375,676
2006	636,901	552,323	84,578	51,916	766,089	53,755	-400,493
2007	615,507	530,420	85,087	52,229	892,771	50,126	-842,645
2008	744,575	601,368	143,207	36,330	618,062	75,106	-542,956
2009	751,006	598,210	152,796	75,662	786,075	146,931	-639,144
2010	817,516	616,981	200,535	115,421	973,724	154,608	-819,116
2011	856,614	635,486	221,128	122,681	2,027,797	83,824	-194,3973
2012	922,652	668,754	253,898	125,762	1,472,258	331,052	-114,1206
2013	1,000,061	721,355	278,706	144,927	1,213,562	283,390	-930,170
2014	1,073,059	759,828	313,231	157,748	1,308,947	93,573	-1,215,374

Source: FAO, Yearbook of Fisheries and Aquaculture Statistics (2006, 2008, 2012)  
FAO, State of World Fisheries and Aquaculture, 2014; FAO, FishstatJ, 2017.

The preference of farmers to culture catfish may be due to their better growth performance and survivability (Adeogun, et. al. 2008), as well as a better market value that is two to three times that of tilapia (Olagunju, et. al. 2007). The level of aquaculture production appears to be rather low, giving the declining yield of natural fish stocks due to over-exploitation and climate change, coupled with the annual huge loss in foreign exchange to fish importation. Given the present scenario, fish farming, especially catfish farming still holds the greatest potentials to rapidly boost domestic fish production and place the nation on the part towards self-sufficiency in fish production (Ugwumba, 2005; Inoni, 2007).

## **Statement of Problem**

Fish farming is a major component of the agricultural production system in Delta State because of the abundant land and water resources that can support the cultivation of both marine and freshwater fish species. The prevailing hydrographic conditions have thus made fish farming a thriving agribusiness investment for small-scale fish farmers in the State.

Although a number of studies may have been carried out on the economics and profitability of fish farming in many States in Nigeria including Delta State, not many such studies have focused on the profitability and technical efficiency in catfish production at the homestead level in the central agricultural zone of Delta State. This is the gap that this study is conceived to fill. The specific objectives of this study therefore are to describe the socio-economic characteristics of catfish farmers; assessed the profitability as well as determine technical efficiency in homestead catfish production.

## **Empirical Literature on Profitability and Efficiency of Catfish Production**

Ogundari and Ojo (2009) in a study of income generation potential and resource-use efficiency of 120 aquaculture farms in Oyo state Nigeria, reported that fish farms were quite profitable based on the average gross margin of ₦ 207, 000.00 per annum. According to them resources were efficiently utilised with a mean technical efficiency of 81%. The results also revealed that extension contact, level of education, stocking density, and access to credit were the factors that significantly influenced the level of technical efficiency of the fish farms. The authors recommended that policy variables such as extension, education, and credit identified in the study as important determinants of technical efficiency of the farms should strengthen for sustainable fish production in the State.

In another study on 'economic analysis of homestead fish production in Ogun State Nigeria', Olawumi, Dipeolu and Bamiro (2010) examined determinants of revenue and found that pond size, quantity of fish seeds stocked, labour in feeding and harvesting as well as the poultry waste are the major determinants of the revenue that accrued to homestead fish farmers. The study concluded that policy variables such as pond size, labour and fingerlings that influence the revenue from fish farming should be strengthened for sustainable fish production to be attained in the study area.

The report by Ugwumba and Chukwuji (2010) seemed to confirm the profitability of catfish farming Using data obtained from a cross section of 204 catfish farmers in Anambra State, they found net returns on investment of 0.61 while fish feeds constituted over 70% of the total cost of production. Cost of feeds had a negative and significant effect on profitability while output price exerted a positive significant influence. High cost of feeds, lack of capital, scarcity of fingerlings, lack of modern technologies, high cost of transportation, high cost of labour, lack of land, poaching, inadequate water supply, mortality of fish and lastly poor storage facilities were ranked the most serious constraints to catfish production. The authors recommended that government policies

should support the establishment of mills that can produce pelleted and floating feeds, modern hatcheries, and provision of credit facilities as well as intensification of fisheries extension services to farmers.

Using translog form of stochastic frontier production function in an empirical analysis of efficiency of resource-use among rural fish farmers in Rivers State, Nigeria, Onoja and Achike (2011) reported that fish farms had a mean technical efficiency of 71% with farm area and water supply system as significant determinants of technical efficiency. The study concluded that the productivity of factors can be improved by culturing high quality fingerlings, training farmers on current techniques of fish farming as well as optimal utilization of quality feeds.

## **Materials and Methods**

### ***Sampling Procedure and Data Collection***

The Delta Central Agricultural zone was chosen for the study because it has abundant land and water resources that can support the production of freshwater fish species. In fact, the prevailing hydrographic conditions of the area have made fish farming a thriving agribusiness investment for small-scale fish farmers. The Delta Central agricultural zone of the State comprised ten (10) local government areas (LGAs); Udu, Uvwie, Okpe, Isoko North, Isoko South, Sapele, Ethiope West, Ethiope East, Ughelli North and Ughelli South.

Multi-stage sampling procedure was used to draw samples for the study. Out of the ten (10) local government areas (LGAs) that comprised the Delta Central Agricultural zone, five (5) LGAs of Isoko South, Ughelli North, Uvwie, Ethiope East, and Isoko North were randomly drawn using simple random sampling technique. Secondly, two major fish farming communities were randomly selected from each of the 5 LGAs earlier chosen. Thus, a total of 10 communities were covered in the survey. Finally, 20 homestead catfish producers were drawn from each of the 10 communities to give a total sample size of 200 homestead catfish farmers sampled in the study.

Primary data for the study were obtained from a cross-section of homestead catfish farmers using a structured questionnaire. Location of fish farmers were obtained from dealers of fish feeds and feed ingredients in the area as well as catfish farmers earlier identified by the researchers. These were complemented with information obtained from Agricultural Officers in the selected LGAs. However due to non-response and inadequate information, thirty-eight (38) copies of the questionnaire were discarded, and data from only 162 respondents were used for the analysis. Data collected included social characteristics of the catfish farmers such as age, sex, marital status, household size, educational level, and fishing experience; types and quantity of inputs used, pond size, output of fish, input and output prices, fish sales, production period, and labour utilization. The field survey was conducted between 15<sup>th</sup> October and 20<sup>th</sup> December, 2015.

**Stochastic Frontier Model Specification**

The stochastic frontier model proposed by Aigner *et al.* (1977) Coelli (1996) was used to determine technical efficiency in homestead catfish production. The model has been widely used to study farm level efficiency and sources of inefficiency inherent in agricultural production processes (Coelli *et al.*, 2005).

According to Greene (2008), a general stochastic production frontier model can be specified as:

$$\ln q_i = f(\ln X) + v_i - u_i \dots\dots\dots(1)$$

where  $q_i$  is the output (kg) of catfish produced by firm  $i$ ,  $x$  is a vector of factor inputs,  $v_i$  is the stochastic (white noise) error term and  $u_j$  is a one-sided error representing the technical inefficiency of firm  $i$ . Both  $v_i$  and  $u_i$  are assumed to be independently and identically distributed (iid) with variance and  $\sigma^2$  respectively.

Therefore, the production of each firm  $i$  can be estimated as;

$$\ln \hat{q}_i = f(\ln X) - u_i \dots\dots\dots(2)$$

while the efficient level of production (i.e. no inefficiency) can be defined as;

$$\ln q^* = f(\ln X) \dots\dots\dots(3)$$

Then according to Chukwuji et.al. (2007) technical efficiency (TE) can be given by:

$$\ln TE_i = \ln \hat{q}_i - \ln q^* = -u_i \dots\dots\dots(4)$$

Thus,

$$TE_i = e^{-u_i}$$

and is constrained to be between zero and one in value. If  $u_j$  equals zero, then TE equals one, and production is said to be technically efficient. Technical efficiency of the  $i$ th firm is therefore a relative measure of its output as a proportion of the corresponding frontier output. A firm is technically efficient if its output level is on the frontier, which implies that  $q/q^*$  equals one in value.

The Cobb-Douglas form of the stochastic frontier production model is stated explicitly as;

$$\ln q_i = \beta_0 + \beta_1 \ln pdz + \beta_2 \ln lbr + \beta_3 \ln fds + \beta_4 \ln fgn + v_i - u_i \dots\dots\dots(5)$$

Where the variables are as defined earlier.

In order to examine factors that influence catfish farmers' level of inefficiency, an inefficiency model was jointly estimated with the stochastic frontier production function as;

$$\mu_i = \varphi_0 AGE + \varphi_1 HHZ + \varphi_2 EDU + \varphi_3 FEX + \varphi_4 CREDAC + \omega_i \dots\dots\dots(6)$$

Where,

AGE, is catfish farmer’s age,

HHZ, is is house hold size, that is number of persons in the household,

EDU, is years of formal education,

FEX, is number of years of fish farming,

CREDAC, is access to credit (a dummy variable where, 1=have access; 0 = no access)

A negative coefficient of ( ) implies decrease in inefficiency while a positive implies an increase in inefficiency. Maximum Likelihood Estimation (MLE) method was used to estimate the parameters of the models with the aid of the computer program, FRONTIER 4.1c (Coelli, 1996). likelihood ratio (LR) statistic was used to test the relevant hypotheses.

***Profitability in Catfish Production***

The budgetary analysis which involved the costs and returns analysis was used to determine the profitability or otherwise of homestead catfish production as follows;

$$\pi = TR - TC; \dots\dots\dots(7)$$

Gross Margin = TR – TVC

Net Margin = GM – TFC

But TR = PQ; and TC = TVC + TFC

Where,  $\pi$  is profit, TR is Total Revenue; TC is Total Cost; TVC is total Variable Cost; TFC is Total Fixed Cost; P is unit price of catfish (₦); Q is output of catfish (kg).

Apart from the net margin, the net margin-to-total cost ratio was also computed to affirm whether homestead catfish production was indeed profitable in the study area.

**Results and Discussion**

***Socio-economic Characteristics of Homestead Catfish Farmers***

The socio-economic characteristics of catfish farmers (Table 2) revealed that although both men and women were actively involved in homestead catfish production in the study area, men were more dominant in numbers with 72% of male farmers. A number of socio-cultural factors limit women access to productive resources, external inputs and information (Doss and Morris (2001). This may have resulted in the fewer number of women participating in homestead catfish production in the study area.

The age of fish farmers ranged between 27 to 68 years with a mean age of 49 years. In fact majority of them (66.6%) are within the age range of 41 to 61 years. The effect of age comes from accumulated knowledge and experience (Tenge et al., 2004). Furthermore, older farmers may have more personal capital from long accumulation (Nkamleu and Manyong, 2005) and, thus more likely to invest in new technologies and participate in fish production around the home.

The household size, the number of persons per household ranged from 1 to 10 with an average size of 5 per household. Household size is related to the role members play as sources of labour in fish farming activities. Homestead catfish farming operations require a great deal of human effort from stocking, routine management to harvesting. Thus households with increased labour supply are more likely to adopt and participate in labour-intensive new technologies than those with fewer persons per household (Nkamleu and Manyong, 2005; Amsalu and de Graaff, 2007).

Operators of all the fish farms studied acquired some level of formal education. The modal educational status amongst the farmers was senior secondary education. Generally education is thought to create a favourable mental attitude for the

**Table 2.** Distribution of socioeconomic characteristics of homestead catfish farmers (n = 162)

Parameter	Frequency	Mean (Mode)
<b>Sex</b>		
Male	117(72.2)*	(Male)
Female	45(27.8)	
<b>Age</b>		
27 – 33	15(9.3)	
34 – 40	22(13.6)	
41 – 47	29(17.9)	49
48 – 54	39(24.0)	
55 – 61	40(24.7)	
62 – 68	17( 10.5)	
<b>Marital status</b>		
Married	123(75.9)	(Married)
Single	39(24.1)	
<b>Household size</b>		
1 – 2	20(12.4)	
3 – 4	39(24.1)	
5 – 6	66(40.7)	5.02
7 – 8	31(19.1)	
9 – 10	6(3.7)	
<b>Educational status</b>		
Primary school (6)	47(29.0)	
Junior Secondary school (9)	9(5.6 )	
Senior Secondary school (12)	53(32.7)	(SSS)
OND/NCE/HND(14 – 15)	36(22.2)	
University degree (16 – 17)	17(10.5)	
<b>Fish farming experience(years)</b>		

Parameter	Frequency	Mean (Mode)
1 – 2	28(17.3)	
3 – 4	60(37.0)	4.44
5 – 6	47(29.0)	
7 – 8	22(13.6)	
9 – 10	5(3.1)	
<b>Pond size (m<sup>2</sup>)</b>		
36 – 58	27(16.7)	
59 – 81	56(34.6)	83.43
82 – 104	51(31.4)	
105 – 127	18(11.1)	
128 – 150	10(6.2)	
<b>Access to credit</b>		
Have access	74 (45.7)	
No access	88 (54.3)	(No access)

Source: Computed from survey data, 2015

Note: \* Figures in parentheses are percentages

acceptance of new practices especially of information-intensive and management-intensive practices (Caswell et al., 2001). Furthermore, apart from being early innovators that provide examples that may be copied by illiterate farmers, educated farmers are better able to copy those who adopt innovation first, thereby enhancing wider diffusion of the new technology in the community (Samiee et. al., 2009).

Pond size is a very important factor in homestead fish production because it depends on the land area available for pond construction. Thus a number of potential investors in homestead fish farming are unable to do so because they do not have control over land that is around their home. Pond size ranged between 36m<sup>2</sup> and 150 m<sup>2</sup>, with an average of 83.43 m<sup>2</sup>. According to Doss and Morris (2001) farm size is the first and probably the most important determinant of participation in agricultural production. This is perhaps because farm size can affect, and in turn be affected by the other factors that influence the adoption of modern techniques of catfish production.

**Costs and Returns in Catfish Production**

The results of the costs and returns analysis in catfish production are shown in Table 3. Cost of labour and feeds are the most critical items of variable costs in catfish

**Table 3.** Profitability in Homestead Catfish Production, Delta Central Agricultural, Zone.

Parameter	Cost (₦ <sup>†</sup> )
<b>Total Revenue</b>	<b>241,094.15</b>
<b>Variable Cost items</b>	
Feeds	55,489.09(31.42)*
Fingerlings	11,893.59(6.73)
Labour	81,151.74( 45.95)
Water	23,118.21( 13.09)
Fertiliser	2,611.49( 1.48)
Other Expenses	2,345.62(1.33)
<b>Total Variable Cost(TVC)</b>	<b>176,609.75</b>
<b>Fixed Cost items</b>	
Depreciation costs of (ponds, water pump, nets, bore-hole,	16,309.03
<b>Total Costs(TC)</b>	<b>192,918.78</b>
<b>Gross Margin(TR – TVC)</b>	<b>64,484.40</b>
<b>Net Margin(GM – FC)</b>	<b>48,175.37</b>
<b>Profitability/Efficiency ratios</b>	
Net Margin/kg (₦)	67.17
Net Margin/m <sup>2</sup> (₦)	490.31
Net Margin-TC-ratio (%)	0.29

Source: Computed from survey, 2015

Note: \* Figures in parentheses are percentages of Total Variable Cost

<sup>†</sup>US \$1.00 = ₦170.00

production. While labour cost constituted 45.95% fish feeds made up 31.42% of the variable costs of production. The net margin, which is total revenue less total cost of production was found to be ₦48,175.37, implying that catfish production is profitable in the study area.

Also, the net margin/kg was 67.17. The results indicate that for every kilogramme of fish sold, the farmer earns a profit of ₦67.17 on the average. The combined effects of low yield and high cost of production, particularly of variable costs components such as labour and fish feeds are implicated for the rather low net margin per kilogramme. Although the net margin per kilogramme revealed the level of profitability, it is not a very critical measure because it does not take into consideration the total cost incurred by the farmer to earn that margin.

The net margin-to-total cost ratio is another measure of profitability that was used to further ascertain the level of profitability of catfish farming at the homestead level.

The ratio was 0.29%. The implication of the result is that investment in homestead catfish production earned as high as 29% return on capital invested. That is for every 100 kobo invested, the farmer earned a profit of 29 kobo. Therefore, homestead catfish production is profitable in the study area.

In order to test whether there is no significant difference in profit between homestead fish farms of different size categories, two categories of pond sizes were designated using the average pond size of 83.43 m<sup>2</sup> as a cut-off point. Those farms with pond size ≤ 83m<sup>2</sup> were category ‘A’ while those ≥ 84m<sup>2</sup> were category ‘B’. The results of the test of differences in average net margin showed that there was statistically significant difference in net margin at the 1% level of significance (Table 4). That is ponds in category ‘B’ which were greater or equal to 84m<sup>2</sup> were significantly more profitable than those in category ‘A’ that were smaller in sizes. Therefore, significant difference in profit existed between homestead fish farms of the different size categories.

**Table 4.** Test of differences of mean profitability between ponds of two size categories

Parameter	Pond Size Category A (≤ 83m <sup>2</sup> )	Pond Size Category B (≥ 84m <sup>2</sup> )	Mean Difference	t-statistic	p-value
Net Margin	17049.46	83396.81	- 66347.35	-10.252	0.01*

Source: Computed from survey, 2015

**Technical Efficiency in Catfish Production**

The results of the maximum likelihood estimates (MLE) of the stochastic production function used to determine the influence of specified inputs on catfish output as well as the effects of farmers’ socio-economic characteristics on technical inefficiency are presented in Table 5. All the variables have positive and significant effects on catfish output. This implies that an increase in the use of these production inputs would raise output in homestead catfish production. The elasticity estimates which give an indication of how much fish output will vary as a result of a variation in a specified independent variable, while holding all others constant, revealed that pond size had the dominant influence with a value of 1.16; while the elasticity estimates for labour, feeds, and fingerlings were 0.21, 0.24, and 0.63 respectively. The results indicated that a 10% increase in pond size will lead to 11.6% rise in catfish output, while a concomitant change in labour, feeds, and fingerlings cause a 2.1%, 2.4% and a 6.3% increase in catfish output. The findings are in consonance with that of Ekunwe and Omokaro (2009) on the positive significant influence of labour on catfish production in Kaduna State. Onoja and Achike (2011) found stock size and feeds to exert positive and significant effects on catfish out in Rivers State; Omobepade, Adebayo and Amos (2014) reported positive and significant impact of labour, feeds and fingerlings on fish output in Ekiti State; Penda, Umeh and Unaji (2013) found labour and fingerlings to positively and significantly affect fish output in earthen pond system in Benue State,

while Ogundari and Ojo (2009) found pond size, feeds and fingerlings as significant determinants of fish output in Oyo State, all in Nigeria.

**Table 5.** Maximum Likelihood Estimates of Parameters of Stochastic Frontier Production Function

Variable	Parameter	Coefficient	Standard error	t-ratio
Constant	$\beta_0$	- 8.26	0.85	- 9.77
Pond size	$\beta_1$	1.16	0.14	8.11***
Labour	$\beta_2$	0.21	0.065	3.23***
Feeds	$\beta_3$	0.24	0.07	3.44***
Fingerlings	$\beta_4$	0.63	0.083	7.58***
<b>Inefficiency Parameters</b>				
Constant	$\delta_0$	-1.36	0.94	-1.45
Age	$\delta_1$	- 0.035	0.017	-2.06**
Household size	$\delta_2$	0.39	0.14	2.85***
Formal education	$\delta_3$	- 0.09	0.032	- 2.83***
Farming experience	$\delta_4$	0.07	0.046	1.52
Credit Access	$\delta_5$	- 0.82	0.39	- 2.13**
<b>Variance parameters</b>				
Sigma squared	$\sigma^2$	0.49	0.13	3.87***
Gamma	$\gamma$	0.70	0.10	6.76***
Log likelihood function	L	-87.33		

Source: Computed from survey, 2015

Note: \*\* Significant at 5% level of significance; \*\*\* significant at the 1% level of significance

The return to scale (RTS) of the farm firms (Table 6), which is the sum of the elasticities of production, was computed to be 2.24. It revealed that catfish farms exhibited increasing return to scale. The RTS implies that if all the inputs are jointly increased by 1%, output will increase by 2.24%. This result is similar to those of Ogundari and Ojo (2009) and Onoja and Achike (2011) who reported the existence of increasing returns to scale in catfish production in Oyo and River States of Nigeria, respectively.

**Table 6.** Elasticity of production and Return to Scale

Variable ( $x_i$ )	Elasticities
Pond size	1.16
Labour	0.21
Feeds	0.24
Fingerlings	0.63
RTS	2.24

Source: Computed from survey, 2015

**Determinants of Technical Inefficiency**

The results of the technical efficiency of catfish production in the study area are also shown in lower segment of Table 5. The sigma squared) is an indication of the goodness of fit of the model applied as well as the correctness of the specified distributional assumption of the composite error term. It was statistically significant at 1% level. The gamma estimate ( $\gamma = 0.70$ ) indicated that 70% variation in output in catfish production in the Delta Central agricultural zone, of Delta State is due to technical inefficiency, rather than random variability. Therefore, the hypothesis which stated that there are no inefficiency effects in the stochastic frontier model for catfish production is rejected (Table 7). The presence of inefficiency in catfish production in the area is corroborated by the range of estimated technical efficiency (TE) in the study which ranged from 0.28 – 0.96 with a mean of 0.87 (Table 8). The mean TE implies that 13% of output of catfish in an average farm is lost due to inefficiency in the production process. The frequency distribution of the technical efficiency of homestead fish farms shows that about 94% of the farms were at least 76% technically efficient. Ekunwe and Omokaro (2009) and Ogundari and Ojo (2009) reported comparable findings on average TE in catfish farms in other parts of Nigeria.

**Table 7.** Results of Test of Hypothesis of Technical Inefficiency in Catfish Production

Null hypothesis	Likelihood ratio statistic	Critical value	Decision
No inefficiency effects in the model; $\gamma = \delta_1 = \beta_2 = \delta_3 = \delta_4 = \delta_5 = 0$	13.62	13.40*	Reject

Source: Computed from survey, 2015

Note: \* Significant at 5% level of significance

The results of the determinants of inefficiency are also shown in Table 5. The results indicate that household size have positive and significant effects on inefficiency, while the influence of age, formal education and access to credit was negative. The implication of these results are that an increase in household size and farming experience led to increase in technical inefficiency but decreased TE; while an increase age, formal education and access to credit decreased technical inefficiency, they lead to an increase in TE. Farming experience, though have no significant effects on technical inefficiency its positive sign is contrary to *a priori* expectation. Age of the farmer had a positive and significant impact on TE. Older people are keener to participate in new technologies because they have more personal capital from long accumulation (Tenge et al.; 2004; Nkamleu and Manyong, 2005; Girei, Dire, Iliya and Salihu, 2013). Years of formal education are another variable that had a positive and significant influence on TE. Operators who spent more years in school acquiring formal education are more likely to carry on production operations more efficiently in catfish farming than their less educated counterparts. This result is in consonance with

**Table 8.** Distribution of Estimates of Technical Efficiency in Homestead Catfish Production

Efficiency class	Frequency
0.28 – 0.39	1(0.62)*
0.40 – 0.51	2( 1.24)
0.52 – 0.63	1(0.62)
0.64 – 0.75	6(3.70)
0.76 – 0.87	46(28.39)
0.88 – 0.99	106(65.43)
Minimum	0.28
Maximum	0.96
Mean	0.87

Source: Computed from survey, 2015

Note: \* Figures in parentheses are percentages

those of Ogundari and Ojo (2009) and Girei, et al. (2013). Access to credit also exerted a significant influence on TE in homestead catfish production. The result indicated that individuals who have access to credit are more technically efficient in production because of the ready availability of credit to procure resources needed to carry out farm operations as soon as the need arises. Therefore, the hypothesis that stated that there was no technical inefficiency in catfish production is rejected.

In order to test whether there is no significant difference in technical efficiency between homestead catfish farms of different size categories, two categories of pond sizes were designated using the average pond size of 83.43 m<sup>2</sup> as a cut-off point. Those farms with pond size ≤ 83m<sup>2</sup> were category ‘A’ while those ≥ 84m<sup>2</sup> were category ‘B’. The results of the test of differences in mean TE showed that there was no significant difference in TE between farms in the two size categories (Table 9).

**Table 9.** Test of differences of mean technical efficiency between farms of two size categories

Parameter	Pond Size Category A (≤ 83m <sup>2</sup> )	Pond Size Category B (≥ 83m <sup>2</sup> )	Mean Difference	t-statistic	Significance
Technical Efficiency	0.8772	0.8563	0.02096	1.497	0.136

Source: Computed from survey, 2015

### Conclusions

This study examined the profitability and resource use efficiency in homestead catfish production in the central agricultural zone of Delta State, Nigeria. The study adopted budgetary analysis and stochastic frontier production (SFP) analysis to achieve the stated objectives. The results showed that catfish production was profitable with a net

margin/kg of 67.17; net margin/m<sup>2</sup> of 490.31 and a net margin-to-total cost ratio of 29%. The results of the SFP analysis indicated that all the independent variables; pond size, feeds, fingerlings and labour exerted positive and statistically significant effects on fish output in homestead catfish production. The technical efficiency (TE) of homestead catfish farms ranged from 28% to 96% with an average of 87%. Further analysis indicated that household size had a positive and significant influence on inefficiency, while age of the farmer, level of formal education and access to credit had negative and significant effects on inefficiency. Thus these farmer specific characteristics have the capacity to increase technical efficiency in fish production at the homestead level. The returns to scale value of 2.26 implied increasing returns to scale and that homestead fish production is within stage I of the total production curve. This is an indication that catfish production holds great potentials for increased productivity in the area. Although catfish production was found to be profitable, the factors that were implicated for the inefficiency in the production process should be improved upon in order to attain optimality in production. We therefore recommend that empowerment programmes of government and other development institutions should be targeted to training catfish farmers and prospective farmers to acquire requisite skills in pond fish management. Furthermore, credit schemes should be implemented to make short-term credit readily available to homestead fish producers to finance their operations. Homestead catfish producers should be encouraged to form cooperative societies in order to pull their resource together to help boost output and enhance household food security in both the urban and rural areas of Delta State, Nigeria.

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## RELATIONSHIP BETWEEN SUSTAINABLE DEVELOPMENT AND GREEN ECONOMY - EMPHASIS ON GREEN FINANCE AND BANKING<sup>1</sup>

*Olja Munitlak-Ivanovic<sup>2</sup>, Jovan Zubovic<sup>3</sup>, Petar Mitić<sup>4</sup>*

### Summary

*In this paper authors review the issue of relationship between economy, society and environmental protection. This could not be done without the three sustainability principles being incorporated in the concept of sustainable development and later in the concept of green economy. Many definitions of both concepts refer to the fact that these relationships are complex, as economic well-being and environmental protection cannot “reconcile” in the short run. The aim of green economy is to even economy, society and environment. Green finance was developed within this new economic concept. One instrument of green finance, i.e. socially responsible finance is the Equator principles. This thesis shows the mechanism of action of financial institutions which accepted these new principles, but also points out disadvantages that must be removed over time so that these principles could have a positive impact on society and environment.*

**Key words:** *Concept of sustainable development, Green economy, socially responsible behaviour, environment, the Equator principles*

**JEL:** *Q01, Q56*

### Introduction

Chronologically speaking, the concept of sustainable development appeared before the concept of green economy. Sustainable development began to be observed as a necessary behaviour

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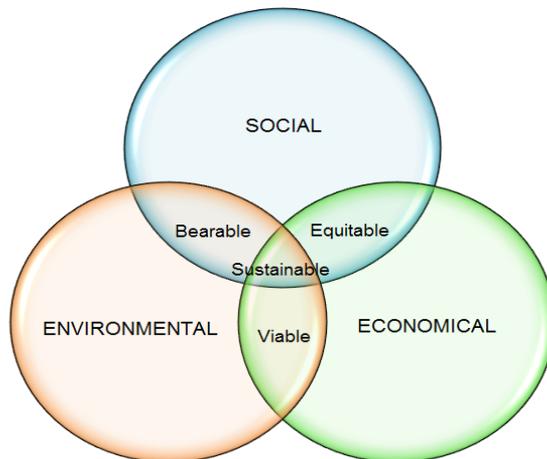
in the second half of the twentieth century, when ecological disasters became more and more intense and the awareness of the need for environmental protection increased. Green economy as a concept appeared at the beginning of the twenty-first century, partly as a consequence of unsatisfactory results of implementing the concept of sustainable development.

Many definitions of sustainable development refer to various opinions of what this concept should include and with how many pillars it should be supported. The end of the twentieth century is characterized by intense environmental disasters which, as a result, increase environmental pollution. Rapid population growth at a global level, followed by intense technical and technological processes, resulted in growing needs of non-renewable energy, raw materials and other natural resources. These problems first appeared in the countries with the highest population growth rate, i.e. in the countries whose development was sudden and rapid. Speaking of this occurrence, we primarily refer to China and India, which means that it had partly local character. However, this trend was transferred to the global level due to this rapid economic development (Munitlak Ivanović et al., 2014).

The aim of creation and implementation of sustainable development is to establish an adequate relationship between production growth (economic aspect), extraction of natural resources (ecological aspect) and life conditions (social aspect). Giving a choice based on the principle „economy versus ecology“ is not sustainable. “It can be concluded that sustainable development is in joint action with economic growth (economic efficiency and productivity growth, technology modernization etc.), social progress (socially responsible business with poverty alleviation, public health improvement etc.) and environment (reduction of pollution, biodiversity preservation etc.)“ (Stanojević et al., 2013).

Chart of the above described relationship is shown below:

**Figure 1.** Interrelationship between economic, ecological and social aspect in the concept of sustainable development



Source: United Nations Forum on Sustainability Standards (2017), (available at: <https://unfss.org/work-areas/topics/additional-areas/>)

There are many definitions of green economy although essentially they don't differ very much. The term itself indicates an eco-friendly principle, involvement of green technology in such economy and production, importance of environmental protection and socially responsible behaviour of not only individuals and companies, but also socially responsible behaviour at a global level (Ilić Petković, 2015). Such a preference is quite clear, taking into consideration that environmental disasters do not know territorial and geopolitical boundaries and divisions. They are regional and global and they have a growth trend.

The attempts of the society to prepare for these and other unexpected shocks and bring the balance of all pillars of society back are reflected in a new concept – resilience (OECD, 2014). Unlike the concept of sustainable development, the concept of resilience is based on four pillars due to its nature - its aim is to prevent shocks and make the society more flexible. Namely, pillars of resilience and sustainable development are similar, but the essential novelty in the concept of resilience is that it is based on four pillars. A new, fourth pillar is the pillar referring to institutional flexibility (Munitlak Ivanović, Mitić, 2016).

### Literature Review

One can say that sustainable development appeared as a concept in 1980 as the first environmental protection strategy that was developed with a basic task: “sustainable development through protection of natural resources”. This strategy was created by the International Union for Conservation of Nature and Natural Resources and it was explained and criticized by Lele (1991).

Sustainable development was officially defined and accepted as a concept, that is, as a possible model of development in 1987 at the 42<sup>th</sup> session of the General Assembly of the United Nations. The World Commission on Environment and Development defined sustainable development in the report entitled “Our Common Future“ as “a development which satisfies present needs without threatening the possibilities of future generations to satisfy their needs” (Brundtland, 1987). The Commission itself was formed earlier, in 1983, at the 38<sup>th</sup> session of the General Assembly of the United Nations. If development is regarded as the increase in welfare, sustainable development means that this welfare is not reduced over time.

The above mentioned definition of sustainable development is the most popular and most accepted, but it is not the only one. This definition is politically acceptable and the concept of sustainable development defined in this way was widely accepted very soon. However, “sustainable development is not included in any discipline as a whole, but it is included in many scientific disciplines: economy, technology, ecology, law, sociology, ethics...” (Munitlak Ivanović, 2007) indicating its multidisciplinary nature.

Green economy, like sustainable development, does not have a common definition which is generally accepted (Vladislavljević et al., 2017). Since there is no consensus on the definition of green economy, the attitude of each country determines the role and significance of green economy according to its needs and its own vision. Therefore, the concept of green economy is defined according to the vision that has been generally accepted in the each countries' economic theory. The basic goal of green economy is to ensure economic growth followed by the growth of

employment, where knowledge plays a pivotal role as it is one of the main sources of long-term economic growth (Tomić, 2015) and salaries with timely prevention of environmental disasters. Logical sequence of unadjusted economic and ecological pillar of sustainability is a situation in which the growth of production and consumption has negative impacts on the environment: increased noise level, environmental pollution, extraction of natural resources, especially fossil fuels, and other production and consumption inputs. Therefore, the goal of green economy is to ensure sustainable production and consumption, as extraction of natural resources in order to increase production growth cannot go on forever (Kalyta, 2016).

According to some theoreticians, green economy contains all achievements of the concept of sustainable development - these achievements being extended by efforts to increase total human well-being, reduce social inequality and number and volume of environmental disasters (Szabo, 2016).

In order to talk about green finance as a manifestation and implementation of concepts of sustainable development and green economy, its close relationship with socially responsible behaviour and business should be pointed out.

Socially responsible business is a concept. Ebner and Baumgartner (2006) researched a relationship between sustainable development and socially responsible business. The results of this research indicate that no definition defines exactly the relationship between sustainable development and socially responsible business. The same research has shown that socially responsible business and sustainable development are equated in practice within the cluster of financial institutions. Essentially, such an attitude speaks of considering sustainable development as a phenomenon which is observed at the macro level, while the concept of socially responsible business is considered as a manifestation of sustainable development at the micro level. The relationships observed in this way indicate the attitude that the concept of sustainable development is a basis of socially responsible business (Ebner, Baumgartner, 2006). Rana et al. (2009) came to the same conclusion. In his thesis, Dahlsrud (2008) analyses various definitions of socially responsible business and confirms the attitude that there is no common definition of socially responsible business, indicating at the same time that five basic dimensions always appear in observations and definitions of various theoreticians: interest groups, economic aspects, environmental protection and social environment, followed by goodwill for such business. Dahlsrud perceives that, in early definitions of socially responsible business, the role of environmental protection is small, but it grows into a significant characteristic over time, when distinction is made between exclusively profit-oriented and socially responsible business (Dahlsrud, 2008).

### **Relationship between Sustainable Development and Green Economy**

Technical, technological and economic researches in this field should be oriented to environmental protection in order to analyse the impact and anticipate consequences of irresponsible behaviour in production. There are many reasons for this: soil degradation, climate changes, GHG emissions and any other activity that can threaten the future or even survival at the global level (Golušin et al., 2012).

It has already been pointed out that green economy and sustainable development cannot be

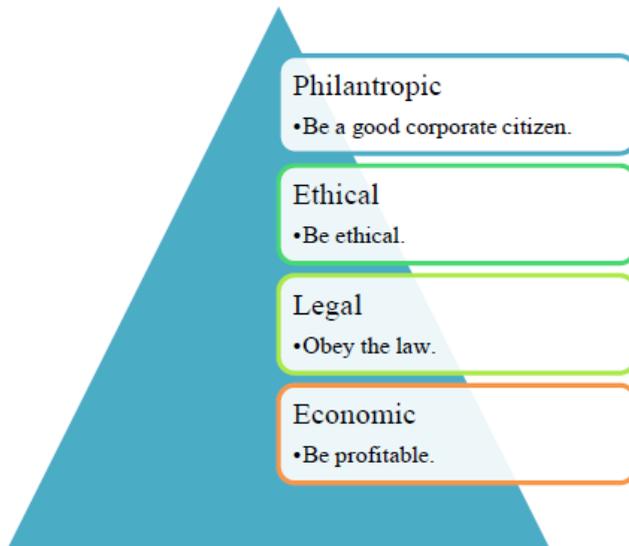
equated. In the relationships set in this way sustainable development is an instrument for implementation of green economy (Ilić Petković, A., 2015, Pokrajac, S., 2009, Unković, Kordić, 2012). Certainly, there are similarities between these two concepts as all ecological activities being undertaken contribute to implementation of both concepts at the same time. In this way, sustainable development really is a basis of realization of green economy (Unković, Kordić, 2012). If production and/or consumption have any negative effects or cause extraction of non-renewable resources, sustainable development does not exist. This means that the concept of green economy is implemented not only when economy accepts “green” business principles, but also when social dimension is taken into consideration, that is, when all forms of social equalization are taken into account (Popović et al., 2015). The above mentioned facts indicate that natural resources, especially non-renewable resources, have limits of exploitation. On the contrary, if resources are exploited irresponsibly and without a plan, production and society will collapse sooner or later due to lack of resources and this is contrary to the bases of the concept of sustainable development and green economy. If relationships are set in this way, these two concepts are equal and absolutely harmonized (Munitlak Ivanović, 2007).

### **Relationship between Sustainable Development, Socially Responsible Business and Green Economy**

The concept and idea of socially responsible business was published for the first time in 1889 in an article “The Gospel of Wealth” written by Andrew Carnegie. Carnegie is the first author who publicly claims that a company must help and therefore improve the quality of the society and environment in which it operates. However, his attitude was not accepted then (Cooper, 2000). Great depression and the collapse of financial market in the 1930s resulted in reassessment of this attitude, but no significant improvements were noticed until the 1950s. This was a result of devastations after the World War Two, as well as of establishing new international and economic relationships. However, the role of the country and its activity related to workers and society was considered for the first time.

At the beginning, owners of capital were afraid that undertaking of such activities would have negative impact, and that it will result in reduction of corporate profit. In the 1970s, when multinational companies appeared, more responsible behaviour towards workers and environment started to be implemented as a result of a pressure on companies to develop such concept of business. Due to numerous industrial, especially environmental disasters whose consequences were felt globally, such way of doing business became significant and started to be implemented in practice more intensely. Essentially, socially responsible activities, according to Sredojević, finally start to be implemented in the 1990s. In that sense, Sredojević (2006) points out: „Activities of many companies had negative impacts on environment and therefore multinational companies had to adopt codices of corporate behaviour. Until then, the activities were voluntary, which was the cause of ecological, ethnical and financial scandals of that time, as well as of scepticism in terms of globalization of multinational companies and their business responsibility, transparency in business and commitment to social development and welfare.“

**Figure 2:** Pyramid of corporate social responsibility



*Source:* (Sredojević, 2006) taken from: Carroll (1991): The Pyramid of Social Responsibility: Toward the Moral Management of Organizational Stakeholders.

The most realistic model of socially responsible business has a pyramid-like shape and it indicates clear interaction of determinants consisting of: philanthropic, ethical, legal and economic factors. The model was developed by Carroll in 1991. Philanthropic factor is at the top of the pyramid and Carroll identified it as the most important factor which is in mandatory synergy with ethical, legal and economic factor. The model was tested in theoretical researches and in practice and it proved to be applicable and optimal as an instrument of assessment of managerial behaviour in successful companies.

Terms “socially responsible business”; “corporate social responsibility”; “social responsibility of companies” or “corporate responsibility” are, in fact, synonyms for the behaviour Carroll described as philanthropically, ethically, legally and economically justified and simultaneous. Likewise other new social approaches, these synonyms will acquire status of scientific discipline over time.

As in green economy and sustainable development, there is no common definition of socially responsible behaviour. Various authors and international institutions have different approaches, but various forms of protection are in the essence of all scientific determinations of this term: consumers’ interest, environment, workers’ rights, interest of business partners and competitors, corporate protection and common protection of global society.

Authors of this paper opted for definitions of two international institutions, the World Bank and European Commission. The World Bank defines socially responsible behaviour as: “Commitment and contribution of profit sector to sustainable development through work with employees, their families, local communities and society as a whole in order to improve quality of life through the process that benefits a company and contributes to general

development” (Petkoski, Twose, 2003). The European Commission’s definition is shorter and more simple – it determines this concept as “corporate responsibility for their impact on society” (European Commission, 2011).

However, from the point of view of the owners of capital, the impact of socially responsible business on corporate profit is a very important issue. There is no common opinion in this field as well, but it can be noticed that there are three principles used. Chapple et al. (2005) and Herbohn (2005), express a dose of “fear”, i.e. an attitude that socially responsible business results in increased corporate costs. Other authors have completely different approach to this issue and they think that socially responsible business is not a cost, but an investment in human capital of the company (Chamorro, Bangail, 2006, Klein, Dawar, 2004). The third approach could be called neutral. Authors Wang & Bansal (2012) and Carter (2005) are of the opinion that there is an impact of socially responsible business on companies and operations, but this impact varies and has different consequences. Essentially, relationship “social responsibility versus profit” includes duality “economy versus ecology”, i.e. “long-term sustainability versus green economy”.

### **Green Banking and the Role of the Equator Principles in Green Economy**

The term “green banking” itself indicates close relationship with business principles which are characteristic for green economy and therefore it is surely a part of socially responsible business (Munitlak Ivanović et al., 2015). This global trend was initiated by international institutions such as Group 20 (G20), International Finance Corporation-IFC as a member of the World Bank, World Trade Organization-WTO, and United Nations-UN. Non-governmental organizations have a special role in implementation of this form of financing.

In order to be considered to comprise elements of green banking, a form of financing has to contain two elements: environmental protection and social protection. To realize such business method of profit-sensitive financial institutions, it was necessary to start various forms of international initiatives, i.e. programmes. From the standpoint of these programmes and initiatives, social protection and/or environmental protection can have binding character (they are created at the national level) or non-binding character (they are created by non-governmental organizations and therefore they can have either international or branch character).

Creation and especially implementation of any change is not a simple process, particularly if it does not contain profit growth in itself directly (Munitlak Ivanović, 2015). This characterizes the beginning of development of green banking in 1992 at the United Nations Framework Convention on Climate Change (UNFCCC). This first attempt directed observation on the relationship between profit (as a return on invested capital) and climate changes which have negative impacts on the environment and society and therefore on instability of profits. The first concrete agreement is the Kyoto protocol, with various mechanisms, of which Clean Development Mechanism (Munitlak Ivanović, Bagarić, 2006), i.e. “cap and trade“ system (Munitlak Ivanović et al. 2014) is most significant. Although a stock market for trading GHG emissions was formed, this agreement did not give good results in practice, as countries which

emitted most harmful gases from production did not ratify or apply it. (Golušin, Munitlak Ivanović, 2011).

After partly successful implementation of this mechanism, a new agreement was signed in Copenhagen. The aim of this agreement was to increase liabilities of developed countries to 100 billion dollars per year in order to reduce GHG emissions. Due to failure of this agreement in practice, a new agreement was signed in Cancun, confirming the necessity for operationalization of liabilities from Copenhagen and amount of these liabilities. Speaking of implementation of these obligations in practice, countries find various ways to avoid implementation of this obligation. The latest agreement, signed in Paris in 2015, is partly optimistic. Disadvantage of this document is a time of its coming into force, which will start when 55 countries (out of 195 member states in total) which emit about 55% of GHG gases ratify it.

The above mentioned protocols and mechanisms mainly deal with issues of environmental protection. In addition to these, there are new ones whose aim is simultaneous social and environmental protection, which will be achieved by creating of ISO standards 26000, Global Reporting Initiative (GRI), “Global Agreement“ and other similar agreements and mechanisms. There are also other initiatives, the most famous being the United Nations Environment Programme Finance Initiative (UNEP FI), Institutional Investors Group on Climate Change (IIGCC), United Nations Principles for Responsible Investment (UN PRI), Equator principles and other initiatives, forums and associations. The question is how financial institutions which are primarily motivated by interest and profit can have an effect on improvement of society and environment. Each of the above mentioned initiatives has a specific way of functioning. Due to limited volume of this paper, authors have chosen the Equator principles.

The Equator principles are a form of risk assessment, determination and management in project financing. Their goal is protection against risks related to social and environmental management at the same time (The Equator Principles Association, 2011). The Association’s vision is to determine minimum standards for risk assessment of both society and environment in order to minimize negative impact of approved funds. The Equator Principles Association was established as a result of the desire of a certain number of financial institutions to raise their socially responsible behaviour to as high level as possible (The Equator Principles Association, 2011).

The headquarters of the Equator Principles Association Secretariat is in London. Board of directors consists of 12 members, some of which are establishers of the Association and others come from the presiding bank. The work of the Association is based on standards prescribed and applied by the International Finance Corporation-IFC. The review of the Equator principles III is given in Table 1. The Equator principles started to be applied in 35 countries in 84 financial institutions. In this way, the risk of project financing related to society and environment is minimized. Until now, the percent of coverage of such financing is over 70%.

**Table 1:** Review of Equator principles III

Theme	THE EQUATOR PRINCIPLES III
Scope	<ul style="list-style-type: none"> <li>• Project Finance</li> <li>• Project Finance Advisory</li> <li>• Project-Related-Corporate Loans</li> <li>• Bridge Loans</li> </ul>
EP Association Member Public Reporting	<p>Minimum requirements:</p> <ul style="list-style-type: none"> <li>• Number of “Projects Closed” including: categorization, sector, region and whether an independent review has taken place</li> <li>• Project Names for Project Finance deals (subject to client consent)</li> <li>• Info on EP implementation process including roles and responsibilities, staffing, policies and procedures</li> <li>• Details on training mandatory for first year of EP adoption.</li> </ul>
Client Public Reporting	<ul style="list-style-type: none"> <li>• Online summary of Environmental and Social Impact Assessment.</li> <li>• Greenhouse Gas (GHG) emission levels for projects emitting over 100,000 tons of CO<sub>2</sub> annually during operational phase.</li> </ul>
Social	<ul style="list-style-type: none"> <li>• Social and relevant human rights due diligence.</li> <li>• “Free Prior Informed Consent” in specific circumstances.</li> <li>• Explicit reference to address human rights in the Preamble.</li> <li>• Reference to “Guiding Principles on Business and Human Rights, Implementing the UN Protect, Respect and Remedy Framework”.</li> </ul>
Climate	<ul style="list-style-type: none"> <li>• Attention in due diligence.</li> <li>• Alternative analysis for high emitting projects in line with Performance Standard 3.</li> <li>• Explicit reference to address climate change in the Preamble.</li> <li>• Project reporting requirements on GHG emission levels: <ul style="list-style-type: none"> <li>• Mandatory: projects emitting + 100K tons of CO<sub>2</sub>.</li> <li>• Encouragement: projects emitting + 25K tons of CO<sub>2</sub>.</li> </ul> </li> </ul>
Language Alignment	Environmental and social risks and impacts.

Source: The Equator Principles III (2013)

Project financing is the first field in which the Equator principles have been introduced, as the impact of each project on society and environment is easiest to be followed. This supports the claim mentioned in the abstract that the Equator principles are the important part of green economy through green banking. According to their negative impact on the environment, loans are divided into categories A, B and C. Funds from category A, for example for construction of plants that use coal, have the biggest negative impact on the environment. On the contrary, a project financed with funds from category C has small or no negative impact on the environment. Because of this, independent auditors’ reports containing impact assessment on the environment have to be submitted together with projects that are financed with funds from category A and B, in order to determine other methods of production later which will reduce these negative impacts.

The client that takes funds is obliged to implement the Equator principles in the project by means of an agreement in which the client’s responsibilities related to protection are clearly

defined. Realization of responsibilities undertaken according to this agreement is followed in the Action plan, which can be a part of the agreement or annexed to it. If the central bank or some legislative authority prescribed these responsibilities, there is no need for this agreement.

Principles can be defined as methods and techniques of impact assessment of approved funds on the environment and society for the entire duration of the concrete project. The table below shows ten principles that are vital for the Equator principles mechanism. The impact of the client's approved funds on the environment and society is determined based on fulfilment/non-fulfilment of these principles.

The Equator principles III (2013) are the following:

- Principle 1: Review and Categorization
- Principle 2: Environmental and Social Assessment
- Principle 3: Applicable Environmental and Social Standards
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan
- Principle 5: Stakeholder Engagement
- Principle 6: Grievance Mechanism
- Principle 7: Independent Review
- Principle 8: Covenants
- Principle 9: Independent Monitoring and Reporting
- Principle 10: Reporting and Transparency

Since the introduction of first Equator principles in 2003 two audits were performed, in 2006 and 2013. The above classification is in accordance with the latest audit from 2013. Audits were performed under the significant influence of non-governmental sector and motives for these audits were the following (UNEP, 2016):

1. Deficiencies in the first report published by the Equator Principles Association and stakeholders
2. Modification of standards within the International Finance Corporation-IFC
3. Necessity for more simple implementation and more detailed definition of standards.

The following deficiencies were listed in the study conducted by the United Nations Environment Programme (UNEP, 2016):

1. Majority of financial institutions which introduced the Equator principles use this mechanism mainly for creating of positive public image or as a basis for establishing of the risk assessment system – as risk management.
2. Absence of financial incentives, such as special interests (bonuses) for users of

these funds, is mentioned as a methodological deficiency. Essentially, this means that there is no mechanism of financial incentive for users of these funds which really invest funds in a manner that does not endanger the environment or society. Or shortly, there is no reward system for financiers of socially responsible projects.

3. A significant deficiency is the existence of obligation to indicate projects that emit more than 100.000 tons of CO<sub>2</sub> in the report, while there is no mechanism that could stop financing of such projects or demand an adequate substitution.

4. Due to lack of information, reports make impact analysis of financed projects on the environment and society impossible.

### **Conclusion**

Responsible and conscious societies build long-term national sustainable development strategies. Essentially, this is green economy. In this paper it is pointed out that there is no common understanding of the concept of green economy, but that definitions of almost all authors indicate five identical elements: stakeholders and economic aspects of their profit, environmental protection and social matters followed by goodwill of socially responsible business.

The paper mentions dilemmas on the relationship between sustainable development and green economy. The authors' attitude is that sustainable development is "older" since it appeared earlier as a concept and therefore its implementation started earlier. A series of national and later even local strategies was developed based on a number of international documents with the aim of incorporating pillars of sustainability in continuous social and environmental protection. These processes were incorporated easily in some economies and hardly in other. Green economy as a concept appeared later and its aim was to facilitate, fasten and implement principles of sustainable development in practice. The task of green economy, as a part, system, sub-system or any other form of mutual conditionality with the concept of sustainable development, is to start global changes in terms of poverty reduction and improvement of human well-being with constant economic growth. As a function of socially responsible business, green economy results in boosting of business based on sustainability principles both at macro and micro level. Technological innovations should result in reduction of production costs, not in the growth of these costs. Otherwise, better choice would be ecologically cleaner, but economically less acceptable (uncompetitive) production.

Although there is no common definition of green economy and each country defines it according to its own needs and visions, it is clear that these two concepts are inextricably linked and conditioned. In practice, a process or procedure will not be acceptable from the point of postulates of green economy if one or more principles of sustainable development are not complied with at the same time. On the other hand, it is certain that such business is completely safe and socially responsible.

Likewise two previous concepts, there is no common and official definition of socially responsible business, but each definition contains philanthropic, ethical, legal and economical factor. A pyramid-like model was developed in 1991. Various observations developed by international institutions and some authors have been mentioned in this paper and it can be noticed that all definitions insist on various forms of protection (consumers' interest, environment, workers' rights, interest of business partners and competitors, corporate protection, i.e. protection of global society).

What is interesting is a phenomenon of green banking and social responsibility in financial institutions. Banks have always been focused on profit and, if possible, on profit growth trends. However, as a result of intense development of green economy, the principle of sustainability and social responsibility extended to financing as well. This resulted in development of climate finance and other forms of green finance.

Creation of the Equator principles and participation of financial institutions in this process speaks of raising awareness in this field. The idea of the Equator Principles Association is to determine minimum required standards that a project has to meet in order to get funds from financial institutions which accepted these principles. The basic idea is to finance projects having minimum negative impacts on the society and environment from these funds.

Likewise any mechanism, the Equator principles have their methodological deficiencies, but they certainly represent a step towards green economy and sustainable development.

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## ODNOS ODRŽIVOG RAZVOJA I ZELENE EKONOMIJE - OSVRT NA ZELENE FINANSIJE I BANKARSTVO

*Olja Munitlak-Ivanović<sup>5</sup>, Jovan Zubović<sup>6</sup>, Petar Mitić<sup>7</sup>*

### Rezime

*U radu autori razmatraju pitanje odnosa između privrede, društva i zaštite životne sredine. To nije moguće uraditi bez tri principa održivosti koji moraju biti uključeni u konceptu održivog razvoja, a kasnije i u koncept zelene ekonomije. Veliki broj definicija oba koncepta ukazuju na činjenicu da su ovi odnosi kompleksni, s obzirom da se ekonomsko blagostanje i zaštita životne sredine ne mogu da "pomiriti" u kratkom roku. Cilj zelene ekonomije je da izjednače ekonomske, društvene i životne aspekte. Zelene finansije su razvijene u ovom novom konceptu. Jedan instrument zelenih finansija, pa i društveno odgovorne finansije su Ekvatorski principi. Ovaj rad pokazuje mehanizme delovanja finansijskih institucija koje su prihvatile nove principe, ali takođe ističe i nedostatke koji se moraju ukloniti tokom vremena, tako da ovi principi mogu imati pozitivan uticaj na društvo i životnu sredinu.*

**Ključne reči:** *održivi razvoj, zelena ekonomija, društveno odgovorno poslovanje, životna sredina, Ekvatorski principi*

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## FARM SIZE AS A FACTOR OF EMPLOYMENT AND INCOME OF MEMBERS OF FAMILY FARMS<sup>1</sup>

*Petar Munćan*<sup>2</sup>, *Dragica Božić*<sup>3</sup>

### *Summary*

*Based on data collected through a survey of 35 family farms in Vojvodina, specialized in the market-oriented agricultural production, the interdependence of the size of family farm and structure of field crop production was studied, and its impact on the employment of permanent members actively employed in agriculture and their income. It was found that with an increase of farm size from 20 to 100 ha, the utilization of the available fund of working hours of active members increases by almost 2 times. In addition, with an increase in the size of the farm and increase in the share of industrial crops in the structure of field crop production, income per active member of the family household employed in agriculture also exhibits a tendency to increase. Income per active member, on the farms of 50-100 ha, is 3.6 times higher than the income generated on farms of 10-20 ha in size.*

**Key words:** *family farm, structure of production, active family farm members, employment, income*

**JEL:** *Q12, R29*

### **Introduction**

According to the data obtained in the Census of Agriculture in 2012, in Serbia, total of 628,552 family farms are registered, and 1,416,349 persons are engaged in agricultural activities as members of family farms (households), or full-time employees on the family farms. Employment in agriculture, as well as the scope and structure of the labour force of family farms are decisive factors for the dynamics of structural changes in agriculture and

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its overall development. The importance of the analysis of labour force and employment of family farm members derives from the fact that these studies provide important information on how to use the available labour resources on the farm, the labour productivity in agriculture and the importance of individual sources of income and their stability, as well as many other important aspects of the functioning of the family households as basic socio-economic unit in the rural areas, i.e. villages (Bogdanov, Babović, 2014). Analysis of the labour force and employment on family farms is very complicated, taking into account the specificities of agricultural production and a pronounced seasonality (a large number of workers engaged in a relatively short period of time). Due to the significant share of persons who are partially (seasonal and part-time) working on the farm, labour force in agriculture can be successfully analysed on the basis of data on the annual work units (Božić, Munčan, 2015). The total number of annual work units (equivalent of persons employed full time throughout the year) on family farms in 2012 was 618,054. Family labour force has a dominant share measured by this indicator, it amounts to about 95% (46% are carriers of family households and 49% of other family members).

More than 1/4 of the farm members and persons employed in agriculture, annually are engaged in agricultural activities with less than half of full-time work (Bogdanov, Babović, 2014). Relatively low utilization of available labour force indicates that the Serbian agriculture is dominated by work extensive type of agriculture specific for small farms. Previous statement is confirmed by the results of the Agricultural Census in 2012, according to said source, farms of 5 ha make up about 78% of the total number of family farms and dispose with 30.5% of utilized agricultural land. Farms of over 10 ha make up only 8.1% of farms in Serbia, using 47.7% of utilized agricultural land listed in the Census. The largest farms, with over 50 ha, make up only 0.9% of the total number of family farms and dispose with about 19% of utilized agricultural land. Therefore, the average economic size of family farms, expressed as the total value of the standard output of the farm is only 5,492 Euros and is lower by 4.6 times in relation to the economic size of the EU-27 farm, which is 25,450 Euros (Eurostat). The average economic size of family farms, observed by regions of the Republic of Serbia, is the largest in Vojvodina and is double the Serbian average, but nevertheless is 2.2 times lower than the EU-27 average (Božić, Munčan, 2015). Given the importance of family farms in terms of available resources, workforce and land use, the research subject in this paper are family farms and their available workforce. The starting point in the paper is the assumptions that with an increase in the size of the family farm and the share of industrial crops in the sowing structure, the volume of members' employment and the size of their income exhibit a tendency of increase. The aim of the research is to study the interdependence of the impact of farm size and different structure of the crop production to the extent of engagement of the available workforce and the level of income per family farm member.

### **Data Sources and Methods**

The data collected by interviewing 35 family farms, focused solely on field crop

production from the area of the region of Vojvodina<sup>4</sup>, was used as the main source of data for this research. Determination to focus on the region of Vojvodina comes from the fact that the results of the Census of Agriculture in 2012 showed that this region, compared to whole Serbia, and individually with the other three regions, is characterized by the following characteristics: substantially greater average size of family farm; the lowest share of family farms below 5 ha of utilized agricultural land; the highest share of farms with over 50 ha; the highest average economic size of farms, the most significant share of farms with only agricultural income. The major part of the agricultural production of the Republic of Serbia is realized on the territory of AP Vojvodina. In this area, on average, about 52% of the total area under grain and more than 92% of the area under industrial plants are sown (Bošnjak, Rodić, 2010). In addition, the classification of farms according to the type of production<sup>5</sup> indicates that of the five types of specialized farms, in the region of Vojvodina, 40.8% are specialized for field crop production (Cvijanović et al., 2014). In a survey of family farms engaged exclusively in the production of field crops from the area of the region of Vojvodina, during production years 2011/2012, 2012/2013, 2013/2014, 2014/2015 and 2015/2016, the data were collected that were used for this study. The survey covered family farms of 10-100 ha of arable land, with four main arable crops (maize, wheat, sunflower and sugar beet) present in the structure of production. These crops are considered to be basic, major crops due to the fact that, during the survey period 2011 – 2016, annually on average about 75% of arable land of family farms in the region was used for their production. The questionnaire includes the following data: number of active members of the family farms engaged exclusively in agriculture, used arable land, number of tractors and combines, production value and variable costs and basic technical and technological parameters on the farm.

All surveyed family farms are classified according to the size/surface of the area of arable land used in the three interval groups (10-20 ha, 20-50 ha and 50-100 ha).

In the calculation of the value indicators, the five year (2012 to 2016) average prices realized on the surveyed family farms were used. Average prices were used in order to avoid the extreme impacts of natural conditions on yields and annual fluctuations in the prices of inputs and outputs that occur as a result of disturbed relations in the market.

According to the sources and characteristics of the data, the methods of analysis and comparison are used in this paper, as well as the usual mathematical-statistical methods for analyzing important indicators of conditions and business results (Vidović,

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4 *Region* is statistical, functional, territorial unit, consisting of one or more areas, established for the purpose of planning and implementing regional development policy, in accordance with the nomenclature of statistical territorial units at level 2, not administrative territorial unit and has no legal personality; Law on Regional Development “RS Official Gazette”, No. 51/09.

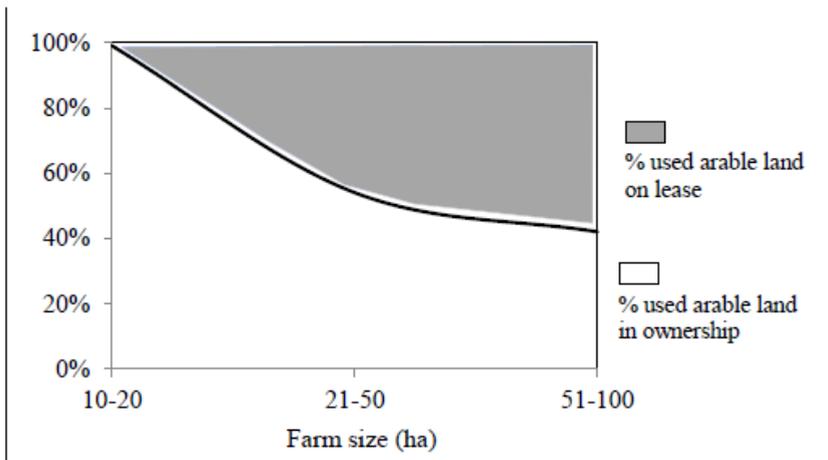
5 Type of agricultural production of the farm is the farm production system characterized by the relative contribution of different activities/operations (production lines) in the total standard output of the farm (Cvijanović et al., 2014)

Milunović, 2017), economic size and employment of the workforce of surveyed family farms, depending on the farm size, and the research results are presented graphically.

### Resources of surveyed family farms

The average area/surface of utilized arable land owned by the surveyed family farms was 23.98 ha and ranged from 14.23 to 53.55 ha. In regard to the area/surface of utilized arable land taken on lease, the average area of surveyed family farms was 39.67 ha. The average area of utilized arable land taken on lease was 15.69 ha and ranged from 0 ha to 55.23 ha, and it was established that with an increase in the size of the farm, the share of arable land taken on lease in the total arable land of the farm also increases (Graph 1). The results of the earlier research conducted on 24 family farms in the area of the two municipalities of South Banat district confirm that smaller farms use only their own arable land, while in case of farms with up to 50 hectares of land, leased land accounts for 53%, and in case of the largest farms with up to 100 ha, leased land accounts for about 66% of the total arable land used (Munčan, 2011). Similar results were obtained in the research conducted on 30 family farms on the territory of Vojvodina, according to which the smaller farms of 10-20 ha, are using only their own land, while in case of farms with over 20 ha, leased arable land contributes with over 50% in the total used arable land (Todorović, 2014). These proportions indicate that an increase in the size of family farms, in the study area, is largely achieved by leasing the arable land.

**Graph 1.** The ratio of used arable land owned and leased by the surveyed family farms

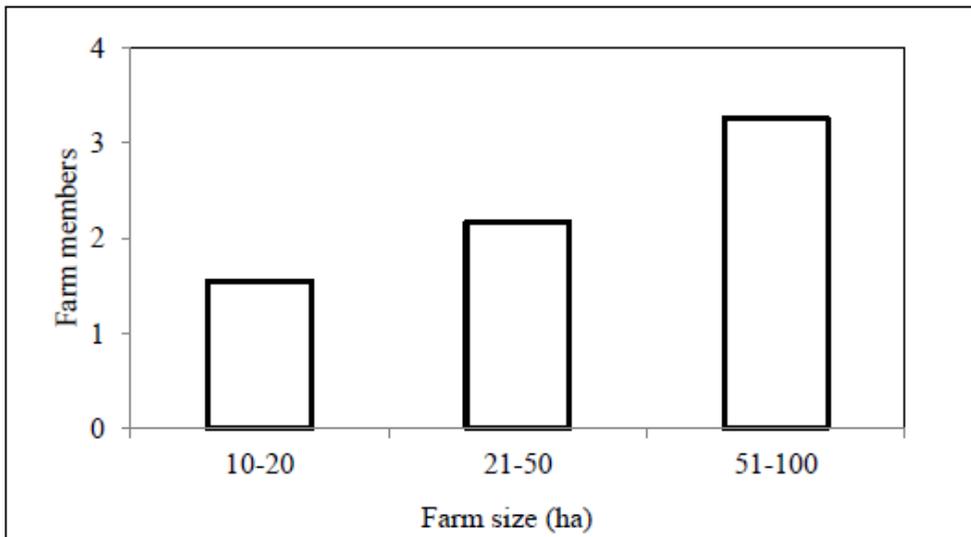


Source: author’s calculation based on survey data

For the functioning of family farms, operation/work is a key element of a combination of production factors, and thus has a decisive influence on the achieved results (Mihajlović, 2016). Labour force of family farms is the most important input in agricultural production as it constitutes an active factor of land use and capital. Its deficiency is usually the limiting factor for the rational exploitation of other resources on the farm; while on the other hand, the surplus of labour force causes insufficient utilization of available working hours, i.e. their insufficient employment.

Members of family farms, by their number and activity, determine not only their overall development but also the development of agriculture in general. The main characteristic of surveyed family farms was the dominant share of family farms with less than 3 members engaged exclusively in agriculture. Farms with least land had the least number of active members who are engaged exclusively in agriculture, on average 1.54 while the biggest farms had average 3.48 active members. With the increase of size of the used arable land, the total number of active members engaged exclusively in agriculture also increases (Graph 2).

**Graph 2.** The number of active members who are engaged exclusively in agriculture on surveyed family farms



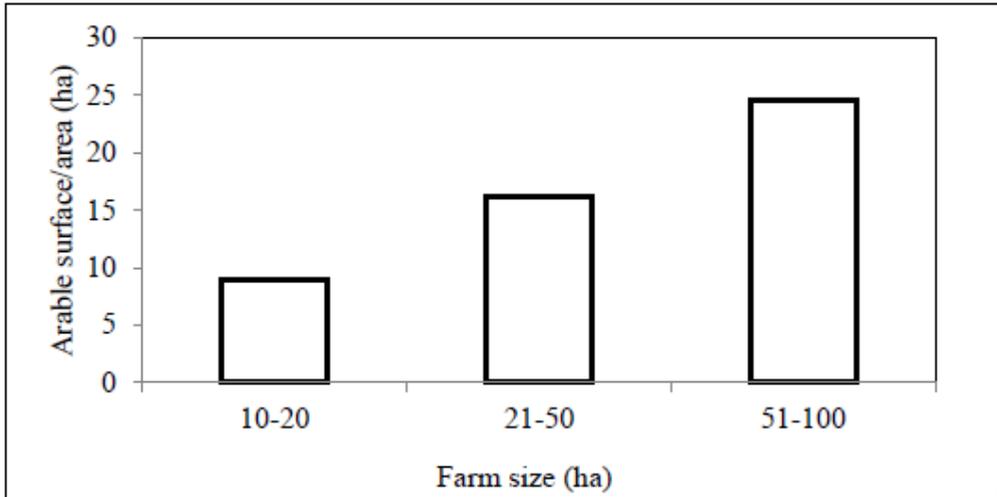
*Source:* author's calculation based on survey data

Consolidation of land in ownership carries with it changes in employment on farms. It is known rule that with the increase in farm size, the number of active members who are full-time working on the farm increases, and the number of active members who are permanently employed outside their own farms decreases. This fact suggests that the largest farms can experience labour deficit, while smaller farms on the other hand are not able to employ all active members working on the farm, so that some of them are forced to look for work outside the farm, i.e. to seek additional sources of income outside of their own farm (Todorović et al., 2009).

With an increase in the size of arable land the degree of engagement of the workforce increases observed from the perspective of the area of the used arable land per active member of the household engaged exclusively in agriculture (Todorović et al. 2011). It may be noted that most members of the family farms work on the farms of 50-100 ha. Thus, for most of surveyed family farms, area of arable land per active member of the household engaged exclusively in agriculture was little over 2.7 times higher

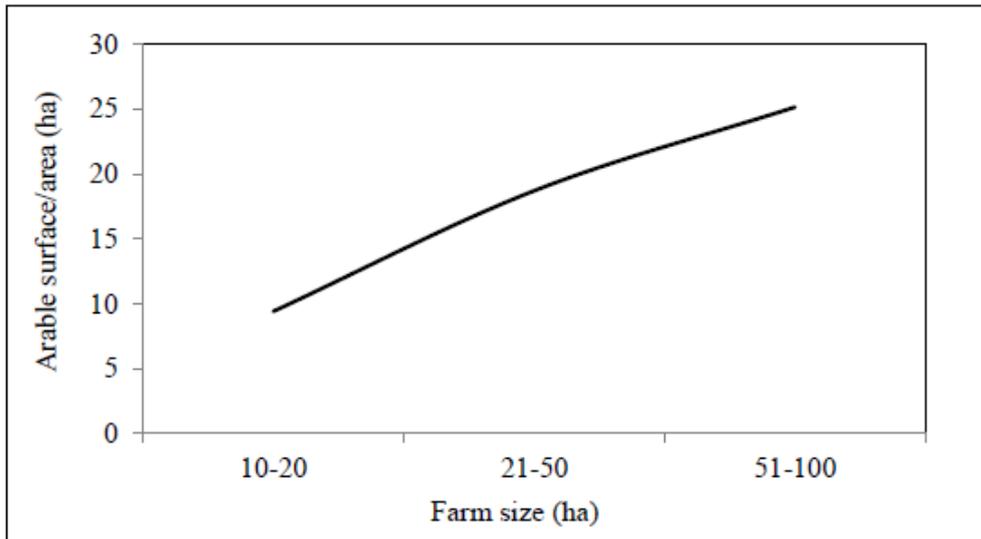
than the same indicator on the smallest farms. The least favourable ratio of the area/surface of used arable land and the number of active household members engaged only in agriculture, is observed in the smallest farms and is improved with the increase in the size of the farm (Graph 3). The increase of the area of arable land used by an active member of the household who is engaged exclusively in agriculture, in the surveyed farms, offers the opportunity to fully use available resources from the aspect of working time in agriculture.

**Graph 3.** Arable land per active member engaged exclusively in agriculture



Source: author’s calculation based on survey data

Agricultural machinery, as an important factor of production, plays an important role in the process of agricultural production. Its importance is both of technical and organizational-economic character, as tractors, combine harvesters and other auxiliary agricultural machines allow a more rational use of available natural and other resources, increase production volume and productivity, and enable relative reduction of production costs. For evaluation of energy equipment of family farms, the presence of important equipment, such as tractors and combines as the main source of mechanical energy in agriculture, is very significant. The average number of tractors per surveyed farm was 1.73, indicating that almost 90% of the surveyed farms own more than one tractor. The remaining 10% of the surveyed farms owning only one tractor belong to the group of the smallest farms of 10-20 ha. Certain farms, size 20-50 ha and all of the farms of 50-100 ha, own the universal harvester, while none of the surveyed farms possess sugar beet harvesters. All surveyed farms have the necessary auxiliary agricultural machines for the realization of technology of field crop production present on the farm. On average 16.54 hectares of arable land per single tractor, with a variation of 9.42 ha in case of the smallest family farms 10-20 ha, to 25.14 ha in case of the largest farms (Graph 4).

**Graph 4.** The surface/area of arable land of surveyed family farms by tractor

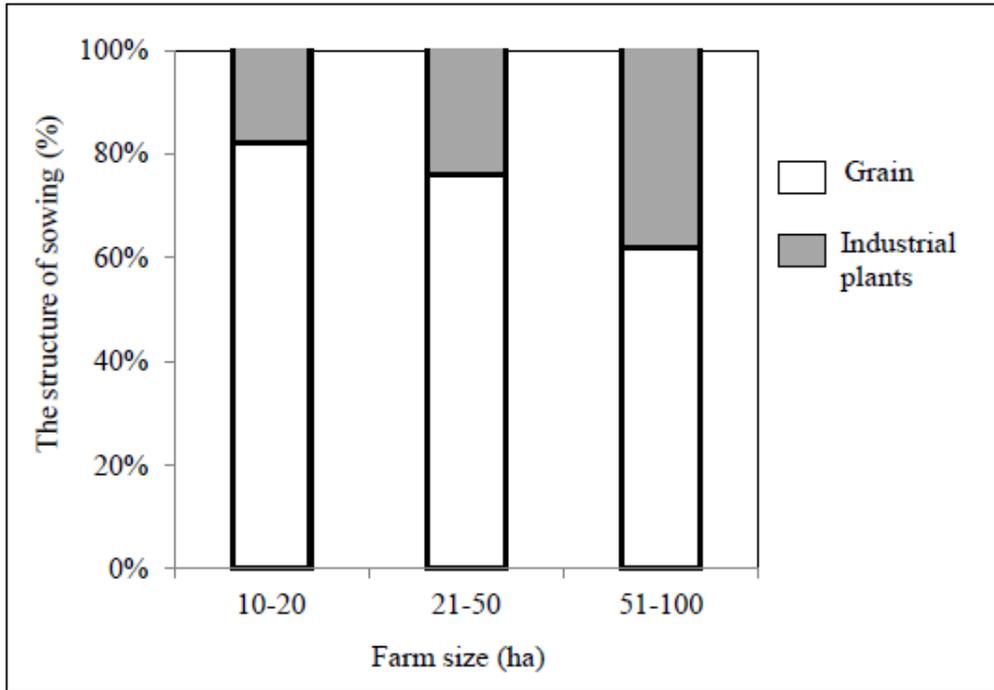
*Source:* author's calculation based on survey data

If we observe kW per ha of arable land, then it is possible to speak about the good equipment, because the average energy equipment of surveyed farms was 3.42 kW per ha which is very close to the average level specified for some EU member states (Heinrich, 2001; Kovacs et al. 2003).

### **Operating results of the surveyed family farms**

The main characteristic of the sowing structure of surveyed family farms of all sizes is the dominant share of grain (maize and wheat) and a slightly lower share of sunflower and sugar beet as a representative of the group of industrial plants (Graph 5). The share of grain is dominant in the sowing structure of farms up to 20 ha and ranges up to a maximum of 80%, while in case of farms over 50 ha, share of grain is lower primarily due to the fact that the sunflower and sugar beet also appear in the structure of sowing of these farms. The smallest farms show the lowest share of industrial plants, only 19%, while in case of the largest farms, this share was 41% in the structure of sowing of arable land (Munčan et al. 2014). With regard to the production of industrial plants (sunflower and sugar beet), a certain tendency in the sowing structure is observed. The participation of this group of crops increases with the increase of farm size. The smallest surveyed farms, the size of up to 20 hectares, have the lowest share of the industrial plants, about 18%, while in case of the large farms industrial plants are included in the sowing structure with over 30%. This tendency can be explained by the fact that larger farms are better equipped with mechanization which allows them more efficient implementation of the technology of production of industrial crops, particularly sugar beet, which only appears in the structure of sowing on farms over 50 ha.

**Graph 5.** The structure of sowing of surveyed family farms



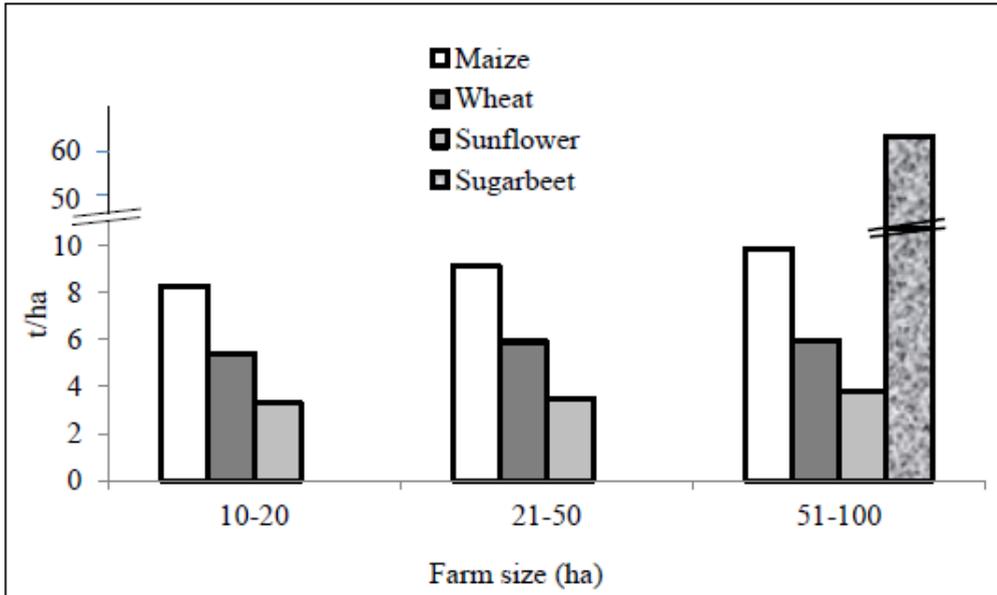
Source: author’s calculation based on survey data

Different levels of intensity of production, caused primarily by the size of family farms, are responsible for the presence of significant differences in the realized grain yields on surveyed family farms (Graph 6).

Although the surveyed family farms have realized slightly higher yields than the average in Vojvodina, depending on the farm size and the types of crops, these yields are still by 20 to 130% lower compared to yields achieved in developed European countries. The reason for this is primarily in relatively low intensity of production of basic field crops, especially on surveyed small family farms. The increase of the level of intensity of production has very much a favourable impact on the increase of yield of these crops. However, the rise in prices of raw materials and fuel in the reporting period had adverse effect on the level of intensity of production, so that producers, in conditions of expensive production inputs, attempting to secure income, reduce agricultural technology and produce at the expense of natural resources, which is socially unacceptable (Bošnjak, Rodić, 2010). In the current conditions, part of the surveyed family farms were unable to provide the necessary financial resources which resulted in a decrease in the level of investment, and therefore the level of realized grain yields. For these reasons, the gross margin was used as the main indicator of economic efficiency of production of basic field crops on surveyed family farms. Gross margin is the difference between the realized value of production and total variable costs (seed, fertilizer, plant protection products, own services of tractors and combines, the costs

of using the services of the combine on small farms, etc.). The realized gross margin at the farm level greatly affects the overall performance because all fixed costs of family farms are deducted of this amount in order to calculate the income. Given that the fixed costs are constant, any change in the breakeven margin at farm level in the short term has a direct impact on the amount of income. Positive breakeven margin contributes to covering of fixed costs and therefore, as pointed out by Ivkov et al. (2008), maximizing of gross margin is equivalent to maximizing profits or minimizing losses.

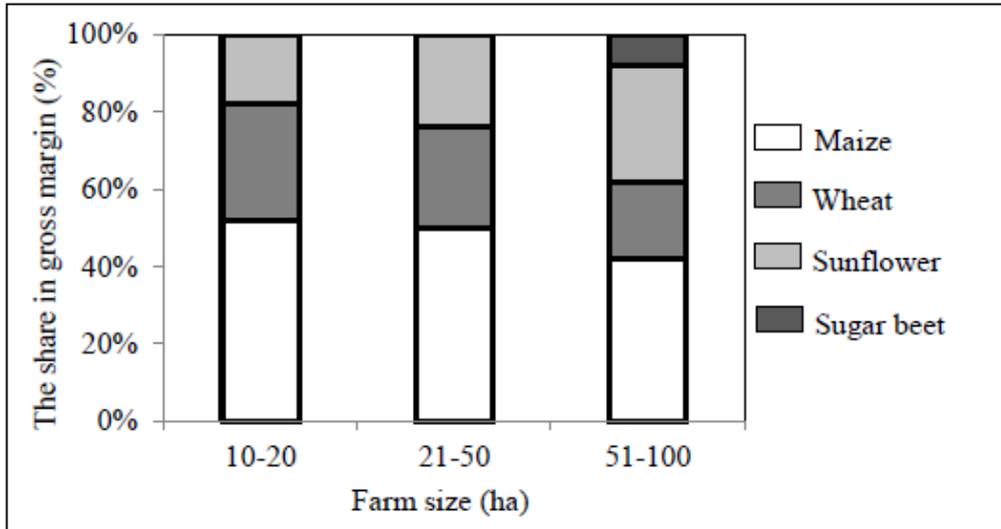
**Graph 6.** Average yields of major field crops of surveyed family farms



Source: author’s calculation based on survey data

Given that the gross margin at the level of family farm depends on the farm size and structure of sowing, based on the representation of the analysed crops in the sowing structure of surveyed family farms, the average contribution of each of them in forming of the gross margin was determined, at the farm level and during the observed period. The main characteristic of the structure of the gross margins on the surveyed farms of all sizes is the dominant share of grain (maize and wheat), ranging from 82% for the smallest farms to 62% for the largest farms. Maize is the dominant crop with about 50% of the share when it comes to the structure of the gross margin of the surveyed farms of any size, whereas, the highest share of wheat on the smallest farms was 30% (Graph 7). The share of industrial crops (sunflower and sugar beet) in the structure of gross margin increases with the increase of farm size.

**Graph 7.** The share of crops present in the overall gross margin of the surveyed family farms



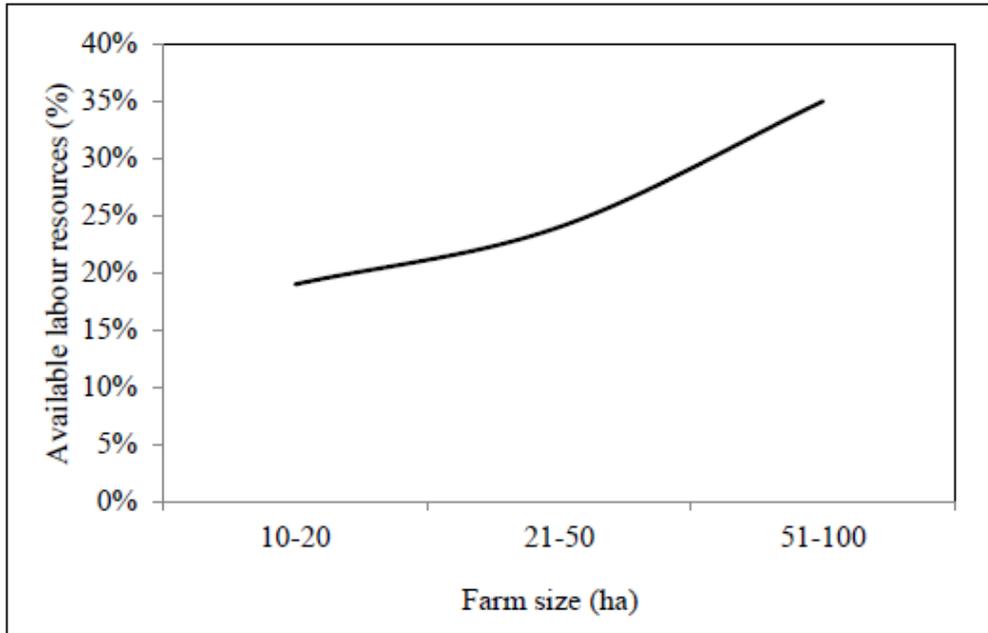
Source: author’s calculation based on survey data

### Employment and the generated income of members of surveyed family farms

Utilization of available workforce on family farms engaged exclusively in field crop production varies greatly during the year. By reviewing the time distribution of labour consumption by months on family farms engaged in the field crop production, Munčan et al. (2008) have come to the conclusion that the labour peaks occur in April and October, considering that these are periods of intense work in field crop production, and this is the case only on farms over 45 ha in October, and farms over 70 ha in April. With this in mind, it is clear that the labour deficit in the season, under certain circumstances, can be an obstacle to the rational use of other production factors and limiting factor for further growth of the largest surveyed family farms. On the other hand, the problem of utilization of available labour resources - active members of household<sup>6</sup>, who are engaged exclusively in agriculture, occurs on small family farms. Namely, insufficient size of family farms is one of the limiting factors of exploitation of available labour resources and presence of significant untapped potential of workforce on them (Graph 8). On the other hand, the utilization/exploitation of the available fund of working hours on the largest surveyed farms was almost 2 times higher than the utilization of the available working hours of members of the smallest family farms. This fact suggests that the increase of the size of farms certainly has big impact on increasing the employment of the active members of the household who are engaged exclusively in agriculture.

6 The available labour resource of members of surveyed farms is calculated as the product of 8 hours of work per day and 225 working days a year.

**Graph 8.** The utilization of the available fund of working hours of active members engaged exclusively in agriculture

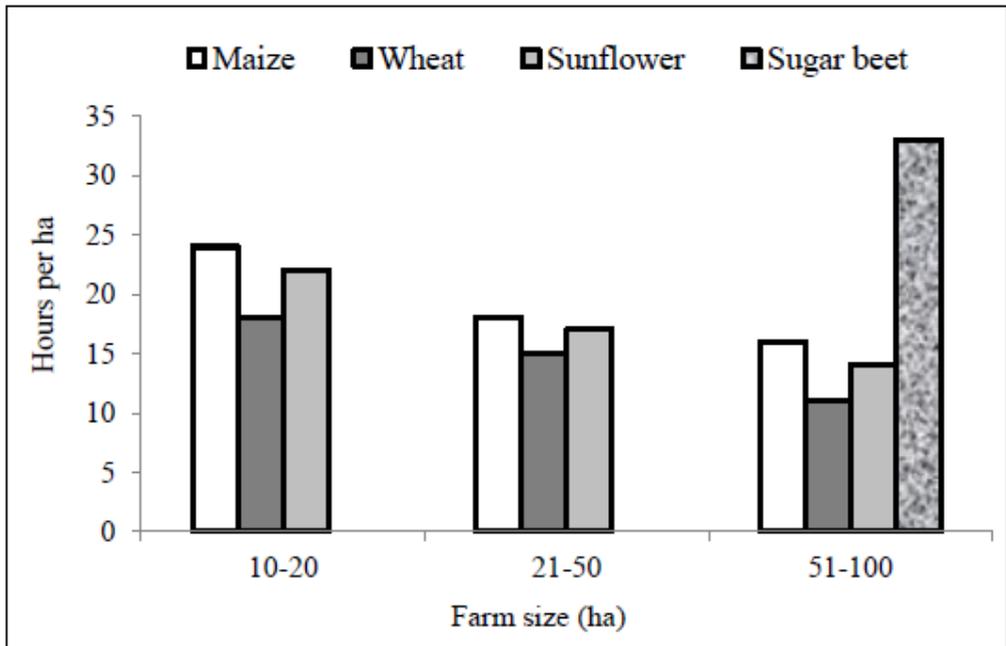


*Source:* author's calculation based on survey data

However, the scope of employment of the active members of the household does not depend solely on its size, but also on other factors such as the structure of field crop production on the farm, the level of technical equipment of farms, the intensity of field crop production, etc. For example, greater share of grain in the structure of sowing (which is typical for smaller farms) requires greater involvement of the workforce at the time of sowing and harvesting, while at other times during the year there are significant unused resources/reserves of available workforce. On the other hand, with increasing share of industrial plants in the structure of production, in particular sugar beet, the scope of employment/engagement of available labour force increases (Graph 9).

The income of surveyed family farms is calculated as the difference between the value of the total yield and the sum of the external costs of materials, services, depreciation of buildings and plant machinery, cost of insurance of products and instruments of labour, lease of land, interest on loans, property taxes and various taxes and fees (social security fees and taxes, taxes for pension and disability and health insurance, water fees, etc.). In this particular case, the income represents the difference between the revenue realized on the farm and total farm expenses, and shows how much a farm can spend in a certain period, without reducing its property (Gogić, 2014).

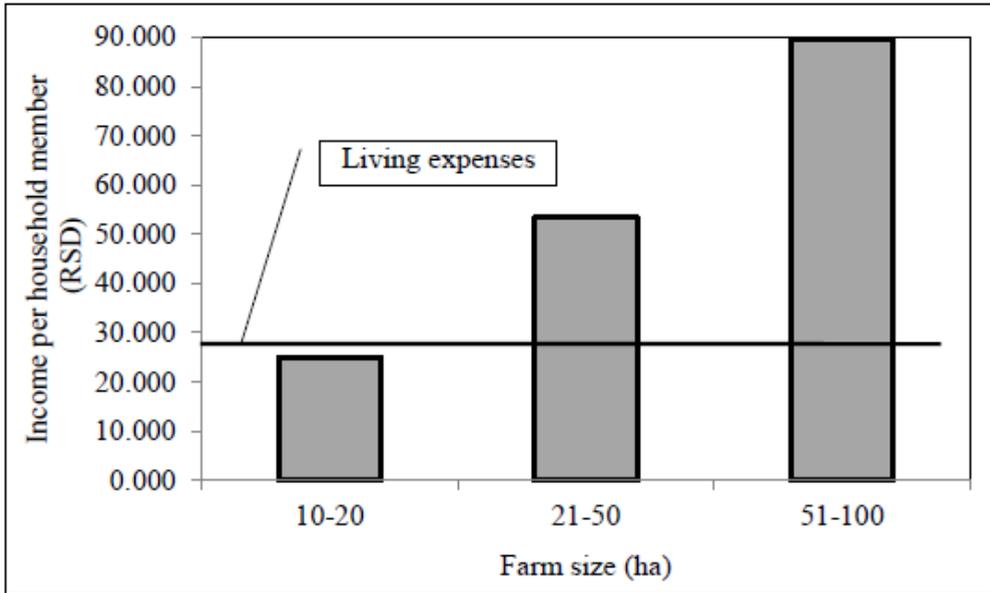
**Graph 9.** The utilization of huma labour in production of major field crops in surveyed family farms



Source: author’s calculation based on survey data

With an increase in the size of the farm and by changing the structure of field crop production, i.e. increase in the share of industrial plants in the sowing structure, income per active member employed full-time in agriculture exhibits a tendency of increase (Graph 10). The realized value of the income per active member is higher on farms of 20-50 ha by 2.15 times, and in case of farms of 50-100 ha even 3.6 times compared to income realized on farms of 10-20 ha (Graph 10). To which extent the level of generated income will satisfy the needs of active members of the family household fully employed in agriculture, largely depends on the socio-economic environment in which the family farms operate because it determines how much income is enough to cover living expenses. The cash outflows for personal use and needs were considered as the cost of living in the present study, which in fact represent household expenditures according to the following groups: Food and non-alcoholic beverages; Alcoholic beverages and tobacco; Clothing and footwear; Housing, water, electricity, gas and other fuels; Furniture, household equipment and household maintenance; Health care; Transport; Communications; Recreation and culture; Education; Restaurants and hotels; Other goods and services. The cost of living accounted for in the present way is given in dinars per household member, ensuring their comparability with the income.

**Graph 10.** The income per active member of the household engaged exclusively in agriculture and living expenses



Source: author’s calculation based on survey data

The income per active member of the surveyed farms who are engaged exclusively in agriculture is the lowest in the smallest farms and does not cover personal expenditure (Duffy, 2009). Survival in agriculture for these farms is possible by changing the structure of production (introduction of intensive vegetable or fruit production). The measures and instruments of the agricultural policy should be adapted to the specific needs of these farms. The latest reform of the CAP for the period 2014-2020, despite the introduction of basic payment scheme per hectare and two forms of compulsory direct payments (green and payments for young farmers), other payment schemes are introduced, including support for small farms with insufficient income (European Commission, 2016).

### Conclusion

Family farms in Serbia, as well as in the surveyed region of Vojvodina, have significant workforce resources often not sufficiently and uniformly employed throughout the year. Also they own the largest areas of arable land which is additionally increased by taking land on lease, but this option is available only to larger, economically stronger farms. Larger farms are better equipped with mechanization which allows them more efficient implementation of the technology of production of industrial crops (especially sugar beet, which only appears in the structure of sowing on farms larger than 50 ha) and intensive production enables them to realize higher yields.

Income per active member of the surveyed farms that is engaged exclusively in agriculture is the lowest in farms with least land and does not even cover the expenditures

for personal consumption, which makes these farms uncompetitive and they can not survive without significant support from the state. These farms can not guarantee greater employment of their members and can be expected to gradually disappear in the coming period.

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## VELIČINA GAZDINSTVA KAO FAKTOR ZAPOSLENOSTI I DOHOTKA ČLANOVA PORODIČNIH GAZDINSTAVA

*Petar Munćan<sup>7</sup> Dragica Božić<sup>8</sup>*

### Apstrakt

*Na osnovu podataka prikupljenih metodom ankete na 35 porodičnih gazdinstava sa područja Vojvodine specijalizovanih na tržišno orijentisanu ratarsku proizvodnju u ovom radu je ispitivana međuzavisnost veličine porodičnih gazdinstava i strukture ratarske proizvodnje na zaposlenost aktivnih članova stalno zaposlenih u poljoprivredi i njihov dohodak. Ustanovljeno je da se sa povećanjem veličine gazdinstva sa 20 na 100 ha povećava iskorišćenost raspoloživog fonda radnog vremena aktivnih članova stalno zaposlenih u poljoprivredi za skoro 2 puta. Pored toga, sa povećanjem veličine gazdinstva i povećanjem učešća industrijskih biljaka u strukturi setve, dohodak po aktivnom članu gazdinstva stalno zaposlenom u poljoprivredi takođe ispoljava tendenciju porasta. Na gazdinstvima veličine 50-100 ha dohodak po aktivnom članu 3,6 puta je veći od dohotka ostvarenog na gazdinstvima veličine poseda 10-20 ha.*

***Ključne reči:*** porodično gazdinstvo, struktura proizvodnje, aktivni članovi gazdinstva, zaposlenost, dohodak

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**EFFICIENCY OF WHEAT PRODUCTION IN REPUBLIC OF SERBIA***Rade Popović<sup>1</sup>, Mina Kovljenić<sup>2</sup>***Summary**

*Wheat is one of the most important cereal and it is considered primarily as a source of energy (carbohydrate), in human diet. In Serbia, the most farms producing crops, where wheat is one of the most important crop. The paper investigates differences in efficiency of wheat production among Serbian farms with objective to identify the most efficient farms and possibilities for further improvement. Data for 2015/2016 production year are gathered through questionnaire during farms visit. In the paper non-parametric models of Data Envelopment Analysis (DEA) was used to identify differences in efficiency of wheat production among farms. The results reveal importance of farm size, size of plots and investments in the new machinery.*

**Key words:** *wheat, farms, efficiency, DEA.*

**JEL:** *Q12, Q15*

**Introduction**

Today by far the most important food source in the world continue to remain cereals, contributing 50 percent of calories and as much as 54 percent in group of developing countries. Their contribution to energy intake varies markedly between developing and industrial countries. In developing countries such as in Africa and parts of Asia, cereals can contribute as much as 70 percent of energy intake. While in industrial countries, for example, the UK, cereals provide approximately 30 percent of energy intake and 50 percent of available carbohydrates. Projecting to 2050, it is expected that the share of cereals in calories for food use will continue to decline slowly from 54 percent in 2001 to 49 percent in 2030 and 46 percent in 2050 (Alexandratos, 2006). Of course, it does not mean decrease in production of cereals, but oppositely. On demand side, expected increase of population for 30% will be followed by 70%

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increase of food demand (Rutten, 2012). On production side, process of slowing growth in yields has been going on for a longer period of time so that in the future expects to projected growth rates of return will be lower than half the actual historical growth rate (Lovre, Gajic, Kresoja, 2011).

The capacity of available resources and technologies that should meet the demands of a growing population for food and other agricultural products remains uncertain. Therefore, certain innovations are needed in agriculture, environmental protection and macroeconomic policy, at both national and international levels, in developed and especially in developing countries.

Wheat is the most important cereal on international market. As a global commodity, amount of wheat traded at international market reached 180 million tons in 2016 (USDA, 2017). Wheat is often considered primarily as a source of energy (carbohydrate) and it is certainly important in this respect. However, it also contains significant amounts of other important nutrients including proteins, fiber, and minor components including lipids, vitamins, minerals, and phytochemicals which may contribute to a healthy diet (Shewry, Hey, 2015). It provides 20% of the calories to the world's population and a similar proportion of daily protein for about 2.5 billion people in less-developed countries. If we look at its contribution to overall consumption of cereals, wheat provides about 41% of the calories and 50% protein (Shiferaw et al., 2013). The future productivity of wheat will arguably have more influence on global food security, than that of any other crop, because it is the most widely grown. Wheat is being adapted to a broad range of latitudes, temperatures, water regimes and nutritional levels (Reynolds et al., 2012).

In the Republic of Serbia wheat is one of the two leading plant products according share in sowing area and amount of production. In sowing structure wheat occupies 0.6 million hectares, with average production over 2 million tons per year during last decade. Regionally distribution of wheat production is more focused on North Serbia where farms have bigger average acreage. Thanks to good weather conditions in 2016 Serbia reached record wheat production in recent history. Although acreage planted by wheat was stable, strong increase in average yield pushed production up to 2.9 million tons (RZS, 2017).

Serbia is a net exporter of wheat. During the last decade from 2007 to 2016 net export of wheat and products from wheat varied from 0.2 to 1.2 million tons, depending on production. The leading export markets for Serbian wheat and products from wheat are: Romania, Bosnia and Herzegovina, Macedonia, Montenegro and Albania (RZS, 2017).

In recent years area of corn increased at the expense of reducing the area under wheat in the total planted area, due to reduced prices of wheat. In 2016, wheat prices ranged from 15.2 din/kg, to 16.20 din/kg with VAT for standard quality, delivered to

the buyer. Just year ago price of wheat in 2015 was 20.13 din/kg (18.30 excluding VAT) (Produktna berza, 2016). Higher corn prices relative to wheat caused a higher demand for wheat for production of animal food, as a substitute for corn.

According to the Census of Agriculture in 2012, in Serbia 99.5% farms are individually owned, and they use 84% of the total arable land area. The average size of the farms owned by individuals is 4.5 ha, and the size varies considerably by regions - 2.1 ha in the Jablanicki county, to 10.0 ha in Srednjobanatski county. The remaining 0.5% of farms are held by the legal entities, and they use 16% of the arable land and have an average size of the 210 ha per farm (Strategija, 2014).

In Serbia every second farm producing wheat. Production is well distributed among all types of farms size. Small farms with up to 8,000 EUR of Standard output (SA) produce wheat on 33.4% of total area under wheat. Middle size with 8,000 to 25,000 EUR of SA produce wheat on 22.4%, and big farms plant wheat rest of 44.2% hectares (RZS, 2017).

The importance of individual farms is large, however, the economic importance of these holdings is at odds with their potential opportunities. This is because they are mostly small and without adequate support from the state for an extended period of time. Family labour carries out the work on the farm, which results in reduced employment potential. Nevertheless, these farms operate mainly within the limits of simple reproduction, with pronounced elements of natural and simple commodity production (Jelic, Jovanovic, 2004). Farm size is crucial for the efficiency of operations in agriculture, so one can conclude that with such unfavorable size farms hard to be competitive in the market and in terms of increased competition (Muncan, Todorovic, Muncan, 2014). Total production of wheat depends primarily on the area planted and the average yield of bread grain. Sowing areas of wheat vary from year to year, as a result of farmers profit expectation, market position etc.

On small farms with fragmented holdings and the existing structure of production, there are high production costs and inefficient use of resources, with the inability to achieve an efficient use of land. In addition, the average farm in Serbia is characterized by a low level of technical - technological equipment, an extremely small number of livestock per unit of agricultural land, and other indicators that make it difficult to increase productivity and profitability in production. Low productivity in the production has a negative impact on the price competitiveness of production and brings the average agricultural producer in a difficult position in the market (Nestorov-Bizonj, Kovljenic, Erdelji, 2015).

*The purpose* of this paper is to discover efficiency differences between wheat production among farms in North Serbia region. *The goal* of the paper is to discover the most efficient farms using the combination of inputs that minimises the cost of producing a given level of output, from an economic standpoint.

## Literature review

Many economic production models have been developed to estimate efficiency of farms and identify efficiency determinants. One of these models is nonparametric estimation named Data Envelopment Analysis - DEA. DEA constructs a nonparametric frontier over data points, so that all observations lie on or below the frontier (Laturffe et al., 2005).

There are input-orientated DEA model and output-oriented DEA model. Input-oriented technical efficiency measures address the question: “By how much can input quantities be proportionally reduced without changing the output quantities produced?” While output-oriented technical efficiency measures trying to answer question: “By how much can output quantities be proportionally expanded without altering the input quantities used?” (Coelli et al., 2005).

Farrell (1957) described two components of efficiency: technical efficiency (TE) and allocative efficiency (AE) or price efficiency. Technical efficiency reflects the ability of firm to obtain maximal output from a given set of inputs. Allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions. Technical and allocative efficiency are then combined to provide a measure of total economic efficiency.

Two types of DEA model are in use: model with constant returns to scale (CRS) and model with variable returns to scale (VRS). The CRS assumption is appropriate when all firms are operating at an optimal scale. CRS is a strong assumption. In practice, production processes often do not scale perfectly, showing instead increasing returns to scale (IRS) and decreasing returns to scale (DRS) at various points (Rouse, Harrison, Chen, 2010). Imperfect competition, government regulations, constraints on finance, etc., may cause a firm to be not operating at optimal scale (Coelli et al., 2005). Non-constant returns to scale are referred to as variable returns to scale (VRS). The VRS frontier envelops the farms more tightly than the CRS frontier. Consequently, farms that are inefficient under CRS can have higher estimated TE scores under VRS. Since VRS takes size into account, a farm is compared to other farms of similar size and hence may not have the same benchmarks as under CRS (Rouse, Harrison, Chen, 2010).

As a method DEA has been widely applied to evaluate the performance of many different types of organizations performing a variety of activities, including both profit and nonprofit organizations, at micro and macro level (Popovic, Djokic, Kleut, 2015).

Reig-Martinez and Picazo-Tadeo (2004), used Data Envelopment Analysis as an appropriate analytical tool to explore the possibilities of short-term viability of individual Spanish citrus farms, after eliminating current inefficient practices.

They computed an overall efficiency measure and several indicators of short-run competitiveness that compare the ability of farms to generate net income under both current and efficient production plans. Their results show that there is a substantial fall in the number of farms judged economically non-viable after inefficiency has been removed.

Gerdessen and Pascucci (2013) paper shows how DEA can be used to address the issue of sustainability of 252 European agricultural systems. One CRS model and two VRS models were used to partition the regions into a subset of efficient and a subset of non-efficient regions. Inputs and outputs were defined based on the multidimensional perspective of sustainability and its three dimensions: economic, social, and environmental. Impact of model choices such as CRS versus VRS, input versus output orientation, and balancing constraints was shown in the paper.

Speelman et al. (2008) used data envelopment analysis (DEA) techniques to compute farm-level technical efficiency measures and sub-vector efficiencies for water use. It was shown that under constant returns to scale (CRS) and variable returns to scale (VRS) specification, substantial technical inefficiencies, of 49% and 16%, respectively, exist among farmers. Farm size, landownership, fragmentation, the type of irrigation scheme, crop choice and the irrigation methods applied showed a significant impact on the sub-vector efficiency for water.

Laturffe et al. (2005) were analyzing efficiency differences of Polish livestock and crop farms, at two points time during transition, 1996 and 2000. In the paper they used data envelopment analysis. The results showed that livestock farms were on average, more technically and scale efficient than crop farms.

Hoang (2013) analyzed the productive efficiency of rice production systems in Sri Lanka. In the first stage, crop growth and economic production models were estimated to calculate three measures of productive efficiency: (1) agronomic efficiency, as the ratio of actual yield to potential yield; (2) technical efficiency (TE), as the ratio of actual yield to best practice yield; and (3) agro-economic efficiency (AgEcE), as the ratio of best practice yield to potential yield. In the second stage, TE and AgEcE were analyzed in relation to economic, institutional, social and technological factors that cause farm and spatial heterogeneity.

Results of empirical studies which analyzed efficiency of farms can provide meaningful information for farmers and policy makers to improve productive and economic performance. The inputs such as fuel, electricity, machinery, seeds, fertilizers, and chemicals significantly consume energy supplies in the production system of modern agriculture. Efficient use of these inputs helps to achieve increased production and productivity. That contributes to the economy, profitability, and competitiveness of producers (Sahabi, Feizi, Amirmoradi, 2013).

When measuring the economic viability of farms some of the following indicators are used: the entrepreneurial profit, operating profit margin, net farm income, productivity, competitiveness, market position, rate depending on household income from non-agricultural activities, the rate indebtedness etc (Popovic, Knezevic, Tosin, 2011). When looking at the production of field crops, economic efficiency is evaluated on the basis of the achieved yields and prices of goods on the one side, and manufacturing costs on the other. Economic efficiency of production of field crops are often evaluated on the basis of gross-margin. The value of the gross margin varies from farm to farm, depending on the yield, market prices, sales method, field crops, the variable costs and the size of the farm (Jankovic et al., 2013).

### **Materials and methods**

The survey was conducted in the region Serbia North, for 2015/2016 production year. The study included six farms, where types of small, middle and big farms are presented by two farms each. In the paper as a instrument we used a questionnaire designed for the purpose of research. The questionnaire was drawn up on the basis of literature and previous research.

The first part of the questionnaire includes identification questions (registration on farm, tax amount, age of the manager, education, successor of the farm, number of active members in the production). The second part of the questionnaire includes questions related to income on farms (total used agricultural area, area under wheat, average yield, price of wheat). The third part of the questionnaire includes questions related to costs on the farms (all elements of: variable, fixed and opportunity costs).

In the paper DEA model is used to estimate productive efficiency of farms and identify efficiency determinants. DEA was developed as a mathematical programming technique for evaluating and comparing the performance of a set of decision making units (DMU's) with common inputs and outputs. Within the DEA framework a DMU is defined as an entity that converts inputs into outputs. In DEA efficiency is defined as ratio of the weighted sum of the outputs and the weighted sum of the inputs, under the constraint that efficiency can never exceed the value of 1. The efficiency of decision making units (DMU) increases as its outputs increase or its inputs decrease (and vice versa) (Gerdessen, Pascucci, 2013).

Each wheat producing farm is treated as decision making unit (DMU) and relative efficiency is measured for them. As the relevant inputs in wheat production are chosen:

- variable cost in RSD per hectare,
- fixed cost in RSD per hectare, and
- opportunity cost in RSD per hectare.

The group of variable costs include expenses for, namely costs of seed, fertilizers and pesticides, and contract harvesting services. Fixed costs include depreciation of farm mechanization used in wheat production and taxes. Opportunity costs include rental rates for own land, cost of family labour, interest on own operating capital, interest on the own capital invested in machinery (Milanović et al., 2017). Farm utilised land represent farm size and include own and rented agricultural land.

From outputs as relevant in wheat enterprise was chosen farmers' income and entrepreneurial profit. Farmers' income is calculated as sum between economic profit and all opportunity costs incurred in wheat production per hectare. Entrepreneurial profit is calculated as a difference between revenue in wheat enterprise and all cost incurred in wheat production per hectare, except cost of own management.

Technical efficiency is estimated, on the basis of quantities used on input side (variable, fixed and opportunity costs), and farmers' income and entrepreneurial profit on output side. In the paper input - oriented multi stage model with variable return to scale was chosen for analysis.

Table 1 presents descriptive statistics of data set for 6 wheat producing farms. High standard deviation coefficients comparing with average values indicate of wide range used inputs. In wheat production farms vary from small with 5.5 hectares to big with 80 hectares.

In the sample all farms, except one, have several smaller parcels of wheat. A couple of farms have old mechanisation, and only one farm has a contract harvest with bigger farms. On the farms usually family labour carries out the work on the farm.

Wheat producing farms, are diverse in total farm land size, ranging from small to big farms. Because of their size, their cost, farmers' income and entrepreneurial profit vary significantly. Farmers' income varied from 24,783.57 to 44,682.34, and entrepreneurial profit varied from 182.42 to 14,642.88. Variable cost varied from 54,105 to 71,273, fixed cost varied from 5,446.43 to 13,381.25, and opportunity cost varied from 24,420.5 to 30,039.47. As we can see the biggest differences are the fixed costs and entrepreneurial profit.

**Table 1.** Descriptive statistics of sample

Wheat	Average	Min	Max	St. Dev.
Farmers' income (RSD/ha)	31,109.44	24,783.57	44,682.34	7,114.48
Entrepreneurial profit (RSD/ha)	3,339.38	182.42	14,642.88	5,742.48
Variable cost (RSD/ha)	59,815.66	54,105	71,273	7,156.77
Fixed cost (RSD/ha)	8,923.02	5,446.43	13,381.25	2,754.46
Opportunity cost (RSD/ha)	27,770.06	24,420.5	30,039.47	1,965.12

Source: Author's calculation

**Table 2.** Correlation coefficients among inputs and output

	Farmers' income	Entrepreneurial profit	Variable cost	Fixed cost	Opportunity cost
Farmers' income	1.00				
Entrepreneurial profit	0.98	1.00			
Variable cost	0.00	-0.14	1.00		
Fixed cost	0.18	0.04	0.81	1.00	
Opportunity cost	0.77	0.61	0.42	0.53	1.00

Source: Author's calculation

The correlation analysis results are presented in Table 2. The application of DEA method presumes relation among inputs and outputs. The correlation coefficients between selected two outputs and three inputs are ranged from weak to strong.

## Results

The computer program DEAP version 2.1. was used to analyse relative efficiency in sample of wheat producing farms in Serbia in 2015/2016 production year. For analysis input - oriented multi stage model with variable return to scale was chosen. The results of CRS and VRS DEA models presents TE and PTE respectively. Scale efficiency is the ratio of TE and PTE. Farm is scale efficient if ratio is equal to 1, otherwise if ratio is lower than 1 farm is scale inefficiency.

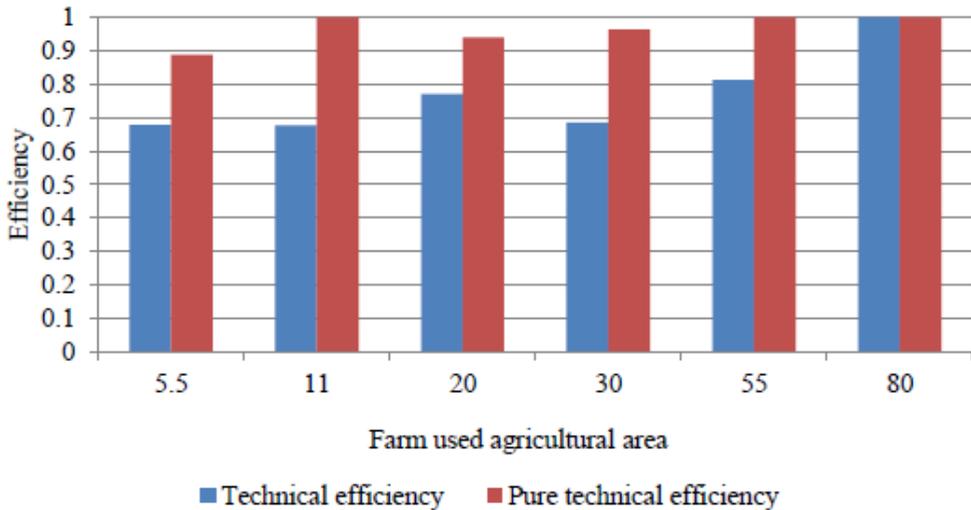
The results of DEA models are presented in Table 3. The average efficiency for whole sample of 6 farms was 0.77, and only 1 farm achieved technical efficiency score of 1. Besides technically efficient farms, 3 farms had pure technical efficiency indicating its disadvantageous conditions with size of business i.e. low scale efficiency. The technical efficiency varied from 0.677 to 1 with standard deviation of 0.126.

**Table 3.** Average efficiency of wheat producing farms

	Average	SD	Min	Max
Technical efficiency	0.770	0.126	0.677	1
Pure technical efficiency	0.965	0.045	0.888	1
Scale efficiency	0.797	0.114	0.677	1

Source: Data obtained from DEA analysis

In the sample increasing return to scale (IRS) dominate, since  $TE/PTE < 1$ . That implies that wheat producing farms are technically inefficient because of scale inefficiency. Farms that are inefficient could increase efficiency by increasing arable land area and by the investments in machinery.

**Graph 1.** Efficiency score distribution of wheat producers by farm size in ha UAA

Source: Data obtained from DEA analysis based on variables from 6 farms and its wheat enterprise budgets.

Efficiency score distribution presented in Graph 1., revealed that, from analysed 6 farms, 3 of them had PTE score of 1, while only 1 farm scored TE with value 1. Efficient farms exist in all range of farm size, measured in utilized agricultural area (UAA).

Farm which had the best results, i.e. PTE and TE efficient, does not have a fragmented holding, it is biggest farm and the whole wheat production is performed on one parcel. Also, this farm use relatively modern machinery compared to other farms.

## Conclusion

In Serbia the production of wheat, as the most important bread grain, had negative trend in area harvested till last decade when area under wheat stabilised on 0.6 million hectares. Sowing areas of wheat slightly vary from year to year, as a result of various factors including weather conditions in planting season, expected entrepreneurial profit, etc.

Small farms in Serbia with fragmented holdings and the existing structure of production, have high production costs and inefficient use of resources. Because of that they are unable to achieve an efficient use of land. The low level of grain yields are conditioned by a high proportion of production for their own needs, and the low level of market launch. High input prices, old machinery and decline in investment make it difficult to increase productivity and profitability in production. Large farms are more likely to opt for the application of new technologies, and they usually have higher grain yields. Low productivity in the production has a negative impact on the price competitiveness of production and brings the average agricultural producer in a difficult position in the market.

This study examines technical efficiency of 6 wheat producing farms. DEA input - oriented multi stage model with variable return to scale was applied to measure relative efficiency scores. The results revealed that only 1 farm achieved technical efficiency score of 1 and 3 farms had pure technical efficiency. Farm which had the best results, does not have a fragmented holding, the whole wheat production is performed on one parcel, and the farm uses a relatively modern machinery compared to other farms.

In the sample increasing return to scale (IRS) dominate and that implies that wheat producing farms are technically inefficient because of scale inefficiency. Inefficient farmers could increase technical efficiency of their wheat production by increasing arable land area and area planted with wheat, reducing fragmentation, decreasing level of used inputs, and by investments in the new machinery.

This research had some limitations. The most of family farms in Serbia do not keep evidence, what brings wide range of challenges for researcher. DEA model have advantages over other models in micro economic analysis of efficiency, but opportunity to use bigger number of inputs and outputs in analysis is conditioned by bigger sample of DMU's.

The research opens the door for future studies examining the efficiency of other crops that are produced on farms in Serbia. Research of this kind would have a major significance for all individuals involved in the agricultural sector. Analyses of determinants of efficiency provide important information for farmers to improve their performance and for policy makers to know what policies to put in place to increase the overall efficiency of farms.

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**EFIKASNOST PROIZVODNJE PŠENICE U REPUBLICI SRBIJI***Rade Popović<sup>3</sup>, Mina Koveljenić<sup>4</sup>***Apstrakt**

*Pšenica je jedna od najvažnijih žitarica i smatra se prvenstveno izvorom energije (ugljenih hidrata), u ljudskoj ishrani. U Srbiji najveći broj gazdinstva se bavi biljnom proizvodnjom, a pšenica je jedan od najvažnijih useva. U radu se istražuju razlike u efikasnosti proizvodnje pšenice na gazdinstvima u Srbiji sa ciljem da se identifikuju najefikasnija gazdinstva, kao i mogućnosti za dalje poboljšanje. Podaci su prikupljeni za 2015/2016 proizvodnu godinu putem upitnika tokom posete poljoprivrednih gazdinstava. U radu je korišćen neparometrijski model analize podataka (DEA) za identifikaciju razlika u efikasnosti proizvodnje pšenice između gazdinstava. Rezultati istraživanja ukazuju da na efikasnost proizvodnje pšenice značajno utiču veličina poljoprivrednog gazdinstva, veličina parcele i investicije u novu mehanizaciju.*

**Ključne reči:** *pšenica, gazdinstva, efikasnost, DEA*

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## THE DISCRIMINANT ANALYSIS APPLIED TO THE DIFFERENTIATION OF SOIL TYPES

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### Summary

*It is frequently important in agro-economics, on examining for example in plant breeding the problem might be to decide whether a plant or plant progeny belongs to a high-yielding or low-yielding group.*

*Sometimes decisions can be made on the basis of a single variable, but more often of the 2 group differ in several variables, each of which gives some indication as to group in which the individual should be placed. This is a classical problem of discrimination, where the general problem is to find a discrimination function.*

**Key words:** analysis, differentiation, soil, types, plant.

**JEL:** C25, C35.

### Introduction

According to Kardaun, et al. (1993), the theory of discriminant analysis is a well developed branch of statistics and at the same time still a field of active research. Part of the algorithms are implemented in special or general statistical packages. One can approach discriminant analysis from a purely data-descriptive point of view and from a probabilistic point of view (Both approaches, but most easily the latter one, can be incorporated into a decision theoretical framework). In the latter approach, a probabilistic model is used to describe the situation. The applicability of such a model in non-random situations may be questioned

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from a fundamental point of view (Breiman et al., 1984) However, such a probabilistic framework is almost indispensable if one wants to estimate the performance of procedures in future situations, and to express uncertainties in various estimates.

Moreover, it often leads to procedures that are also sensible from a data-descriptive point of view (Chercassky, Mučier, 2007). Or reversely: A specific procedure can often be viewed upon as a data-descriptive one, with little further interpretation, and as a probabilistic one, with considerably more interpretation, the validity of which is of course dependent on the adequacy of the framework.

Sometimes a procedure developed in one probabilistic framework can also be interpreted in another probabilistic framework, which may be more relevant for the data at hand (Farlov, 1984; Forsyth, 1989; Gilad-Bachrach, 2006; Gilad-Bachrach, 2004).

Thanh et al. (2017) show that there has been a great effort to transfer linear discriminant techniques that operate on vector data to high-order data, generally referred to as Multilinear Discriminant Analysis (MDA) techniques. Many existing works focus on maximizing the inter-class variances to intra-class variances defined on tensor data representations. However, there has not been any attempt to employ class-specific discrimination criteria for the tensor data. In this paper, they propose a multilinear subspace learning technique suitable for applications requiring class-specific tensor models. The method maximizes the discrimination of each individual class in the feature space while retains the spatial structure of the input.

Early on, Beauchamp et al. (1980) implemented discriminant analysis method to uranium exploration. It is possible to use discriminant analysis methods on hydrogeochemical data collected in the NURE Program to aid in formulating geochemical models that can be used to identify the anomalous areas used in resource estimation. Discriminant analysis methods have been applied to data from the Plainview, Texas Quadrangle which has approximately 850 groundwater samples with more than 40 quantitative measurements per sample. Discriminant analysis topics involving estimation of misclassification probabilities, variable selection, and robust discrimination are applied (Hart, 1989; Haussler, 1989; Han & Camber, 2000; Kantardzic, 2011). A method using generalized distance measures is given which enables the assignment of samples to a background population or a mineralized population whose parameters were estimated from separate studies (Milojević et al., 2013; Vukoje, 2013; Stanojević et al., 2017).

Also, Zhijin, et al. (1994) used the discriminant analysis method in multivariate statistical theory to handle the  $\epsilon$   $\pi$   $\mu$  separation in BES, describing the principle of the discriminant analysis method, deriving the unstandardized discriminant functions (responsible for particle separation), giving the discriminant efficiency for  $\epsilon$   $\pi$   $\mu$  and comparing the results from the discriminant analysis method with those obtained in a conventional way.

### Data and Variables

Our data collected 286 samples of soil of which 100 contained the organism *Azotobacter* and 186 did not. Characteristics of the soil were studied:

$X_1 = \text{pH}^6$

$X_2 =$  amount of readily available phosphate

$X_3 =$  total nitrogen content

Data are collected from Iowa Agriculture Experimentation Station, Cox and Martin (1) In our case, a sample for  $X_1$ ,  $X_2$ , and  $X_3$  was taken to 52 samples of the earth. Group A had 25 samples and contained *Azotobacter*, while Group B had 27 samples and did not contain *Azotobacter*.

### Methods

In our case, we will use discriminatory analysis in order to evaluate the difference in soil diversity. In other words, through the knowledge of 3 characteristics  $X_1$ ,  $X_2$ , and  $X_3$ , through formal presentations in our case, the application of discriminatory analysis can make significant indications whether the soil sample contains or does not contain the organism *Azotobacter*. Respecting the fact that *Azotobacter* positively affects agriculture products, which is not a matter of our consideration. For the purposes of our research, we have identified the use of stepwise discriminant analysis for the purpose of determining a variable that is decisive for the classification procedure (Kohavi, 1995; Quinlan, & Cameron-Jonas, 1995; Koteri & Lester, 2012), whether the type of soil contains or does not contain the bacterium *Azotobacter*. The first step in our analysis is the application of linear discriminatory analysis.

#### Linear Discrimination Analysis-LDA (Supervised Learning)

The first step in the classification process is the application of LDA in the application of the Data Mining method - finding drowned knowledge (Written & Frank, 2005), which presupposes learning on the sample, produced the following results:

We only hold on the confusion matrix, which indicates a resubstitution error of the order of 12%. A detailed analysis of the results shows that some variables are not important in the process of determining the presence of *Azotobacter*.

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6 The pH value is the measure of the activity of hydrogen ions ( $\text{H}^+$ ) in the solution and thus determines whether a solution is of acid or base character. The pH value is dimensionless, and for the comparison, a pH scale of values ranging from 0 to 14 is used. For acid solutions, the pH is less than 7 ( $\text{pH} < 7.0$ ), and for bases it is greater than 7 ( $\text{pH} > 7, 0$ )

**Table 1.** Classifier performances

<b>Error rate</b>			<b>0,1224</b>			
<b>Values prediction</b>			<b>Confusion matrix</b>			
Value	Recall	1-Precision		Yes	No	Sum
Yes	0,7727	0,0556	Yes	17	5	22
No	0,9630	0,1613	No	1	26	27
			Sum	18	31	49

Source: authors' calculations;

The classification function would be, as follows:

$$Z = 21.5 X_1 - 0.07 X_2 + 0.03 X_3 - 76$$

The question arises as to whether the variables X2 and X3 should be rejected from the analysis as insignificant for our classification process.

Although the error is optimistic, we approach the use of resampling methods called bootstrap I which gives a better assessment of the classification potential.

**Table 2.** Bootstrap error estimation

<b>Error rate</b>	
<b>.632+ bootstrap</b>	<b>0,1429</b>
.632 bootstrap	0,1423
Resubstitution	0,1224

Source: authors' calculations;

We see that the actual error is significantly higher than the initial error.

Otherwise in the classification process is the application of stepwise discriminant analysis, with the results as follows:

**Table 3.** Detailed results

N	d.f	Best	Sol.1	Sol.2	Sol.3	Sol.4	Sol.5
1	(1, 47)	X 1 L : 0,4565 F : 55,95 p : 0,0000	X 1 L : 0,4565 F : 55,95 p : 0,0000	X 2 L : 0,7000 F : 20,15 p : 0,0000	X 3 L : 0,7295 F : 17,42 p : 0,0001	-	-
2	(1, 46)	-	X 3 L : 0,4444 F : 1,26 p : 0,2679	X 2 L : 0,4454 F : 1,15 p : 0,2900	-	-	-

Source: authors' calculations;

Using forward strategy, we obtained for F statistics 3.84 that there is only one relevant variant X1 = pH.

The third step in the analysis is the re-implementation of the LDA, which in this case gives the same classification error, but with a discriminatory function, as follows:

$$Z = 19.5 X_1 - 71.5$$

Again, using the bootstrap validation we came up with a similar error of 13%.

Application of the LDA and STEPDISK classification indicates that after the application of the Data Mining method, the so-called. The supervised learning came to a single chrysal variable that, in combination with a constant, has a dominant effect on determining whether the type of soil contains or does not contain Azotobacter.

The next section of the appendix has the purpose to define how many “potentials” influence the classification variables through the application of the Decision Trees.

### Application of Decision Trees

Learning the decision tree is the process of creating a discriminating function in the form of a decision tree (1,8), (2,995-1003), (18, 404). The tree is created recursively, from the top (roots) to the leaves, so each tree node represents a logical test of the value of an attribute from the description of the problem, and leaves represent the class in which the example is classified. When creating, the assortment of attributes for each node is done by heuristic methods, based on the assessment of the quality of discrimination (under) of a set of examples from the training session, remaining for discrimination in the observed node. Although a tree can perfectly classify all the cases from a training session, it does not represent a high accuracy guarantee on new examples, as they are often overfits according to training examples, so simplification is made, resulting in smaller trees, which are more accurate at the same time and more comprehensible. In our analysis, we used well-known decision-making algorithms, C4.5 (16,287), which are available within the WEKA (University of Waikato) system (19) for the purpose of selecting associated attributes. The main advantage of the decision tree is to provide a significant way of presenting knowledge by extracting IF-THEN classification rules.

The results obtained indicate a level of accuracy of 90% versus an error of 10%.

#### Decision tree

- $X_1 < 6.8000$ 
  - $X_1 < 5.7500$  then contains Azotobacter = No (100.00% of 9 examples)
  - $X_1 > 5.7500$ 
    - $X_2 < 34.0000$  then contains Azotobacter = No (90.91% of 11 examples)
    - $X_2 > 34.0000$ 
      - $X_1 < 6.1500$  then contains Azotobacter = Yes (60.00% of 5 examples)
      - $X_1 > 6,1500$  then contains Azotobacter = No (83.33% of 6 examples)
- $X_1 > 6.8000$  then contains Azotobacter = Yes (94.44% of 18 examples)

### Attribute selection methods

The formation of an adequate model is based on the knowledge of the problem and is often reduced to the selection of the corresponding set of attributes. The existence of irrelevant and redundant (irrelevant, surplus) attributes in the problem model negatively influences the performance of most of the inductive learning methods, and such attributes are often removed from consideration by the method of previous or embedded selection of attributes (2). The optimal set of attributes contains all relevant attributes, while redundant and irrelevant attributes are usually excluded from consideration, although poorly relevant redundant attributes potentially contain information that can affect the improvement of classifying performance in practice (2), (4), (9). In the attachment, some methods of the previous selection of attributes embedded in the WEKA system (19) will be used to further check the significance of individual attributes from the problem model.

Results WEKA Selection of the Attribute. With different methods of searching and evaluating attribute subsets, the best subgroup is found, which gives the most accurate rules (trees). Some of the methods for individual attributes also give numerical estimates.

Method Relieff (evaluates each attribute separately), gave the following results:

**Table 4.** Detailed results

N	Attribute	Weight
1	X1	0,175578
2	X3	0,054731
3	X2	0,048435

*Source:* authors' calculations;

The Relieff method estimates that the most important attributes are hierarchically compared: X1 = pH.

### Conclusion

Agroeconomics is facing increasing challenges, especially in the domain of research not only on the quality of land, but also on other food resources as sources of organic food. Methods of finding hidden knowledge have a presumption in relation to classical methods because they more precisely classify, and have higher predictive capacities.

The aim of this study is to examine the usefulness and exactness of these methods in the case of examining the presence of an asteroid in the soil or non-existence (category “yes” and “no”) based on the sample examination. Supervised Linear Discrimination Analysis was used to identify the specific effect of variables on the presence versus non-deposition of the Azotobacteria with methods of validating the accuracy of the classification of the effect of variables and identifying the key variables in this case, this is the presence of pH. In addition to this method, the Decision Tree was used, which gave results that are more precise in terms of determining the level to which the influence of individual

variables is. The data obtained are accurate at the level of 90% and unlike conventional multivariate research, this is a survey where the influence of four variables on the presence of Azotobacteria from which three variables are not decisive for qualification is improved by means of the supervised analysis. Everything that the research put into the foreground was achieved and this is a great degree of research accuracy (level of 90%).

The RILIEF method - the selection of the attribute clearly defined the supremacy of the pH - factor effect, while the impact remained two relatively minor values of about 5% respectively. The use of this methodological tool would greatly help researchers in the field of agriculture, especially because of the possibility for research to be carried out on scarce training sessions with a large number of attributes (characteristics of the subject of research, eg land, quality of agricultural products, fruits, vegetables, eggs, meat I many others) and very few examples (the so-called scarce rallies). The problem of scarcity is related to the task difficulty assessment, which is dealt with in the Domain Data Mining domain by reducing the number of attributes (variables). Such methodological approaches enable the discovery of hidden knowledge in agronomy and agro-economics, and primarily in the causes that determine the key - determined variables and attributes and factors for solving research problems and correct hypothesis, both in the field of agronomy and in other fields of research.

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## PRIMENA DISKRIMINACIONE ANALIZE U IZBORU TIPOVA ZEMLJIŠTA

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### Rezime

*Čest problem, u agroekonomiji na primeru ispitne forme uzgoja biljaka, jeste odluka o tome da li biljka ili biljno potomstvo pripada grupi koja donosi profit kada se uzgaja u velikim ili malim zasadima.*

*Ponekad se odluke mogu doneti na osnovu jednog parametra, međutim, češće se ove dve grupe razlikuju na osnovu nekoliko promenljivih, od kojih svaka daje indikator o tome u kojoj se grupi pojedina biljka treba svrstati. Ovo je klasični problem klasifikovanja, gde je opšti problem da se pronađe funkcija raspodele.*

**Ključne reči:** *analiza, diferencijacija, tlo, vrste, biljka.*

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## FOSTERING ENTREPRENEURSHIP AT HIGH SCHOOLS: A CASE OF RURAL AREAS IN VOJVODINA (SERBIA)

*Slavica Otović<sup>1</sup>, Dunja Demirović<sup>2</sup>, Kristina Košić<sup>3</sup>, Aleksandra Vujko<sup>4</sup>*

### Summary

*An early entrepreneurial education has a positive influence on decisions of young people to engage in entrepreneurial activities. Long term unemployment among young people is a characteristic of Republic of Serbia. The youth unemployment can be decreased by directing and encouraging young people to start their own businesses, but shaping the entrepreneurial aspirations should take primacy. These aspirations must be founded on knowledge, skills, social involvement and networking. Educational system should be adjusted to follow economic and market shifts. In this paper, research was conducted in four high schools in rural municipalities of Autonomous Province of Vojvodina. The pupils were given a questioner regarding their entrepreneurial aspirations. Based on the collected data, measures for altering and complementing curriculums in high schools can be designed. Early entrepreneurial education is helping young population to build their careers on realistic grounds and compatible with ongoing global trends.*

**Key words:** *entrepreneurship, unemployment, education, young people, Vojvodina (Serbia)*

**JEL:** *Q13, Q15*

### Introduction

In modern economy, entrepreneurship is viewed as an important component in industry, next to land, work and capital. The definition of entrepreneurship includes proactive,

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innovation based economic activity of an individual, group of individuals bound with contract (such as joint-stock companies, corporations and even countries in form of public entrepreneurship) (Rusu et al., 2012). Among other initiatives, European Union strongly supports the one regarding rural entrepreneurship. This type of entrepreneurship strives towards rural development sustainability and falls under the second pillar of agrarian politics. Entrepreneurship is a specific feature of an individual, corporation or an institution. Entrepreneurs see a change as an inevitable and a healthy thing.

In accordance with perceptual shift regarding needs of individuals, society and economy and also with aim to improve training for educators and evaluation process, curricula of schools in the EU countries have been revised. All financial and non-financial parameters were taken into account ([www.europa.eu/eurostat](http://www.europa.eu/eurostat)). On the other side, research conducted in Sweden in Norway found a link between participation in youth entrepreneurship programs and establishing personal businesses. The research has shown that 26,7% of people over the age of 29 who attended “Young entrepreneurs” program the year before started their own business (Napier et al., 2012). Norway is known for its high employment rate among young people aged between 16 and 19. This might be a result of implementation of entrepreneurship in educational system. This way, the government influenced on strengthening the ability of an individual to seize the opportunities given in industry and other parts of the community (NIC, 2005).

With more education and encouragement, youth should be able to realize their entrepreneurial aspirations. This outcome will increase economic growth in communities and open new job and career opportunities, regardless of economic circumstances. Although not all youth will become entrepreneurs, all students and society benefit when individuals have a solid education, that gives them entrepreneurial knowledge and skills to use over their lifetime (Raposo, do Paço, 2011).

The question of great importance is how high school pupils, future university students in the Republic of Serbia, choose their studies and what influences their decision. To what extent do labour market conditions and enrollment quota influence pupils' choices, bearing in mind that the information regarding demands for certain jobs on labour market is not accessible to the public and that enrollment quota trends have been the same over the years. Radical reforms of the labor market institutions were needed in the Republic of Serbia after the October of 2000. These reforms would be the key to economical efficacy and aim to create employment policies that are compatible with general direction of comprehensive market reform. However, the market reform wasn't designed to fit labor market needs, nor the market was taken into account as an endogenous variable, nor as a significant limitation in the outcomes of strategic directions of the reform (Žarković, Rakić, 2015).

Authors Markov and Mirkov (2006) in their research indicate that Serbia is in the middle of process of shaping students that way that they can see establishing own businesses as a potential career option. Compared to students in western countries, Serbian students have lower aspirations to become entrepreneurs. This gap in tendencies can be explained

in the light uneven possibilities in different socio-economic contexts. According to the same authors, one third of the students in Serbia has entrepreneurial tendencies and sees it as a potential career choice. This number is significant for a country that has entered the transition process rather late. This group of students sees their society as market economy oriented and they are adopting behavioral patterns it's imposing.

The main question in this article is: Does the current program of education in high schools in Serbia need addition in the form of contemporary teaching materials related to current socio-economic context and with regard to global trend? Likewise, do curricula need radical adaptation or obligatory courses which encourage innovative thinking, new inventions and entrepreneurship skills among high school pupils?

The aim of this research is to form a data base which contains information about entrepreneurial tendencies and affinity of high-schools located in rural municipalities in Vojvodina. The purpose of this article is to analyze the influence of entrepreneurial education on formation of entrepreneurial tendencies among the young. By employing further research, entrepreneurial tendencies could be compared among high-school pupils across the Republic of Serbia, but also among the young in other countries. Concluding remarks from this paper could serve as a guideline for advancement of curricula or at least as an addition to the current ones. This could be done through proposal for alteration and addition of certain parts of Strategy of local economic development of local governments and Strategy of educational development in Serbia until 2020.

### **Importance of early entrepreneurial education of young people in rural areas**

Entrepreneurship isn't solely business and economic phenomenon (Milojević, Zekić, 2015). It is related to every aspect of human behavior and functioning, regardless of the type of organization, ownership and branch of industry (Grilo, Thurik, 2006). Collection of various qualitative factors such as historical, cultural, political, ideological, psychological and structural could, as well as an educational system which encourages entrepreneurial tendencies, with time boundaries, influence the level of entrepreneurial activity of a country.

Contemporary research in developed countries indicates that early entrepreneurial education in rural areas has a positive influence on decisions of young people to engage in entrepreneurial activities (Schoof, 2006). In this way, the number of so called "pre-entrepreneurs" is increasing. Entrepreneurial education of the young brings numerous benefits: teaches them how to plan, start and manage their own business (Young, 2014; Oostrebeek, van Praag, Ijsselstein, 2010), sparks creativity and motivates them to transfer their ideas into practice (Fayolle, 2008), exposes the young to real life and prepares them to be responsible, to think and to take risks (Carayannis, Evansm, Hanson, 2003). Authors Korhonen, Komulainen and Rätty (2011) see the significance of early entrepreneurial education of the young in creating citizens able to take risks to be concurrent and innovative, hence they would like to stay in rural areas and maybe attract other people to live and work there.

Introducing entrepreneurship as an integral part of educational program on all study levels (from elementary to university education) aims at acquiring knowledge and a set of cognitive and non-cognitive skills (persistence, creativity) (Heckman, Rubinstein 2001; Gensowski, Heckman, Savelyev, 2011). Furthermore, it increases awareness about entrepreneurship as a career option, but also that entrepreneurship is a suitable call for the young (Peterman, Kenedy 2013; Souitaris, Zerbinati, Al-Laham, 2007).

### **Entrepreneurship in Serbian education system**

According to available data the number of pupils enrolled in high-schools (in Vojvodina) at the beginning of the school year 2014/15 was 66,372 whereas 32,886 were female pupils. The young in Autonomous Province of Vojvodina can choose to attend grammar schools, vocational schools, mixed schools, art schools, and schools for pupils with special needs. The number of regular schools is 121; while there are 10 schools for pupils with special needs, spread across 40 municipalities. Lectures in schools are organized in Serbian, Hungarian, Slovakian, Romanian, Rusyn, and Croatian.

High-school entrepreneurial education in the Republic of Serbia to this date has been organized as a one-term extracurricular activity. One of the examples is “The Junior Achievement Young Enterprise”, American program conducted in 50 schools by NGO “European movement in Serbia”. Another one is “Youth Entrepreneurship Program”, project conducted by “Business Innovation Programs” - a Norwegian non-profit and a Serbian NGO “Civil Initiatives” in 10 vocational schools in Belgrade and Kragujevac. Fifteen high schools for agriculture from various parts of Serbia have introduced *Entrepreneurship* in their curricula of three-year vocational studies as a part of a pilot program. One of them is Agriculture high school from Futog whose pupils comprise 36% of the sample in this research. Hence, comparison of the results obtained from this group and the results from the rest of the participants (who are not partaking in the entrepreneurship pilot program) will stress the influence of entrepreneurial education of the young.

According to authors Bogetić, Đorđević and Čočkaló (2011), the economic situation in the Republic of Serbia (especially in rural areas) is not providing suitable stimulating ambiance that is helping young people to start their own business. As a reason for this attitude young people have stated some limitations and barriers that are inhibiting their entrepreneurial tendencies: lack of financial means, unstable political and industrial situation, and high taxes. Also, results from the research conducted during 2011 in Serbia with approximately 1200 young people aged between 15 and 30 show that most of the young people in Serbia isn't motivated to engage in entrepreneurship and do not plan their professional career in this area (Stojanović et al., 2012).

Author Đuran (2012) explained how contemporary research supports assumptions that some inventors are simply entrepreneurial personality type and implies how their motivation comes from their personality drives them towards starting their own business. On the other hand, different authors (Vuletić, Stanojević, 2010) are suggesting

that inventors-entrepreneurs are starting their own businesses by translating research findings into applicable knowledge, driven by both formal and informal education. The above mentioned research implies that the Republic of Serbia needs education system which is going to educate innovative individuals with inventive drive and creative energy who are going to be able to create new industries and products. Furthermore, we need educational institutions that will produce young people with awareness and capability to create new environments such as innovative self-sufficient rural communities that will generate new jobs.

### **Methodology**

The research about entrepreneurial tendencies of the young from high schools in rural areas in Vojvodina was conducted on data gathered from available literature, scientific papers, journals, books, and internet. Based on theoretical background, authors' previous findings, and consultations with secondary school pedagogy, sociology, and psychology experts, field research was conducted by distributing questionnaires to pupils. The questionnaire consists of four complementary parts. Besides general information, education and personal preferences, and entrepreneurial tendencies, gender equality was also considered by measuring the influence of gender in future career decisions.

Data collection was conducted in the period from September until November 2016 in four vocational schools: Medical High School "Kozma i Damjan" (16% of the participants) and vocational high school "4<sup>th</sup> July" (32% of the participants) from Vrbas, Technical High School "Mihajlo Pupin" (16%) from Kula, and Agricultural High School from Futog (36%). The sample comprises of 400 pupils from the age of 15 to 18, proportionally distributed according to vocational profiles.

Results of the field research will identify entrepreneurial tendencies of high-school pupils from rural areas in Autonomous Province of Vojvodina. On the other hand, the results from this study could serve as a start for other research. For example, to investigate entrepreneurial tendencies of high-school pupils and university students in Vojvodina, and to compare these tendencies between pupils in rural and pupils in economically more developed areas where entrepreneurship and innovativeness are the core of curricula.

The main assumption of this research is that secondary education that encourages creativity, planning, teamwork, proactivity, and problem solving strengthens entrepreneurial spirit of young people. Another assumption is that young people who come from families with entrepreneurial tradition have stronger entrepreneurial aspirations. This research employs descriptive statistics methods and t-tests to discover significant mean differences among answers on the items of the questionnaire.

### **Results and Discussion**

High schools that have participated in this research are located in the South Bačka District and this region is classified as significantly rural. However, the region has urban areas, such as city of Novi Sad.

### *Descriptive statistics results*

The questionnaire was distributed in cooperation with high-school teachers, pedagogists, and psychologists. The survey was anonymous and voluntary, and gathered data was used exclusively to identify entrepreneurial aspirations of the pupils. The response rate of the questionnaire was 82.5%, i.e. out of 400 distributed questionnaires 330 were filled out. 61.2% of the participants were male, while 38.8% were female pupils.

Around 47% of participants had a very good average mark (3.5 – 4.49 on a scale from 1 to 5), while 25.1% had excellent average mark (above 4.5). Other than standard courses, pupils acquired additional knowledge and skills such as foreign languages (44.5%), craftsmanship (25.4%), art and design (22.7%), and technical skills (22.7%). As far as extracurricular activities are concerned 55.8% were involved in helping around the household, agricultural estates, or family farm or business, 39.7% were engaged in sports or some other activities, and 42.4% were attending seminars and trainings. Some of the respondents (15.1% of the pupils) were working part-time, and only 4.8% participated in an international student exchange.

The highest number of participants attended courses for computer skills (34.2%), and entrepreneurship (9.1%), which are encouraging results. Each of these courses can influence formation and empowerment of entrepreneurial traits together with self-directed learning which is related to optimization of different types of lifelong learning. Each individual can choose in which type of organized learning they want to part in and in which way they want to combine them, taking into account their affinities and needs in order to achieve adequate adaptation to societal needs and individual development.

In accordance with the attendance rate of computer courses, as well as contemporary technology trends, 92.1% of participants stated that they informed themselves using internet and social media. Only 4.8% of the pupils informed themselves via television, radio, or printed media exclusively, while 19.4% uses all available media. One of the previous research (van der Merwe, Swardt, 2008) results is that entrepreneurship requires change of perception in the light of new information and application of state-of-the-art technology for their easier collection.

Intensity of engagement in sports, arts, educational, humanitarian and other organizations could indicate the affinity towards team work as a prerequisite for developing entrepreneurial traits (Table 1).

Most of the participants are members of sports organizations (61.2%) despite the lack of time (as stated in the comment remarks). They show high affinity and awareness of positive effects of these activities on psycho-somatic wellbeing. Only 13 pupils did not reply to this part of the questionnaire which indicates the lack of the interest for the topic, hence we can classify them as pupils “nonmembers” in sport organizations. Almost half of the pupils (48.2%) are members of humanitarian organizations, i.e. they're involved in some type of humanitarian activity. Certain pupils did not have any knowledge and information about humanitarian actions but they expressed interest

in joining them. Beside mentioned organizations, pupils are members in following associations: fishermen's club, gaming clubs, civil police, and political parties.

**Table 1.** Intensity of engagement of high school pupils in associations and organizations

Type of organization	Intensity of engagement		
	Not a member	Inactive	Active
Sports organization	28,8%	18,5%	48,8%
Arts/educational organization	48,8%	30,9%	13%
Humanitarian organization	51,8%	23,3%	17%
Other	13,9%	5,2%	2,1%

*Source:* Authors based on data analysis from survey research

For about 55% of pupils, the time spent in school is optimal. Their attitude towards time spent with family and friends is similar, while the only noticeable difference is towards boredom, since 47% of pupils find that they have insufficient time for idleness. Even though 7.3% of participants didn't answer the question concerning this issue, results indicate that some pupils have excessive amount of free time that could be under proper guidance utilized for acquiring various skills (Table 2).

**Table 2.** Time spent in various aspects of life

Time for:	Insufficient	Optimal	Excessive
School	8,79%	54,55%	34,85%
Family	11,52%	65,15%	21,52%
Friends	6,97%	57,88%	33,33%
Idleness	47,27%	27,27%	18,18%

*Source:* Authors based on data analysis from survey research

Results of this research state that 36.36% of participants have a family tradition of entrepreneurship, while the rest of pupils don't have entrepreneurs in their families.

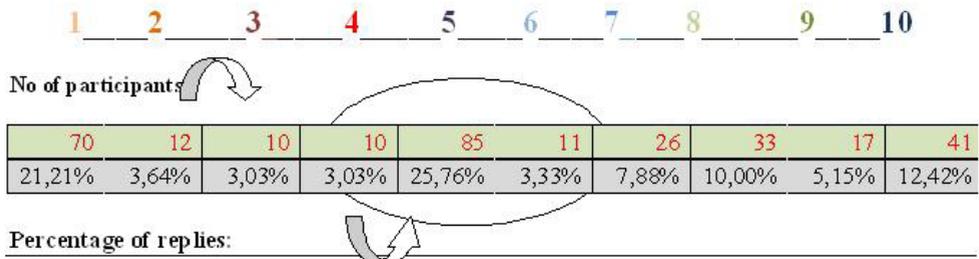
The highest percentage of pupils (42.12%) stated that they will maybe or most likely continue their education after finishing high school, while 30.61% of pupils is certain that they will continue their education, which indicates a certain degree of insecurity regarding decisions whether to continue education, or indicates tendencies of pupils to look for employment.

Majority of high school pupils (60.91%) would like to find employment in state/public companies which indicates that this type of organization is still most desirable for employment. Even though 36% of pupils have an entrepreneurial family tradition only 20.3% is willing to continue family business. These results point out that it is necessary to additionally educate pupils in the subject of entrepreneurship in order to prevent family businesses from shutting down. Moreover, the fact that only 13% of pupils

desire to start their own business, and that 7.3% of pupils plan to live and work abroad is worrying.

In order to examine the influence of gender on future career choices, continuing family business, or starting own business, participants rated gender influence on a scale from 1 to 10 (1 representing lowest, while 10 representing highest impact) (Graph 1).

**Graph 1.** Gender impact on career choices



Source: Authors based on data analysis from survey research

Although the answers of the participants vary, they are grouped around the mean values, so we can conclude that gender may have some influence, but it is not crucial when it comes to choosing a career, starting own businesses, or continuing family business.

*Comparative analysis: Influence of entrepreneurial education, tradition, and personal entrepreneurial experience between high schools involved in the conducted research*

Agricultural High School in Futog offers the course “Entrepreneurship”, and 92% of surveyed pupils from this school are attending it. Only 3.42% of surveyed pupils from the other three schools have attended or had been attending extracurricular courses for entrepreneurial development.

Results are confirming the assumption that high-school pupils with entrepreneurial family tradition have stronger entrepreneurial tendencies. Opposite of that, author Markov (2006: 48) in his research found no differences between students from the middle class and students from entrepreneurial families.

The number of pupils that exhibited entrepreneurial tendencies, or desire to continue family business is significantly higher in Agricultural High School (46%) compared to other three schools (25.5%). Even though course “Entrepreneurship” is attended only by pupils in the senior year, entrepreneurial attitudes, beliefs, and values are considered to be transferable across members of the same institutions and organization (Rot, 2010).

In order to identify differences in entrepreneurial tendencies of the young between the pupils who have attended entrepreneurship courses and the ones that have not, dependent sample t-test has been employed (Table 3). Results indicate significant difference ( $t \geq 2.58$ ;  $p < .01$ ) between pupils from the Agricultural high school, and pupils

from other schools, which suggests that early entrepreneurial education is favorable for developing entrepreneurial tendencies of the young.

**Table 3.** Mean difference tests

Pairs (Schools)	Mean value	Standard deviation	T	df	p-level
Agricultural - Medical	.83799	.45608	21.427	135	.000
Agricultural - Vocational	-.10042	.40620	-2.883	135	.000
Agricultural - Technical	.73757	.46198	18.619	135	.000

*Source:* Authors based on data analysis from survey research

Pupils find that entrepreneurial learning helps them in enhancing their independence, responsibility, planning skills, and also in developing innovativeness and creativity. One part of the pupils stated that examples of successful entrepreneurs inspired them to pursue a career of an entrepreneur. However, larger portion of respondents (41%) views the “Entrepreneurship” course as just another subject they attending during their education and do not consider its impact on their career choice as relevant nor on the fact whether they will work in public or private sector.

According to the research results, a strong cross-relation exists between entrepreneurial tendencies and pupils who help around household, family business, or work part-time. According to some authors (Markov, Mirkov, 2006) the influence of previous entrepreneurial experiences on forming entrepreneurial aspirations is strong. Pupils who show stronger entrepreneurial tendencies are pupils who “busted their self-confidence”, also “proved that they can earn income on their own”, the ones who “have increased motivation for achievements” and that had already “made some money”. On the other hand, pupils with lower entrepreneurial tendencies lack these types of experiences, but most of this group stated that “they learned how to appreciate money”.

Earlier research found that young people emphasize the importance of having vocational skills as a prerequisite before starting own business (Viduka, 2014). This attitude reveals the significance in educational system in forming entrepreneurial spirit and also in acquiring comprehension, knowledge, skills, and positive perspective regarding entrepreneurship. Pupils who have approach to these courses and skills have more likely to engage in entrepreneurial career.

### Conclusion

In this research about entrepreneurial aspirations of the high-school pupils in rural areas, the sample of students was comprised of participants of different vocational profiles. In this way, representative sample was created. Furthermore, the sample included pupils that attended the “Entrepreneurship” course, in order to enable the comparison in forming career choices between pupils who are educated in this sense and the ones who are not. All of the participants have very good average marks and have additional knowledge in foreign languages. Besides school activities, many pupils spend their

time helping their families around household, family farms or business. They are also engaged in acquiring different types of knowledge, most often computer skills.

High school pupils get necessary information via modern ways of communication, such as internet and social networks. They rather become members of sports organizations than any other associations or organizations. Most of the participants rated time spent on school, family, and idleness as optimal, but just a few of them actively prepare themselves for their further education through participating in international student exchange.

Entrepreneurial experience gained from the family business has a strong impact on future orientation of pupils. However, large number of participants sees jobs in governmental and public institutions as most steady, despite numerous layoffs and salary reductions due to ongoing fiscal consolidation in the Republic of Serbia.

The impact of introducing the Entrepreneurship course on the high school level in rural areas is still small. The biggest shift in understanding the importance of the entrepreneurship is visible among teachers and increased participation of schools in various entrepreneurial programs (it is important to note how significant support from the school management is).

Based on the information from this research, authors can conclude that entrepreneurial family tradition and education have strong impact on forming pupils' entrepreneurial tendencies. However, the solution for youth unemployment doesn't lie only in encouraging pupils to start their own business via a single course, but in designing compete high school programs which will shape enthusiasm and innovation tendencies among pupils. These programs need to be created based on data bases that should be continually upgraded with new research data on contemporary business trends.

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## PODSTICANJE PREDUZETNIŠTVA U SREDNJIM ŠKOLAMA: PRIMER RURALNIH SREDINA U VOJVODINI (SRBIJA)

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### Rezime

*Rano preduzetničko obrazovanje ima pozitivan uticaj na odluke mladih ljudi da se uključe u preduzetničke aktivnosti. Dugoročna nezaposlenost mladih je karakteristika Republike Srbije. Nezaposlenost mladih može biti smanjena usmeravanjem i podsticanjem mladih ljudi da započnu sopstveni biznis, ali oblikovanje preduzetničkih težnji treba da bude primarno. Te težnje moraju biti zasnovane na znanju, veštinama, socijalnom uključivanju i umrežavanju. Obrazovni system treba prilagoditi tako da prati ekonomske i tržišne promene. U ovom radu, istraživanje je sprovedeno u četiri srednje škole koje se nalaze u Autonomnoj Pokrajini Vojvodini. Učenici su dobili upitnik kako bi se ocenile njihove preduzetničke težnje. Na osnovu prikupljenih podataka, mere za menjanje i dopunjavanje planova i programa u srednjim školama se mogu osmisliti. Rano preduzetničko obrazovanje pomaže mladima da izgrade svoje karijere na realnim osnovama koje će biti kompatibilne sa tekućim globalnim trendovima.*

**Ključne reči:** *preduzetništvo, nezaposlenost, obrazovanje, mladi, Vojvodina (Srbija)*

**JEL:** *Q13, Q15*

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## INSTITUTIONAL SUPPORT FOR STRENGTHENING ENTREPRENEURSHIP IN AGRICULTURAL PRODUCTION OF THE REPUBLIC OF SERBIA

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### Abstract

*Developed countries reaffirm the role of agriculture in the functioning of the entire economy, emphasizing the importance of agricultural production. Faced with the need for greater investment in agriculture while directing new investments into underdeveloped rural areas, transitional countries must realistically assess their potentials and limitations in this area. The aim of the study is to define the characteristics of the SME sector during structural changes in agriculture, which is one of the drivers of economic development of Serbia. This study analyzes the current state of the sector of small and medium enterprises and entrepreneurs in agriculture and examines indicators that point to their development. How to encourage the development of agricultural production in a country that has experienced a complete economic collapse? Why do incentives to entrepreneurship and agricultural production in the Republic of Serbia have no expected effects? Institutions of the Government of the Republic of Serbia have created a whole spectrum of economic and fiscal incentives after the 5th October changes, but the effects of such programs are limited. Political managing of funds, institutions and ministries reduces the efficiency and transparency of the program, which greatly reduces the scope and importance of these programs in a healthier business environment. Serbia's determination to continue European integration obliges economic policy makers to comply with the most important economic development documents and strategies accepted by EU countries. General economic development must provide the conditions for further successive expansion of agricultural production in Serbia, while at the same time undertaking measures for the modernization of agricultural holdings as part of integral development.*

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**Key words:** *agriculture, production, institutional support, economic development, Serbia;*

**JEL:** *Q16, M24*

## Introduction

The Republic of Serbia is a country of incomplete transition, which has degraded the economic structure inherited from the period of common socialist Yugoslavia, while leaving little space for entrepreneurship or any other form of private, market economy. The irresponsible political elites during the last decade of the twentieth century and the first decade of the twenty-first century, often associated with criminal and tycoon structures, allowed the inexorable collapse of the country's economy, whose consequences will be felt for many more years. The wars of the 1990s, sanctions and speculative privatization pushed Serbia to the very end of European countries in many areas. For example, industrial production in Serbia today barely reaches 40% of industrial production in 1989.

Under these circumstances, a logical question is raised - how to develop the economy and ensure sustainable growth over a longer period. The most common answers that can be heard are slowly being converted into phrases such as “structural reforms are necessary..., a serious turnover in fiscal and monetary policy... creating an environment for attracting foreign investment and creating new jobs.<sup>2</sup> All of these phrases are usually heard during political campaigns for elections, and after that, optimism and energy for change are blurred by giving way to an powerful and politicized bureaucracy that “does everything” to kill any desire for entrepreneurship or any other initiative to create the conditions for running a business. For objective reasons, there has been a shift over the past ten years, especially when it comes to supporting foreign investors by facilitating many procedures, building the necessary infrastructure, amending regulations and other activities. According to many estimates, from the beginning of the nineties to the present, the transition has “swallowed” more than half a million jobs, which in Serbia in the late eighties were almost 3 million. According to official statistics, nowadays there are over 2.1 million workers in Serbia, of which only 1.7 million workers pay taxes and contributions from which the total population of 7 million people, including 1.7 million pensioners, is financed.<sup>5</sup>

According to the number of entrepreneurs, we could say that Serbia is a country of entrepreneurs, considering that on June 1, 2016 there was 217.035 of them.<sup>6</sup> This data suggests that more than every tenth employee in Serbia is an entrepreneur, on what might envy us many developed countries with a centuries-long tradition of entrepreneurship. Unfortunately, this information although accurate, is saying something completely different

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5 Data of the Statistical Office of the Republic of Serbia for 2016. <http://www.rzs.gov.rs>, accessed on: 07.11.2017

6 According to the Serbian Business Registers Agency : <http://www.apr.gov.rs/>, accessed on: 08.11.2017.

- a wave of layoffs and the consequences of speculative privatizations have forced many people out of work and on the verge of existence to enter into entrepreneurial waters. Many have failed in their attempts to become “their own bosses” because of the lack of any institutional support from the state, as well as because of their inexperience, unpreparedness and inability to access sources of financing. Entrepreneurship in Serbia has developed spontaneously and without special inventiveness. People would most often copy something they thought was a “successful” business. This “copywriting entrepreneurship” brought us thousands of exchange offices, coffee shops, bakers, pizzerias, betting shops and cafes. Most of them were closed much more quickly than it took the procedures for opening them. Large economies that usually accompany small satellite entrepreneurial activities has long disappeared, which further narrowed the opportunities for new entrepreneurs. The state has failed to open channels to international markets, so entrepreneurs in Serbia are closed within a shallow and undeveloped market without enough experience and funding, looking for real business activity. Fortunately, there are also many good examples of successful small businesses that have found a place under the sun, primarily through innovation and connecting to regional and global markets.

When it comes to the role of the state in encouraging micro, small and medium enterprises and entrepreneurs in agriculture, things have improved in recent years by finally raising awareness that financial and nonfinancial support to small business is necessary in order to survive and continue to develop. For these reasons, previous 2016, was declared “the year of entrepreneurship” in Serbia, which is certainly a step forward in the right direction. It remains to be awaited and evaluated the effects of such a goal.<sup>7</sup>

### **Limitations and prospects for the development of agrarian entrepreneurship**

Serbia, like the rest of the world, is seriously shaken by the global economic crisis, which is ending several times, but eight years after the outbreak of this crisis, it is clear that this long-awaited end is not visible. It’s no longer the point of crisis only in poor economic indicators, the capabilities of the entire country’s bankruptcy, growing unemployment and simply dropping the standard of living. At the heart of the latest economic crisis is the unsustainability of the world economic order, which for decades raises the gap between the rich and the poor. A number of social, political, geo-strategic, religious and other factors have been incorporated into the latest economic crisis of the globalized world. Liberalism, as the concept and key mantra of globalization, abandons today its fiercest supporters and theorists facing the realities of the modern world and threats such as catastrophic climate changes, limited resources, potential regional (and wider) conflicts and migrations from the East to the West. The current crisis in Syria and the wave of refugees from that part of the world to Europe is just the announcement of a “great migration” that will certainly come if the model of the global economic order is not abandoned.

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7 <http://www.kombeg.org.rs/Slike/UdrPoljoprivreda/2014/februar/Strategija%20Poljoprivrede%20i%20ruralnog%20razvoja%20RS%202014%20Nact%20word.pdf>, accessed on: 09.11.2017.

In the long run, economically sustainable development of Serbia is not possible in the current way through GDP growth based on the growth of domestic demand caused by foreign credits and privatization revenues. The consequences of such growth are the constant deficit of the foreign trade balance, the growth of wages above the productivity growth and the constant inflationary pressures. In the current concept of development, more than 4/5 of capital inflows from loans and foreign direct investments went to non-resident sectors (banking, trade, real estate, transport, telecommunications), while for the sectors of exchange (agriculture, industry, mining), the only ones that can actually correct the foreign trade imbalance, remained only 1/5 capital. This situation is unsustainable, especially since we can no longer count on the privatization proceeds and additional borrowing. This period is over and there is no other way than to attract foreign direct investments in the aforementioned exchange sectors in all areas and activate entrepreneurship with our own capital in this direction. (Tesić et al., 2015)

From the economic crisis to the present, we have seen a significant drop in GDP, resulting in a lack of foreign direct investment (FDI). In this way, one of the most important factors of Serbia's growth over the whole period is missing or decreasing (from about 2.5 billion dollars in 2008 to about 1.2 billion dollars in 2014). The slowdown in foreign direct investment is a consequence of the global crisis, but, on the other hand, is the result of the lack of structural reforms and the creation of a healthy business environment. The unreformed public sector in Serbia is becoming a big ballast and stone around the neck, for the budget of the Republic and for economic growth. Public sector losses, redundancy, over-indebtedness of public enterprises, political governance and unwillingness to reform will make every effort difficult for development.

The insufficient growth of the GDP of Serbia in the last decade, which is on average below 1%, does not provide a minimum chance of joining the developed countries of the EU, on the contrary, it increases the relative lag behind of Serbia. This circumstance provides arguments in favor of encouraging the development of SMEs in agriculture as the only realistic and sustainable economic development options "(Nešković, 2016). Therefore, not only investments from abroad are sufficient, it is necessary to activate one's own potentials that lie primarily in creative and relatively educated people ready (and compelled) to fight on the market and to ensure the existence not only for their family, but also for a large number unemployed who could recruit in a relatively short time. Serbia must recognize this opportunity and provide conditions for their association, growth and development (Tesić et al., 2015). As state does not regret funding to encourage investment from abroad, it must equally find resources to activate the potential of our entrepreneurs and small businesses. In the next part of this study, we will analyze the incentives provided by Serbia to the development of agricultural entrepreneurship through its institutions.

## **Strategic efforts of the Republic of Serbia towards the development of SME in the field of agriculture**

Today, economic policy makers in Serbia are becoming aware that, for the sake of false social peace and short-term political benefits, they wasted tens of billions of euros while maintaining in life state-owned enterprises - socialist mammoths such as “Zastava”, “Železara”, “RTB”, “Petrohemija”, “PKB”, “Resavica” and many others. The decennial protection of these companies from commercial creditors, bankers and taxpayers has created the structures of “interest-related management and trade unions” with the great blackmailing potential of the simple formula “You give us the money, we vote for you and create social peace”. The price of such an arrangement was expensive - almost all privatization revenues and several billion of euros of indebtedness went missing, and neither social peace nor money.

On the other hand, the private sector of Serbia, without any support, sought its place on the market with “protected state-owned enterprises”. After 2000, it began with the creation of various institutional arrangements for support to the private sector, primarily the SME sector. At this point, we will look at several key institutions and mechanisms of support to entrepreneurship of Serbia, in an attempt to assess the effectiveness and effects of different financial and non-financial measures “(Nešković et al., 2016). The key institutions of support that we will mention here are the Government of Republic of Serbia and its agencies such as the National Employment Service of Republic of Serbia (NES), the Development Fund, the Serbian Chamber of Commerce and the Serbia Investment and Export Promotion Agency - SIEPA (today the Development Agency of Serbia - RAS). Entrepreneurship is also encouraged by various other institutions outside the public sector (such as the Foreign Investors Council), as well as by various associations of entrepreneurs, farmers, non-governmental sector and others. However, the subject of this study is the institutional, state aid to entrepreneurship and therefore it will be in the focus of this analysis.

The role of the Government of the Republic of Serbia in creating a business environment and support is of utmost importance, bearing in mind the resources and power it has. The strategy for supporting the development of small and medium-sized enterprises, entrepreneurship and competitiveness for the period from 2015 to 2020<sup>8</sup> (hereinafter the Strategy) was adopted by the Government of the Republic of Serbia on March 26, 2015. This is a key document that should provide a strategic framework and continuity with previously adopted documents, and in particular with the Development Strategy for Competitive and Innovative Small and Medium Enterprises for the period 2008-

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8 <http://www.privreda.gov.rs/wp-content/uploads/2015/06/Strategija-mala-i-srednja-preduzeca.pdf>, accessed on: 08.11.2017.

2013<sup>9</sup> (hereinafter: Strategy 08-13), whose time period is over.

The strategy relies on the already established EU policy in the field of entrepreneurship and competitiveness, and above all on the Europe 2020 Strategy Paper and the Small Business Act. The following table provides a clear indication of the connection between the European and Serbian strategic documents (*Table 1*).

**Table 1.** The connection between the Strategy and the Small Business Act<sup>10</sup>

Small Business Act	Strategy
1. Principle: Create an environment in which entrepreneurs and family businesses can thrive and entrepreneurship is rewarded	Pillar 3 Continuous development of human resources Dimension 1 Measure 3: Development of the non-formal education system for improving knowledge and skills Dimension 2 Measure 1: Introduction of entrepreneurial education into all levels of the educational system of the Republic of Serbia Dimension 2 Measure 2: Education and training of teachers for entrepreneurship Pillar 6 Development and promotion of the entrepreneurial spirit and encouraging female entrepreneurship, youth and social entrepreneurship
3. Principle: Design rules according to the “Think Small First” principle	Pillar 1 Improving the business environment Dimension 1: Establishing an incentive regulatory framework in line with the needs and capabilities of the SME Dimension 3 Measure 1: Obligatory inclusion of the representatives of the economy in the process of adopting regulations and public policies and increasing the predictability of changes in the terms of business Dimension 3 Measure 2: Creation of the Council for Small and Medium Enterprises, Entrepreneurship and Competitiveness Dimension 3 Measure 4: Inserting the impact test on small and medium enterprises in the analysis of the effects of regulations
4. Principle: Make public administrations responsive to SMEs’ needs	Pillar 1 Improving the business environment Dimension 2 Measure 1: Amendments to the regulatory framework in the implementation of administrative procedures in state administration bodies, autonomous provinces and local self-governments Dimension 2 Measure 2: Continuation of the work on strengthening the electronic administration system Dimension 2 Measure 3: Establishing a one-stop-shop system for providing as many services as possible

9 Strategija za podršku razvoju malih i srednjih preduzeća, preduzetništva i konkurentnosti za period od 2015. do 2020. godine, Vlada Republike Srbije, Službeni glasnik RS, Srbija, broj 55/11, 2014,(available at: <http://www.privreda.gov.rs/wp-content/uploads/2015/06/Strategija-mala-i-srednja-preduzeca.pdf>) accessed on: 08.11.2017.

10 <http://www.privreda.gov.rs/wp-content/uploads/2015/06/Strategija-mala-i-srednja-preduzeca.pdf>, accessed on: 08.11.2017.

Small Business Act	Strategy
5. Principle: Adapt public policy tools to SME needs	Pillar 2 Improving access to funding sources Dimension 3 Measure 3: Raising awareness among entrepreneurs and all other stakeholders about the availability and characteristics of non-banking financial instruments Pillar 4 Strengthening the sustainability and competitiveness of SME Dimension 1 Measure 3: Further development of business services for SME Pillar 1 Improving the business environment Dimension 2 Measure 5: Improving conditions for participation of SME in public procurement
6. Principle: Facilitate SMEs' access to finance and develop a legal and business environment supportive to timely payments in commercial transactions	Pillar 2 Improving access to funding sources
7. Principle: Help SMEs to benefit more from the opportunities offered by the Single Market	Pillar 5 Improving access to new markets Dimension 2: Reducing and overcoming technical barriers to trade
8. Principle: Promote the upgrading of skills in SMEs and all forms of innovation	Pillar 4 Strengthening the sustainability and competitiveness of SME Dimension 1 Measure 4: Further development of training for potential and existing entrepreneurs Pillar 4 Strengthening the sustainability and competitiveness of SME Dimension 3: Strengthening innovation in SME
9. Principle: Enable SMEs to turn environmental challenges into opportunities	Pillar 4 Strengthening the sustainability and competitiveness of SME Dimension 3 Measure 2: Improve support for highly innovative SMEs, eco-innovations, improving energy efficiency and efficient use of resources
10. Principle: Encourage and support SMEs to benefit from the growth of markets	Pillar 4 Strengthening the sustainability and competitiveness of SME Dimension 4 Measure 2: Creating new value systems and increasing the degree of finalization of the product Pillar 5 Improving access to new markets Dimension 1: Providing continuous support to SME for entering new markets

*Source:* The strategy for supporting the development of small and medium-sized enterprises, entrepreneurship and competitiveness for the period from 2015 to 2020, Government of the Republic of Serbia, March 2015, p.2

Strategy 2008-2013 that is the precursor to the current SME Strategy, relied on five pillars. This five pillars included: promotion of entrepreneurship and establishment of new enterprises, development of human resources for the competitive SME sector, providing more sources of financing for small and medium enterprises, encouraging the competitiveness of this sector, and creating a better legal, institutional and business environment for the SME in the Republic of Serbia. This strategy was implemented through annual action plans prepared by the Ministry of Economy together with about thirty other institutions that were directly or indirectly involved in the implementation of the Strategy 08-13.<sup>11</sup>

The effects of all previous efforts by the Government of Republic of Serbia and other participants in improving the position of the SMEs throughout the transition period, which include the implementation of the Strategy 08-13, can be evaluated through the comparison of indicators on participation in employment of SMEs in the EU and Serbia. According to the data published in the magazine *Business and Finance* (24.12.2015.) under the title *Small and Medium Enterprises - entrepreneurial guerrillas*, USAID<sup>12</sup> experts say the average number and participation in the number of employees in the EU according to the size of enterprises is similar in the EU and Serbia. In the European Union, out of 19.3 million enterprises, 99.8 percent are defined as SMEs and employ around 75 million people, or 66 percent of the total number of employees (6th Annual Report of the European Small Business Observatory). There are only 35.000 companies with more than 250 employees, while 18 million enterprises are of a small size and employ fewer than 10 workers. The average European business provides employment for four people, including the owner / director, with an annual turnover of around 500.000 euro, while the total turnover of the SMEs sector in the EU amounts to 56.2 percent of total turnover. From the standpoint of size, the structure of companies in Serbia is similar to the European Union, as 99.5% of the companies belong to the SME sector (Business Report of the Republic of Serbia in 2014, APR data). Most of them are micro enterprises (88.9%), small ones are 9.4%, medium 1.2%, while large ones makeup only 0.5%. Large enterprises employ a third of the total number of employees, and the rest employ SMEs, which is also in line with European practice.<sup>13</sup>

Speaking of agricultural production in Serbia, *Table 2* shows the indices of agricultural production at the national level (which is a little less than 2% increased compared to the previous year, as well as indices by culture). It is noticeable that plant production grew by just under 6% compared to the previous year, while livestock production remained at the same level.

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11 Strategija za podršku razvoju malih i srednjih preduzeća, preduzetništva i konkurentnosti za period od 2015. do 2020. godine, Vlada Republike Srbije, Službeni glasnik RS, Srbija, broj 55/11, 2014, (<http://www.privreda.gov.rs/wp-content/uploads/2015/06/Strategija-mala-i-srednja-preduzeca.pdf>) accessed on: 12.11.2017.

12 Biznis i finansije broj 122/203: Mikro i mala srednja preduzeća-Preduzetnička gerila, <http://bif.rs/2015/12/biznis-i-finansije-broj-122123-mikro-mala-i-srednja-preduzeca-preduzetnicka-gerila/>, accessed on: 12.11. 2017.

13 Retrieved from: <https://idea.usaid.gov/cd/serbia?comparisonGroup=region>, accessed on: 12.11.2017.

**Table 2.** Agricultural production indices, 2014/2013

Plant production (1,2,3)	105,59
1. Crop farming and horticulture (total)	111,85
- Wheat	119,86
- Industrial crop	117,81
- Vegetables	82,99
- Forage crops	104,60
2. Fruit growing	79,54
3. Wine growing	72,78
Stockbreeding (1+2+3+4+5)	100,39
1. Cattle raising	99,94
2. Hog raising	104,84
3. Sheep raising	90,81
4. Poultry	100,48
5. Beekeeping	51,24
Agricultural production Total	101,98

*Source:* Statistical Office of the Republic of Serbia (SORS), to: Macroeconomic analysis and trends (MAT), no. 244, (April 2015)

According to economists, the fact that budget funds for agriculture were not affected by measures of fiscal restriction is encouraging, which has reduced negative trends in production, primarily in livestock breeding. According to the data from 2014, in the structure of the created value of agricultural production 70% comes from plant production, and 30% from livestock production. For the competent Ministry of Agriculture, Forestry and Water Management, 4.15% of budgetary funds or RSD 45.394.698.000 have been determined, of which RSD 1.569.220.000 for investment projects.<sup>14</sup>

Last year, agriculture and food industry of Serbia participated in the creation of gross domestic product (GDP) of the country with about 17%:

- agricultural production 10,6% and
- food industry 6.4%.

However, if we consider the overall contribution of agriculture to other sectors of the economy, especially producers and processors of inputs and raw materials, this share exceeds 40% of total GDP.<sup>15</sup>

14 [http://www.mfn.gov.rs/UserFiles/File/zakoni/2013/Zakon%20o%20budzetu%20RS%20za%202014\\_%20godinu.pdf](http://www.mfn.gov.rs/UserFiles/File/zakoni/2013/Zakon%20o%20budzetu%20RS%20za%202014_%20godinu.pdf), accessed on: 11.11.2017.

15 Research of the Library of the National Parliament of the Republic of Serbia (NSRS): Ownership and structure of agricultural land 2013. <http://www.parlament.rs>

### Analysis of the most important measures of incentives to the development of agricultural production

As already mentioned, the key institutional support to the agrarian sector ie. SME in Serbia is provided by the National Employment Service of the Republic of Serbia (NES), the Development Fund of the Republic of Serbia - SIEPA (today's Development Agency of Serbia - RAS), the Serbian Chamber of Commerce and the Government of Republic of Serbia as a creator all policies, measures and incentives related to the SME.

1. In addition to these basic functions, the National Employment Service as a public service for mediation in employment and insurance fund in the case of unemployment, creates a whole spectrum of so-called "active employment measures" aimed at, among other things, initiating entrepreneurship for unemployed persons. By raising the competencies of the unemployed persons, the NES, besides improving their skills, increases their chances of starting their own business.

According to the NES Work Plan for 2016 and the Law on the Budget of the Republic of Serbia ("Official Gazette of the Republic of Serbia" No. 103/215), funds are provided for the implementation of an active employment policy. These funds amount to 2.8 billion RSD, as well as from the budget fund for professional rehabilitation and incentives for employment of persons with disabilities in the amount of 550 million RSD (Table 3).

**Table 3.** Active measures of the National Employment Service for 2016.

No.	Measure	Planned number of persons				Effect
		Number of persons included in the measures	Number of PWD included in the measures	Total number of persons included in the measures	*Number of employees	
1.	MEASURES OF ACTIVE JOB SEARCH	103,490	4,310	107,800	22,735	21%
1.1.	<i>Training for active job search</i>	36,000	1,200	37,200	7,440	20%
1.1.1.	<i>Training for active job search for qualified persons</i>	24,845	700	25,545		
1.2.	Training of self-efficacy	3,040	60	3,100	310	10%
1.3.	Job Search Club	3,500	200	3,700	925	25%
1.4.	Job fair	50,000	2,500	52,500	10,500	20%
1.5.	Workshop for overcoming stress due to job loss	950	50	1,000	50	5%
1.6.	Training for Entrepreneurship Development	10,000	300	10,300	3,510	34%

2.	ADDITIONAL EDUCATION AND TRAINING	8,910	710	9,620	4,373	45%
2.1.	Professional practice	5,000	40	5,040	2,210	44%
2.2.	Acquiring practical knowledge	280	20	300	300	100%
2.3.	Training	2,100	650	2,750	1,539	
2.3.1.	<i>Training for the labor market</i>	1,100	630	1,730	519	30%
2.3.2.	<i>Trainings at the request of employers</i>	1,000	20	1,020	1,020	100%
2.4.	Functional basic adult education	1,500	0	1,500	315	21%
2.5.	Acknowledgment of previous learning	30	0	30	9	30%
3.	SUBSIDIES FOR EMPLOYMENT	6,240	670	6,910	6,910	100%
3.1.	SUBSIDIES FOR SELF-EMPLOYMENT	3,350	160	3,510	3,510	100%
3.2.	Subsidies for employment of the unemployed from the category of hard-to-employ	2,690	110	2,800	2,800	100%
3.3.	Subsidies of part of wages for beneficiaries of financial social assistance	200	0	200	200	100%
3.4.	Wage subsidies for people with disabilities without work experience	0	350	350	350	100%
3.5.	Support measures for people with disabilities who are employed under special conditions	0	50	50	50	100%
4.	PUBLIC WORKS	5,000	1,900	6,900	6,900	100%
	ACTIVE LABOR MARKET MEASURES TOTAL (1+2+3+4)	123,640	7,590	131,230	40,918	31%

Source: [http://www.nsz.gov.rs/live/digitalAssets/5/5039\\_program\\_rada\\_nsz\\_za\\_2016.pdf](http://www.nsz.gov.rs/live/digitalAssets/5/5039_program_rada_nsz_za_2016.pdf)

When it comes to encouraging agricultural entrepreneurship, even a superficial view of this table shows that the National Employment Service (NES) does not have this issue clearly in focus. The total funds allocated to “active measures” of employment from the budget do not reach even 30 million euro for about 750,000 unemployed people on the NES records. Therefore, it is just under 4 euro per unemployed person per year. If you

add the fact that out of all these active measures, entrepreneurs are targeted at only two (1.6 and 3.1), where only about 13.000 people are involved, it is clear that according to this, 2016 is not a “year of entrepreneurship” for NES.

When it comes to the effects of these programs, it is necessary to take them with a serious reserve, bearing in mind the fact that the data is created by the NES, which has a lot of interest in presenting the numbers better than they are in order to apply to the Government for additional funds in the next year. The current measures are already becoming archaic because they do not change for years or in any way follow current policies when it comes to the modern labor market.

2. Development Fund of the Republic of Serbia is one hundred percent state ownership and its purpose is primarily to encourage balanced regional development and improve the competitiveness of domestic economy and agriculture. The task of the Fund is to encourage the crafts production, service activities and employment by encouraging entrepreneurship, improving the liquidity of the domestic economy and contributing to the development of the capital market through its favorable credit lines. The Fund is financed mainly from the budget of the Republic of Serbia and the collection of already approved loans. His annual placement potential is around 55 million euro. The Development Fund policy consists in the distribution of different credit lines to the domestic economy, as a rule, under more favorable conditions than the market conditions (thus challenging one of the objectives of the Fund that relates to the contribution to the market of capital).<sup>16</sup>

The key weakness of the Development Fund over the entire period of its functioning is the distribution of funds under the strong influence of the politics. The harmful consequences of this arbitrary political interference in the management of the Development Fund are in the first place, uncollectible placements, the allocation of most of the funds to the small number of large private companies (close to politics) at the expense of entrepreneurs and start-ups and the occurrence of corrupt behavior in the allocation of funds. For these reasons, the Fund is forced to make new arrangements and forms of reprogramming, mutual settlement of obligations etc. with non-payments. When it comes to agricultural entrepreneurs, the conditions of the Fund for them were in some cases more stringent than with commercial banks, which the Fund often disqualified as an institution for supporting entrepreneurship.

3. Development Agency of Serbia (RAS) is a government agency that provides a wide range of services to investors, exporters and entrepreneurship. RAS continues the good practice of its legal predecessor SIEPA (Agency for Foreign Investment and Export Promotion), especially when it comes to supporting direct investments and export promotion. RAS has fairly limited resources for 2016 - around 17 million euro of the total budget, of which 3/4 is allocated to various programs, including obligations for

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<sup>16</sup> More details on: [http://www.fondzarazvoj.gov.rs/files/uslovi\\_TOS.pdf](http://www.fondzarazvoj.gov.rs/files/uslovi_TOS.pdf), accessed on: 09.11.2017.

programs from previous years.<sup>17</sup> The fact that the Government can increase the total amount of funds depending primarily on the inflow of foreign and domestic investments and the fiscal performance of the budget in the current year, should also be taken into account.

Bearing in mind the subject of this research, on this occasion we will focus more on the support RAS provides to entrepreneurship, aware that the key activities of this agency are nevertheless addressed to investors and exporters. RAS is one of the few institutions that has all the features of a modern service recognizable by its efficiency, speed and orientation towards the client. In this regard, for all praise is the attitude towards investors and the activities that the agency implements in promoting the export of Serbian agriculture. The most important programs, ie competitions and public calls for the allocation of funds for stimulating entrepreneurship in 2017 are:

— **Program for stimulating of balanced regional development in 2017**

- the program is implemented by the Ministry of Economy in cooperation with the Development Agency, the financial framework amounts to 130 million RSD for local self-governments in order to develop various project technical documentation, strengthen regional competitiveness and co-finance membership fees for the work and business of accredited regional development agency.

— **Mentoring for agricultural cooperatives** - A public call for the implementation

of a standardized mentoring service is published in accordance with the Program of the Ministry of Economy - Standardized Service Pack (SSU) for micro, small and medium enterprises and entrepreneurs in 2017, implemented in cooperation with the Development Agency of Serbia (RAS) and through accredited development agencies.

— **A program of support to businessmen through the Italian credit line** -

the program of the Government of Italy, a financial framework of 30 million Euro that is realized through a domestic banking system aimed at strengthening local municipal services and the private sector. Loans between 5,000 and 1 million euro for entrepreneurship (up to 2 million euro for utility companies) are intended for the purchase of new and used equipment from Italian manufacturers.

— **Small business support program for procurement of equipment** - grants

intended for improving the business and improving the competitiveness of the company, whereby up to 25% of the value of the purchased equipment is financed, ie maximum up to 2.5 million RSD. The total available funds under this program for 2017 are over 540 million RSD.

— **The program of support for the internationalization of companies, entrepreneurs and clusters** - funds are aimed at improving the existing and development

of new technological processes, new product and packaging design, participation in fairs, market research and others. The funds are allocated in the range of RSD 50.000

<sup>17</sup> Retrieved from: <http://ras.gov.rs/uploads/2016/07/informator-o-radu-ras-jul-2016-1.pdf>, accessed on: 10.11.2017.

to RSD 1 million for companies, or RSD 100.000 to RSD 2 million for clusters in agriculture. The amount of support is not more than up to 50% of the justified activity of the subject.

— **Financial support to business institutional infrastructure** - a program for clusters, chambers, business incubators and industrial parks for the development of business entities based on knowledge, innovation, competitiveness and business association. The total budget of the program is 130 million RSD, the approved funds range from 500.000 to 5 million RSD, or 50% of the reasonable costs.

— **START-UP Project** - A program is designed for beginners in business and hardly employable categories such as young people, people over 45 years, people with disabilities, women and so on. The total budget is 100 million RSD, and is intended primarily for the purchase of equipment, by individually determining from 300 thousand to one million RSD. Users have to undergo training and mentoring.

— **Support program for further development of SMEs and entrepreneurs** - total RSD 70 million intended for introduction of quality standards, certification or re-certification, as well as obtaining the right to use the product logo (CE mark, FSC, CoC, etc.). This program also has a special component for encouraging women's entrepreneurship.

— **Open competition for support to micro and small enterprises** - incentive funds for 12 companies for up to 25.000 for a small, or 15.000 euro for a micro enterprise, in order to increase production and employment, with the applicants providing at least 30% of the funds in relation to the amount of the requested grant.

Based on the analysis of the available programs, it can be concluded that the intentions of the creators of these support are encouraging entrepreneurship, competitiveness and strengthening the technological equipment of the agricultural production sector, that is, the SME in the Republic of Serbia. Despite relative transparency, the problem of the volume of funds and the way they are distributed is always present. Some of the projects proposed in the RAS Information Bulletin, such as the Project "Year of Entrepreneurship" worth RSD 20 million, is reduced to the selection of one company (strategic partner or promoter) that will receive 15 million dinars to promote entrepreneurship in Serbia. This project is essentially "self-presentation" and promotion of the Government and its institutions, not entrepreneurship.

**4. Chamber of Commerce and Industry of Serbia (CCIS)** is certainly the institution with the largest tradition among the so far mentioned and its key role goes in four directions. First, Chamber represents its members before the Government and other state bodies and institutions. Second, it provides a full range of useful services to domestic and foreign companies including advising, mediating and informing. Third, improves economic cooperation with abroad by promoting Serbia as a good investment destination and organizing meetings of our and foreign companies through various arrangements. Finally, organizes different types of training and business education.

All mentioned contributes to strengthening of competitiveness and enhancing the knowledge and skills of employees.

Certainly, the work of the CCIS can be given different critical assessments, starting from the financing method, bloated administration and the number of employees, as well as the strong influence of the politics on its work. Nevertheless, the role of the Chamber of Commerce is indispensable when it comes to helping the domestic economy by providing important information and services, especially through mediation in the establishment of international economic cooperation between states and businesses. CCIS has to develop a chamber system to position itself as “market-oriented” by creating different services to users in order to build independence and financial sustainability over the long run. Its sustainability is also a measure of the satisfaction of its users.

**5. The Government of the Republic of Serbia, the Ministry of Economy and the Ministry of Agriculture** are the creators of the country’s economic and agricultural policy and the largest number of programs and measures for the improvement of entrepreneurship implemented through the aforementioned institutions. Indicators of economic growth, competitiveness, export of agricultural products, volume of investments and fiscal indicators best illustrate the efficiency of the economic policy of the Government, and ultimately, citizens who give or deny confidence in the elections. The government must do a lot to improve state aid control and incentives for entrepreneurship development. The whole system of incentives is centralized and still insufficiently transparent. The political influence on decision-making economic and entrepreneurship programs is still significant, which is a key factor that diminishes the efficiency and effectiveness of the proposed programs.

The resources available to the Republic of Serbia’s budget are limited and insufficient to make significant progress when it comes to the development of entrepreneurship in agricultural production. It is also disputable how and in what way the funds from the scarce budget are being channeled. Should a state “invest in foreign investors” that open only low-paid jobs or should the state provide maximum support for entrepreneurship that will create sustainable jobs and self-employment of a large number of unemployed persons. Is it more important for the state to create a good business environment, reform the judiciary and education, reduce corruption, solve the problem of the bloated public sector, and finally end privatization or to engage in employment by paying for every opened job position. These are all open questions and dilemmas that lie ahead of the most responsible for the economic development of the country.

What is no longer questioned today, first step in the recovery of national agriculture, (within the agrarian and the SME sector) is education reform (the so-called “dual” model of education). In addition, when it comes to business and entrepreneurship in the agrarian sector, the second step is to promote and implement the concept of lifelong learning as a guarantee of sustainability of entrepreneurship in the “long term”. Entrepreneurial education starts from primary school and continues even

after graduation. The development of entrepreneurship is not based solely on formal education, but involves informal, which goes beyond the formal system. The spiral path of education points out not only that the learning process is not linear, but that in earlier years children faster and easier accept new knowledge, skills, behaviors and attitudes. The consequence is that this spiral is more compact at the beginning of our education, then when we are, for example, students. Going through each phase of education (primary, secondary, faculty, etc.), the scope of entrepreneurial spirit grows because of accumulated educational activities and increases the capacity of students to accept new knowledge and skills over time. What is more, depending on the age, children differently accept the development of different components of the entrepreneurial spirit (for example, in the elementary school, it is easiest and at the same time most important to influence the development of attitudes, while entrepreneurial knowledge and skills at this age are not so significant and important to develop). This is the same, but vice versa, when it comes to faculty: the key area of development is knowledge and skills, not attitudes and behaviors.

The measure that the Government intends to implement indicates changes in priorities, at least declaratively, which is certainly a good step forward. We will see the effects of all programs and measures through trends in agricultural production growth, as well as all other indicators of the national economy's performance, including the growth of citizens' living standards.

### **Conclusion**

There will always be a dilemma whether and in what way the state should interfere with economic activities. Experience shows that state interventions in different times and circumstances can have positive effects, but they can also be very harmful. The outcomes and effects of certain state intervention depend on many factors as well as on the ability of the economic policy makers to correctly and at the right time place appropriate measures that can include various financial and non-financial incentives, including changes in regulations and the creation of a better economic environment. The Republic of Serbia has different experiences when it comes to "stimulating agrarian entrepreneurship". The socialist period and agriculture of the former Yugoslavia are characterised by ideological defect, failed agrarian reforms and colonization attempts on several occasions. The post-Yugoslav period is characterised by the break-up of the country, the criminalization of society, wild criminal-smuggling entrepreneurship and the economic disaster of most of the economies (except Slovenia) in the former country. The new millennium brings the era of "liberalism", speculative privatizations, opening up to the world, gradual economic growth, modest development of agricultural production, but still a relatively lagging behind the entire economic area of the former Yugoslavia. The 2008 economic crisis is the beginning of the abandonment of liberal mantras and the global strengthening of interventionism and protectionism in economies around the world.

The Republic of Serbia must have a clear position when it comes to the concept of economic development and entrepreneurship. Our economic structure is not competitive with the surrounding countries, and especially with the world's largest economies, EU, China and the United States. It is therefore necessary to gradually liberalize economic relations with foreign countries in a way that maximally preserve domestic resources and agricultural entrepreneurship, and only after stabilization and strengthening allow an equal competitive game with global players. Therefore, Serbia must stimulate its agriculture with financial and non-financial measures. At the same time, everything should be done to eliminate numerous bureaucratic, administrative and para-fiscal barriers to the development of entrepreneurship as soon as possible. Incentives, accompanied by reforms in the judiciary and education, can in the long run strengthen agrarian entrepreneurship in Serbia by completely replacing the anachronistic structure from the end of the last century and introducing the country into a new stage of expansive development of agriculture.

So far, Serbia has not been able to find the right balance between different contradictory requirements, starting with those seeking the EU and the US in the direction of liberalization, through citizens' demands for better standards, social protection and infrastructure, to demands towards reducing tax burden, bureaucracy, corruption and the protection of the inefficient public sector.

If one finds "the smallest common denominator" of these demands, it is realistic to expect the beginning of a lasting recovery of agricultural entrepreneurship and its sustainability over a long period.

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## INSURANCE CONTRACT AS THE BASIS FOR THE SAFETY OF AGRICULTURAL PRODUCERS IN THE REPUBLIC OF SRPSKA

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### Summary

*The aim of the paper is to point out the impact of the insurance contract on the safety of agricultural producers in the Republic of Srpska, based on the assumption that the insurance of crops, fruits and animals is a factor that implies elimination of harmful consequences in case of damage. This attitude of the authors is based on the fact that with the conclusion of an insurance contract in agriculture, the part of the responsibility is transferred to the state (by participation in the co-financing of the insurance premium), then to the insurance company (by claiming the damage from the insurance) and finally to the agricultural producers. Bearing in mind that insurance is very present in all segments of the modern society, which implies a great variety of forms of insurance, the authors of this paper start by presenting a general structure and classification of insurance, which also includes the insurance for agricultural purposes. In order to get a realistic picture of the current state of insurance in agriculture in the Republic of Srpska, an analysis of the legal regulation that regulates the mentioned issues was carried out. The authors also conducted a survey among agricultural producers to analyze the reasons why they have a negative interest for this segment of insurance and thus a small number of closed insurance policies with insurance companies. Based on these findings, this paper gives recommendations for the improvement of the situation and proposals for better solutions which would raise the safety of agricultural producers to a higher level.*

**Key words:** *agriculture insurance, insurance contract, agricultural producers, insurance card*

**JEL:** *Q18, K22*

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## Introduction

The term insurance was first used in the ancient times, in terms of organizing communities that would compensate the damage to their members in certain situations, especially in the case of traveling caravans. These forms of insurance first appeared in the Italian trade cities, and then moved to other countries, while new forms of insurance appeared with the establishment of Lloyd 1779 (Vasiljević, 2001).

Unlike Western European countries, the idea and practice of insurance was introduced the new state of Serbia quite late. Insurance activity in Serbia was first performed by foreign companies, and the first domestic insurance institution was founded in 1897 (Kočović et al., 2010). The founders were Luka Čelović and Đorđe Vajfert, and it was first functioning as the Insurance Department of the Belgrade Cooperative. Until the beginning of the First World War in the Kingdom of Serbia, three other insurance companies with domestic capital were established - "Serbia", "Šumadija" and "Jugoslavija". Insurance basically means security, and it is closely connected with terms, danger, risk, damage.

Insurance policy has its roots in games of chance and mathematics of probability, from which it has evolved over time (Rohrbach, 2013). It can be said that insurance implies a collection of multiple disciplines that, with the help of different methods, try to reach certain cognitions. First of all, it refers to the following disciplines: insurance law, insurance economics, actuarial mathematics, medical insurance, engineering insurance, insurance policy, insurance crime, etc. (Rohrbach, 2008)

## Methodology

In the research carried out for the purpose of writing this paper, several different approaches and methodical procedures were used.

*Positive-law method.* Positive regulations of the Republic of Srpska that regulate insurance as a liability-legal relationship, as well as insurance in agricultural production were used to a great extent in the paper. The goal of the positive-law method is to establish the quality of the solution of the positive legal regulations in the Republic of Srpska in the mentioned area, as well as to point to the likely consequences that could result in the application of these solutions in practice.

*Multidisciplinary approach.* The contract on insurance of crops and fruits in the Republic of Srpska is primarily analyzed from the legal aspect. However, in some parts of the paper a multidisciplinary approach was also used. Especially for the analysis of numerous legal solutions in this matter, significant economic knowledge and research are very significant, as well as knowledge from the agricultural scientific field, and statistical analyzes that represent the real basis for accepting some legal concept.

*Survey method.* The survey research was carried out in 2016, among agricultural producers from the territory of the city of Bijeljina (Semberija), the second largest city in the Republic of Srpska, and the first in terms of the intensity of agricultural production.

A total of 120 individual agricultural producers were surveyed. Respondents needed 10 minutes to complete the survey. Those questionnaires that were partially filled and in which the answer to the question of social desirability suggested the random reply were not included in the further analysis and data processing. The final size of the processed sample consisted of 88 questionnaires.

*Statistical methods.* In processing the data, the methods of descriptive statistics were used (frequencies and percentages), then the analysis of time series, and the *Chi-squared test*. The *SPSS 20.0* software package was used for data analysis.

### **Concept and types of insurance**

The insurance contract obliges the insurance contractor to pay a certain fee to the insurance organization (insurer), and the organization is obliged, in the case of the happening that represents the insured event, to pay to the insured or to a third party a fee or contract amount or do something else (ZOO, Article 897). The parties from the insurance contract are:

- the contracting parties - the insurance contractor and the insurer, taking into consideration that the insurance contractor can be the insured, if the contract is concluded on his own behalf and for his own account;
- The insured is a person to whom the rights under the contract belong, provided that the insurance contractor has concluded a contract in his own name and for another person's account;
- An insured person is a subject in relation to whose life or action the contract is concluded;
- The injured third party - a person who in the case of the realized insured event can submit certain claims to the insurer;
- Insurance beneficiary - It is used in the event of death insurance.

The insured case is an event on the basis of which the insurance is concluded, and it must be future, uncertain and independent of the exclusive will of the contracting authority (ZOO, Article 898). The aforementioned legal provision integrated the notion of insured case and risk, while some authors distinguish between the notions of a secured case and risk. The secured case is an event foreseen by a contract whose performance means the realization of the risk and the appearance of the main obligation of the insurer to pay insurance compensation, insured sum or do something else (Vasiljević 2014). Uncertainty actually determines the essence of the insured case. In securing property and liability, uncertainty usually refers to something that has not happened or will happen in the future, and thus the insured event has certain negative consequences for the financial situation of the insured or, in other words, leads to some financial loss for which the insurance coverage is required (MacGillivray on Insurance Law, 2003).

**Table 1.** Types of insurance

No	Criteria for the division of insurance	Type of insurance	
1	According to the place of risk realization	- Land insurance - Insurance in air navigation - Navigation insurance	Transport insurance
2	According to the object of insurance that is at risk	- Property insurance - Personal insurance	
3	According to the method of formation	- Obligatory - Voluntarily	
4	According to the method of carrying out the risk	- Insurance - Reinsurance - Coinsurance	
5	According to the method of organizing insurance	- premium - Mutual	
6	According to the number of insurance subjects	- Individual - Collective	

Source: Vasiljević, 2014;

This division in Table 1 is generally accepted in the legal theory; however, when discussing the insurance in the territory of the Republic of Srpska, the division was carried out according to a completely different classification, i.e. the sub-qualification of the insurance, so the insurance of crops and fruits belongs to the group 9. Insurance against other damages to the property and within the qualification of non-life insurance (Decision on Types of Insurance, 2006 and Instructions for Applying the Decision on Types of Insurance, 2017).

### Insurance of crops and fruits

Insurance of crops and fruits belongs to the group of property insurance (Marović & Avdalović, 2003) . However, in order to make a clearer view of the place, that is, the position of insurance of crops and fruits in relation to other types of property insurance, Table 2 shows the structure of the property insurance company. The division is performed according to the object of insurance that is at risk.

**Table 2.** Classification of property insurance

Property insurance				
Securing things	Liability insurance	Claims insurance	Transportation insurance	
From fire	from damage to liability		Casco	Cargo
From flood	for damage from the use of motor vehicles		insurance of vehicles <i>ships, aircrafts and boats</i>	goods in transport and other insurances
From theft	insurance of the carrier of liability			fares
Crops and fruits				Insurance costs
Construction				

Source: Vasiljević, 2014.

As seen from the presented table, the insurance of crops and fruits belongs to the group of property insurance. Regardless of whatever being in the property insurance group, insurance of crops and fruits has its own conditions, which are, as a rule, determined by insurance companies and that meet their internal standards.

Insurance of crops and fruits is twofold. On the one hand, each country, by measures of economic policy, can affect the safety of agricultural producers, and these are structural policy measures, whereas, on the other hand, every agricultural producer, whether it is an individual agricultural producers or a company that performs the activity of agricultural production, can conclude an insurance contract with certain insurance organizations, and thus secure their crops and fruits from the risks covered by that contract (Dana, 2010).

### **Legal regulations on insurance in agriculture in the Republic of Srpska and surrounding countries**

Agricultural production in the Republic of Srpska has a significant place in the formation of Gross Domestic Product (GDP). In the structure of the Republika Srpska's GDP in 2012, agriculture participated with 8%, which is considered a rather high share. In 2016, after the trade sector (11.1%) and the processing industry (10.8%), agriculture (with hunting and forestry) in the structure of GDP is in the third place with a share of 9.3%. This points to the fact that agriculture and its development are important for the Republic of Srpska, not only from the ecological and social, but also from the economic point of view (Strategic Plan for the Development of Agriculture and Rural Areas of Republika Srpska, 2016).

Bearing in mind the limitations of agricultural land in the Republic of Srpska, in order to achieve the function of sustainable agriculture and sustainable development, besides the rational use of land, it is necessary to introduce additional measures in terms of reducing the risk of damage and destruction of agricultural crops.

Agricultural insurance in the Republic of Srpska is regulated by legal and sub-legal acts, as it is in the Strategic Plan for the Development of Agriculture and Rural Areas of the Republic of Srpska for the period 2016-2020.

A direct incentive for agricultural producers is provided by the Government of the Republic of Srpska by allocating funds for co-financing the insurance premium for primary agricultural production, and the funds are received by beneficiaries who make primary agricultural production for the current year. The amount of incentive funds is paid up to 50% of the amount of insurance costs, and can not be higher than 25,000 BAM (Bosnian Marks) per user. These funds can be used for livestock production (facilities and cattle), fruit and wine production, vegetable and crop production. Any agricultural producer wishing to realize this kind of incentive is obliged to submit to the Agency for Agrarian Payments of the Republic of Srpska the insurance policy for the current year and proof of the insurance payment, and the request can be submitted no later than September 30<sup>th</sup> of the current year (An act on conditions and ways of

achieving financial incentives for the development of agriculture and villages, 2017, Article 59).

Unlike the Republic of Srpska, incentives for securing insurance premiums in agriculture in neighboring countries are regulated in a more precise way. Namely, this type of incentive in the Republic of Serbia is regulated by a special policy that specifies different amounts of funds depending on the type of cultivation that is provided. Thus, incentives for insurance of agricultural crops are 100,000 RSD; incentives for insurance of vegetable crops - 500,000 RSD; the insurance of fruit crops, vineyards and hops - 1.000.000 RSD; incentives for insurance of nurseries and / or young perennial plants - 500,000 RSD; incentives for animal insurance - 2.000.000,00 RSD. As a total for all types of incentives of this policy, the incentive user can obtain a maximum of 2.500.000 RSD. (A regulation on conditions, manner and form of request for exercising the right to incentives for the insurance premium for crops, fruits, perennial plantations, nurseries and animals, 2017, Article 7).

The Republic of Croatia secures reimbursement based on insurance in the amount of 65% of the total premium paid, and a maximum of EUR 70,000 (Regulation on the implementation of the measure M17 "Risk management", sub-section 17.1 "Insurance of crops, animals and plants" from the Rural Development Program of the Republic of Croatia for the period 2014-2020, 2015-2016, Article 10).

As already mentioned, the amount of incentive funds per registered farm in the Republic of Srpska can not be higher than 25,000 BAM, or 12,800 Euros. In Serbia, this maximum is up to 20,800 Euros, which shows a difference of 8,000 Euros, which is important if the interest of an individual (agricultural producer) is taken into account. If the given incentive funds are compared with those allocated by the Republic of Croatia, there is a huge difference, which indicates that the allocations in Croatia are 5.5 times higher than in the Republic of Srpska. Of course, such a high amount of incentive funds in Croatia is partly provided from the funds of the European Agricultural Fund for Rural Development (EAFRD), and partly from the budget of the Republic of Croatia, where the EAFRD participates with 85% of the shares, and the Republic of Croatia with 15%.

The Ministry of Agriculture, Forestry and Water Economy of the Republic of Srpska regulates the issues of insurance in agriculture through funds for financing measures for the improvement of agriculture, established by the Medium-Term Strategy of Agriculture for the Republic of Srpska and measures of the agricultural policy of the Republic of Srpska (Regulation on the provision and direction of funds for encouraging the development of agriculture and villages, 2002) Agricultural policy measures are the economic measures undertaken by the Republic of Srpska, which achieve the objectives of agricultural policy. These measures must be harmonized and must be implemented according to the principle of equality and neutrality. Measures of agricultural policy with regard to the area of action are divided into: market and price policy measures, structural policy measures, land policy measures and measures of incentives in agriculture. (Law on Agriculture, 2006, Article 5).

Within this division, only structural policy measures concern the issue of insurance in agriculture, as they constitute a set of measures that encourage the efficiency of agricultural production to ensure stable income and satisfactory standard of farmers in the rural area, and the balanced development of agricultural regions and rural areas. One of such measures is also “support to the system of anti-hail protection and other measures of protection of crops” (Law on Agriculture, 2006, Article 13).

The Strategy for the Development of Agriculture and Rural Areas of the Republic of Srpska also contains objectives and measures for implementing the production support policy. It is stated that increasing the volume and productivity of agricultural production and ensuring the stability of the income of agricultural producers can also be influenced by the improvement of the insurance system in agriculture and this is one of the strategic goals in agriculture in the Republic of Srpska (Strategic Plan for the Development of Agriculture and Rural Areas of the Republic of Srpska 2016- 2020, 2015).

Agricultural insurance in the Republic of Srpska is underdeveloped and, still, very little is being applied in the function of compensating for lost income in case of harmful events. Therefore, in the program period, the goal is to try to implement a measure of subsidizing agricultural insurance costs with the aim of improving and increasing agricultural areas, facilities and cattle “covered” with agricultural insurance. Apart from subsidies for completed insurance policies, efforts are being made to adjust the supply of agricultural insurance to the needs of agricultural producers and to promote the benefits of its use in various target groups - fruit growers, vegetable growers, livestock farmers (Strategic Plan for Agriculture and Rural Development of the Republic of Srpska 2016-2020, 2015).

State allocation in the form of emergency financial assistance for the remediation of large-scale damages is increasing, so this type of support to agricultural producers has recently taken a more significant place than in the previous period. However, natural disasters and climate change imply the need to introduce new forms of support for agricultural production so that the negative consequences of such events are as small as possible.

The Ministry of Agriculture, Forestry and Water Economy of the Republic of Srpska implements measures for co-financing the cost of anti-hail protection in the function of improving the efficiency and expansion of the anti-hail protection system, with the inevitability to increase the participation of agricultural producers in proportion to the benefits derived from that system (Government Decision on the amount of fees for co-financing the anti-hail protection, 2010). An effective way of preventing the consequences of the hail in plant production is the anti-hail protection that is being carried out by the public enterprise “Anti-hail prevention of the Republic of Srpska a.d. Gradiška” on the territory of the Republic of Srpska. This system functions on the principle of co-financing of costs by the Ministry, local government units and agricultural holdings (Regulation on the conditions and method of achieving financial incentives for the development of agriculture and villages, 2017, Article 47).

Although the Agricultural Development Strategy of the Republic of Srpska foresees significant investments in the system of anti-hail protection, i.e. the protection of crops from the hail, it should be kept in mind that the hail is not the only natural disaster, and that it is necessary to work on the development of other systems of protection of agricultural producers. One way of protecting agricultural producers against the risks that can cause damage to agricultural crops is, as we have already mentioned, insurance of agricultural crops.

### **The contract on insurance of crops and fruits in agriculture**

The contract on insurance of crops and fruits is a way of securing agricultural producers in the case of certain natural disasters when they suffer material damage on their crops or fruits. Therefore, in addition to the agricultural policy measures adopted by the Government of the Republic of Srpska, or the Ministry of Agriculture, Forestry and Water Economy, which are aimed at protecting agricultural producers, such as support for the system of anti-hail protection and other measures for the protection of crops. Agricultural producers can protect their financial security by closing a contract on the insurance of agricultural crops with one of the insurance organizations operating in the territory of the Republic of Srpska and Bosnia and Herzegovina.

Under the insurance contract for crops and fruits, the insurer is obliged to pay the indebtedness indicated in the insurance policy if the insurance premiums have already been paid and the insured is obliged to regularly pay the insurance premium. However, when the insured case arises, that is, when the insurance risk is realized, the insured is obliged to notify the insurer immediately and within three days at the latest, that an insured case arose, and if the notification is made by telephone or verbally, it must be confirmed in writing within three days. The application must indicate the day and time of the damage, as well as the crops, areas and plots. If crops or fruits are damaged during harvest, the insured is obliged to perform harvesting or harvesting before the damage assessment in order to prevent further damage increase. When the damaged crop or fruit has to be harvested or picked, and the damage assessment has not yet been carried out, the insured is obliged to leave the control samples on the lower, middle and upper part of the plot diagonally, of at least 10m<sup>2</sup> of damaged crop, that is, unprocessed fruit, and in vineyard at least 10 grapevine trees and in the orchard several trees unpicked on the lower, middle and upper part of the vineyard or the orchard in the diagonal, which will serve as the basis for the assessment of the damage; in crops where harvesting is done by machine-harvesting, the insured must leave the control samples in the form of a strip. The insured is also obliged to provide the insurer with all the information and evidence at their disposal, that are necessary for determining the sample, scope and amount of damage (General conditions for insurance of crops and fruits, “Dunav osiguranje”, 2012).

For most insurance companies, there is an identical rule that the subjects of insurance in the insurance contract for crops and fruits are: crops (including double cropping, subcrops and intercrops); fruits, meadow grass, herbs, ornamental plants, orchards and vineyards,

young orchards and vineyards before entering the genus; fruit, grapes and forest planting material; young forest culture up to the age of 6; willows for plaiting and reed.

The main hazards in the insurance of crops and fruits are the following: the danger of hail, fire and lightning, while crops and fruits are unharnessed and unpicked, so that the insurer pays for damage or destruction of insured crops and fruits.

In addition to the aforementioned general conditions of insurance there are also special conditions related to supplementary insurance, so the insurer is obliged to pay compensation from insurance and for damages:

- for all crops and fruits - from floods, spring frost and storms,
- for fruits and grapes - from the salinity.

The insurer is obliged to pay insurance compensation for damage only in the loss of yield, and not in quality, except for: hemp and fiber flax, broom sorghum, fruit, vineyard and forest planting material and planting material of ornamental grass and trees, plaques for plaiting, in which cases they are compensated for the loss of quality. The insurance fee for damage caused by the loss of quality in the tobacco which is insured under special conditions, the insurer is also obliged to pay. The insurer is obliged to pay compensation from insurance and for damages that occur and loss of quality in: crops and seeds for the production of seeds, fruits, table grapes. Insurance from supplementary risk can be concluded only if the insurance against basic risks is previously concluded, unless the crop is secured, i.e., protected by the hail network (General conditions for insurance of crops and fruits, "Dunav osiguranje", 2012, Article 15).

### **Insurance companies**

Insurance contracts can be concluded between agricultural producers and insurance companies. An insurance company, which is used by a legislator, is a joint stock company registered in the Republic of Srpska or a mutual insurance company registered in the Republic of Srpska, as well as an insurance company that is not from the Republic of Srpska, but performs insurance activities in accordance with the law (Law on Insurance Companies, 2005, Article 2).

The founders of the insurance company can be domestic and foreign persons, individuals and legal entities. Foreign capital may also be invested in insurance companies in the Republic of Srpska, because according to the Law on Insurance Companies, an insurance company may be an insurance company that is not from the Republic of Srpska, but performs activities in accordance with the Law. A foreign insurance company that has its head office outside of Bosnia and Herzegovina may perform an insurance activities in the Republic of Srpska in the form of a branch office, after obtaining a license for work from the Insurance Agency of the Republic of Srpska and registering it in the court register. From the cited legal provisions it follows that the insurance activities in the Republic of Srpska can be performed by insurance companies established in Bosnia and Herzegovina by foreign investors, as well as existing insurance companies whose head office is outside

Bosnia and Herzegovina. The Insurance Agency of the Republic of Srpska maintains a register of insurance companies whose head office is located outside Bosnia and Herzegovina, which established branches in the Republic of Srpska (Krstić, 2016).

There are 14 registered insurance companies in the territory of the Republic of Srpska, 11 of which carry out non-life insurance activities, and three insurance companies perform non-life and life insurance activities. However, in addition to those listed in the Republic of Srpska, there are also 11 affiliates of insurance companies from the Federation of Bosnia and Herzegovina, while seven insurance companies based in the Republic of Srpska operated through the branches in the Federation of Bosnia and Herzegovina. Almost all insurance companies provide insurance services when it comes to insurance of crops and fruits, however, bearing in mind that the situation on the territory of Bosnia and Herzegovina with this type of insurance is very bad, most of the insurance companies, except for having insurance conditions, do not have actual activities in regarding the issue of insurance policies (Report on the state of insurance in the Republic of Srpska for the period 01.01.2016 - 31.12.2016, 2017).

### Research results and discussion

Bearing in mind that the insurance of crops and fruits in the Republic of Srpska is not represented to the necessary extent, despite significant climate change, and that financial losses are recorded from year to year due to the damage caused to agricultural producers by weather conditions, the authors surveyed agricultural producers in order to examine the causes that are responsible for a small number of closed agricultural insurance policies. Also, the survey helped to see how economically have been justified certain legal solutions, as well as the rules that regulate the insurance contract, in order to gain an insight into the proposals of new solutions.

Bearing in mind the area of land, shown in hectares, which is processed by the surveyed agricultural producers, it shows that an adequate representative sample for this research has been provided. Namely, on the territory of Semberija, or the city of Bijeljina, about 50,000 hectares of land are being processed, and the survey covered 2.42% of the total surface that is being processed.

**Table 3.** The structure of agricultural land that the respondents process and the number of livestock heads

No	The structure of agricultural land	Hectars	Livestock types	Number
1	Arachnids and gardens	1,090.10	Cattle	5,015
2	Orchards	83.15	Pigs	1,000
3	Vineyards	0.00	Sheep	70
4	Meadows	20.00	Goats	1
5	Pastures	1.00	Horses	0
6	Greenhouses	40.00	Poultry	2,115

Source: Author's survey

The survey covered 35 villages from the area of Semberija, or the city of Bijeljina: Gradac, Batković, Magnojević, Velika Obarska, Ljeskovac, Trnjaci, Donje Crnjelovo, Kriva Bara, Dazdarevo, Donje Crnjelovo, Vršani, Donji Dragaljevac, Batar, Triješnica, Donja Čadavica, Patkovača, Modran, Johovac, Mala Obarska, Gornji Dragaljevac, Balatun, Golo Brdo, Amajlije, Zagoni, Popovi, Dvorovi, Međaši, Gornja Čadavica, Kojčinovac, Janja, Srednji Dragaljevac, Brodac, Glogovac, Ugljevička Obrijež and Suvo Polje.

The results of the survey show that respondents are not only targeting one of the agricultural branches, but most of them are engaged in mixed production. Thus, out of the total number of respondents from the territory of the city of Bijeljina, as many as 95.4% of the respondents are engaged in crop production, the similar situation is with livestock production of 90.8%, while the relatively lower interest is in vegetable farming - 54.0%, fruit growing - 32.2%, beekeeping - 9.2% and other 14.9%. From the above data it can be seen that the majority of respondents are equally engaged into crop farming and livestock breeding.

Approximately 4/5 of the surveyed agricultural producers, i.e. 80.5% of them, declared that their agricultural activity was the main activity, that is, it was the main source of income for agricultural production, which led to the conclusion that these were serious agricultural producers. The percentage of those whose agricultural production is not the main source of income is 10.3%, and only 9.2% of the respondents stated that they make partial income in agricultural production. The information that states that these are serious agricultural producers is the fact that 90.8% are registered households.

More than half of the surveyed producers gave the answer that earnings from agriculture do not provide a high standard of living, or that they can not live well from these revenues. This was confirmed by 56.3% of the respondents, while 25.3% answered that the income from agriculture can be sufficient for normal living, with 18.4% of the respondents not providing a precise answer.

**Table 4.** Risks from which the respondents most often suffered damage in the previous period

No	The cause of the damage	Suffered damage in %	Did not suffer damage in %	Partial damage %
1	Flood	86.2	13.8	/
2	Drought	44.8	55.2	/
3	Hail	16.1	83.9	/
4	The irresponsibility of the state	2.3	97.7	/
5	Death of livestock	3.4	96.6	/
6	No damage	2.3	97.7	/

Source: Author's survey

As can be concluded from the data presented in Table 4, the largest number of respondents suffered damage in the previous period, i.e. 97.7% of them. However, despite this fact, the percentage of insurance of agricultural crops and fruits is still

at a very low level. This was confirmed by the survey, where 96.6% of respondents answered that in the last five years they did not use insurance in agriculture, while only 3.4% stated that they had insurance policies.

What is particularly emphasized as a negative phenomenon when it comes to the contract for the insurance of agricultural crops, fruits and animals, is the inaccessibility of the necessary information on certain possibilities that can improve the image in this activity. Namely, the fact is confirmed that there is a poor incentive or incentive awareness of the state for insurance in agriculture, as only 28.7% of the respondents confirmed that they were aware of the discounts, i.e. the subsidies allocated by the Ministry to agriculture insurance, while 71.3% did not have information about it. It also showed that there is a lack of interest in insurance among the agricultural producers themselves (in this case, the respondents), because 9.2% of respondents confirmed that they were familiar with the insurance conditions provided by individual insurance companies, while 56.3% of the respondents were not familiar with the conditions provided by the insurance companies, and 34.5% answered that the information of the insurance conditions were insufficient to opt for the use of these services.

The above arguments point to the conclusion that the poor situation of the coverage of insurance of crops, fruits and animals in agriculture in the Republic of Srpska is mostly affected by insufficient information, as well as the insufficient interest of agricultural producers for this type of insurance. However, the survey also identified other reasons why agricultural producers do not insure their agricultural crops, fruits and animals, as shown in Table 5.

**Table 5.** Reasons why the surveyed farmers do not insure crops, fruits and animals

No	Reason for not-insuring	Answered with YES	Answered with NO
1	Lack of financial resources	51.7%	48.3%
2	Distrust towards insurance companies	37.9%	62.1%
3	Insufficient information about positive effects	24.1%	75.9%
4	High insurance premiums	17.2%	82.8%
5	No need for insurance	5.7%	94.3%
6	Other	3.4%	96.6%

*Source:* Author's survey

Table 5 shows a collision in responses under numbers 1 and 4, as both involve financial allocations, so financial resources can be used as a reason for not using the insurance. This data confirms the claim that, to a large extent, the poor disposal of information for agricultural producers affects the low level of insurance of crops, fruits and animals in the Republic of Srpska.

In order to make the research more credible in terms of the causes that affect the low level of insurance in agriculture, a questionnaire was formed in a way that questions were of conditional character, which in a clearer way pointed to the perspective of insurance in agriculture in the Republic of Srpska. Namely, to the question that if the

insurance of crops, fruits and animals would be a condition for the safe placement of their products, would the agricultural producers close an insurance contract in that case, 57.5% of the respondents answered that they would choose to take insurance, 42.5% said they would not. The second was the requirement for obtaining certain subsidies, where 41.4% of the respondents answered that they would insure crops if this would be a condition for obtaining certain subsidies. However, 58.6% of respondents did not consider this reason as motivating to decide to insure their crops, fruits or animals. Even if the insurance would be a condition for further dealing with certain agricultural activities, only 24.4% of the respondents said they would insure crops, while 75.6% of the respondents gave a negative response. A similar response was also given when it comes to the terms of obtaining favorable agricultural bank loans, where 26.4% said they would ensure their crops and 76.3% would not. The negative attitude of the surveyed agricultural producers in terms of insurance is confirmed by the fact that only 16.1% of the producers would ensure their crops, fruits or animals if this would be a condition for registration of agricultural holdings, while 83.9% responded negatively. Regarding the above issues, there is a relative coexistence in the responses, which can be noticed in the issues related to the condition for further engagement with this activity, that is, the conditions for registration of the holding.

### **Conclusion**

Based on the analysis of regulations and conditions in the field of insurance of agricultural crops, fruits and animals in the Republic of Srpska, it can be concluded that the official institutions, primarily the Government and the Ministry of Agriculture, Forestry and Water Economy of the Republic of Srpska, take certain actions necessary to create as favorable climate in the sector of insurance of agricultural crops, fruits and animals. In addition to the economic policy measures related to the allocation of funds for the support to the system of anti-hail protection, the budget of the Republic of Srpska has also provided funds for co-financing insurance premiums for primary agricultural production, which are provided under the insurance contract, as an obligatory legal relationship, between the agricultural producer and the insurance company. However, when these funds are compared with funds allocated for the same purpose by countries in the environment such as, for example, Serbia and Croatia, it is noticed that these funds in the Republic of Srpska are insufficient. This leads to the conclusion that one of the factors for ensuring better conditions for the insurance of agricultural crops, fruits and animals in the Republic of Srpska would be access to European funds in the field of agriculture and rural development, which would provide additional funds to encourage the incentive of primary agricultural production, in which case the insurance contract would become a guarantor of financial security for agricultural producers.

The conducted survey suggests that there is a poor knowledge of agricultural producers about certain agricultural insurance possibilities, among other things, about incentives for securing agricultural purposes. The fact that the relevant institutions publish certain information in the Official Gazette and on their websites does not mean that the

information is really contributed to the producers. It should be kept in mind that most agricultural producers are not able to use sophisticated media. Thus, it is recommended not only to the institutions at the republic and local level, but also to existing insurance companies, to constantly organize seminars in order to increase the level of education of agricultural producers, and therefore make relevant information available to them. It is also necessary to oblige farmers' associations, whose number on the level of the Republic of Srpska is large and who use the budget funds for their work, to pay more attention to the goals for which they were founded, and thus to inform their members (agricultural producers).

The research also points to a very important conclusion, which is that in the attitude of agricultural producers there is a correlation between the insurance of agricultural purposes and the safe market placement of them. It is recommended that a more secure market for the placement of agricultural products is provided by the Chamber of Commerce of the Republic of Srpska, professional organizations and associations, and that special regulations the access to existing markets is conditioned by the insurance of crops, fruits and animals. We think that this would be a significant reason to increase the growth tendency of closed policies in, which would result in multiple benefits.

In addition, taking into account the fact that there is a lack of funds for the Republic of Srpska to participate in the co-financing of insurance premiums in agricultural production on the one hand, and that insurance companies do not have a critical number of insured persons in order to form a secured amount from which the resulting damages would be paid, it would be a good idea to consider the possibility of forming a public-private insurance company for crops and fruits.

Considering that there are a large number of agricultural producers in the Republic of Srpska who are seriously engaged in agricultural production, the possibility of forming mutual insurance companies should be considered, which, as an option, is also envisaged by the Insurance Companies Act.

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## UGOVOR O OSIGURANJU KAO OSNOV SIGURNOSTI POLJOPRIVREDNIH PROIZVOĐAČA U REPUBLICI SRPSKOJ

*Boro Krstić<sup>4</sup>, Zorica Vasiljević<sup>5</sup>, Miroslav Nedeljković<sup>6</sup>*

### Rezime

*Rad ima za cilj da ukaže na uticaj ugovora o osiguranju na sigurnost poljoprivrednih proizvođača u Republici Srpskoj, polazeći od pretpostavke da je osiguranje useva, plodova i životinja faktor koji podrazumeva solidarno otklanjanje štetnih posledica u slučaju nastanka štete. Ovakav stav autora bazira se na činjenici da zaključivanjem ugovora o osiguranju u poljoprivredi, deo odgovornosti se prebacuje na državu (učešćem u sufinansiranju premije osiguranja), zatim na društvo za osiguranje (sanirajući štetu iz osiguravajuće mase) i na kraju i na poljoprivredne proizvođače. Imajući u vidu da je osiguranje veoma prisutno u svim segmentima modernog društva, što implicira veliku raznolikost oblika osiguranja, autori u radu polaze od jedne uopštene strukture i klasifikacije osiguranja, koja pozicionira i mesto osiguranja poljoprivrednih namena. Da bi se došlo do realne slike postojećeg stanja osiguranja u poljoprivredi Republike Srpske, izvršena je analiza pravne regulative koja reguliše navedenu problematiku, a putem anketnog istraživanja poljoprivrednih proizvođača analizirani su razlozi koji utiču na slabu zainteresovanost za ovaj segment osiguranja kao i na mali broj zaključenih polisa osiguranja sa društvima za osiguranje. Na osnovu utvrđenog stanja, u radu su date preporuke za poboljšanje stanja i predlozi za dolaženje do boljih rešenja, koja bi sigurnost poljoprivrednih proizvođača podigla na jedan viši nivo.*

**Ključne reči:** *osiguranje u poljoprivredi, ugovor o osiguranju, poljoprivredni proizvođači, polisa osiguranja*

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## WHO ARE WINE TOURISTS? AN EMPIRICAL INVESTIGATION OF SEGMENTS IN SERBIAN WINE TOURISM

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### Summary

*This paper aims to investigate who are the wine tourists in Serbia. The research was conducted by using a survey method. Two profile questions were used aimed to identify segments: "Do you consume wine?" and "Have you ever visited some winery in Serbia"? Of a total number, 152 completed questionnaires were received. According to the research results, two segments of wine tourists were defined: active and potential. The active wine tourists are persons who consume wine and so far have visited some wineries and participated in wine tourism. The potential wine tourists also consume wine, but haven't visited any winery in Serbia so far. Motives for inclusion in wine tourism of both these groups are similar, while the active wine tourists have shown greater readiness to revisit the favourite winery and participate actively in wine tourism in future period in regard to the potential ones.*

**Keywords:** *wine tourists, segmentation, motivation, behavioral intention, barriers.*

**JEL:** *D12, M21, Q13, L83*

### Introduction

Modern tourism is based on shorter, but frequent visits of tourists to the specific destinations, in order to reveal new localities and attractions. Tourists are more interested in adventures and experiences during the trip, which affects the emergence of new tourism products and new forms of tourism.

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These modern forms of tourism comprise sport and recreation, culinary delights and gastronomy, culture and customs and can be marked as the specific forms of tourism. Interest in the specific forms of tourism has increased in recent years, and tourists who participate in them spend more money, travel more often and practice more activities than other tourists (MacKay et al., 2002).

Activities related to wine and the desire of tourists to visit wine destinations and wine cellars, and to get acquainted with the wine production method, wine culture and customs, are getting a special interest in the world within the specific forms of tourism, which all affects the development of wine tourism. In the 2004 in France, 7.5 million wine tourists were registered, of which 2.5 million was foreigners. In Italy 4 million wine tourists were registered, in the USA more than 4 million only in Napa Valley, while in Spain in the year 2008 was recorded 1 million wine tourists. The most of wineries open for tourist visits are located in Australia (80%) and in Germany (60%) (Marzo-Navarro, Pedraja-Iglesias, 2010). In the USA, wine tourists spend around \$ 3 billion a year on visits to wine-growing regions (Bonn et al., 2016).

In general, wine tourism can be defined as visits to wineries, to vineyards, and to wine and grape festivals, where experiencing the attributes of a wine or of production regions constitutes the main reason for a visit. Thus, a wine tourist can be any person who gets involved in appreciating elements that are related to wine while visiting a production region (O'Neill, Palmer, 2004). Wine tourists are fundamentally motivated by the esthetic experience or the enrichment through unique environs such as the wine country. Tasting and purchasing wine have been identified as motivations for visiting a particular region. While tourists may gaze at the winescape (esthetic experience), they may also actively engage in wine country recreation (escapist experience), abundant in the natural, rural setting of wine regions (Quadri-Felitti, Fiore, 2016).

Wine tourism, as the specific form of tourism in Serbia is in its infancy. Wineries in Serbia don't have precise data regarding a number of tourists who visit them. That is why these problems point out to the significance of research in the field of wine tourism, motivation of tourists to be included in this form of tourism, as well as defining the wine tourists segments.

The basic research problem in this paper is the definition of wine tourists, as well as the identification of differences in motives, intentions and behavior among them. Based on the review of previous research in domestic and foreign literature, a research model has been developed, which includes three groups of questions related to: motives for participation in wine tourism, behavioral intention and barriers.

An empirical research was conducted to identify wine tourists. Two profile questions, "Do you consume wine" and "Have you ever visited some winery in Serbia", were used. The first profile question aims to identify respondents who consume wine in relation to non-consumers. Respondents who are marked as non-consumers are not included in further research. Only those who are wine consumers remain in the sample. On the basis of the second profile question, the segmentation of wine tourists was carried out

in two groups. The first group consists of those who consume wine and take part in wine tourism. This group is named as “active wine tourists”. The second group consists of respondents who consume wine, but have not yet visited a wine cellar or participated in wine tourism. That is why this group is marked as “potential wine tourists”.

Using the descriptive statistical analysis, the values of the arithmetic means of independent variables in the model are determined. By calculating the Cronbach alpha coefficient, the reliability of the model was estimated. Using the t-test, differences in the average marks of the defined variables were calculated for these two groups of respondents.

In domestic literature there is very little research in this field and these works are primarily theoretical. The significance of the research in this paper, in addition to theoretical contribution, is reflected in the empirical verification of the introduced model in order to identify the most important motives that influence the inclusion of wine consumers in wine tourism, as well as determining the difference between the defined segments of wine tourists.

### **Research methodology**

The survey method was used in this research for collecting the primary data. The questionnaire consists of three groups of questions, which are drafted according to the relevant researches (Bruwer, 2003; Bruwer, 2004; Brown et al., 2006; Marzo-Navarro, Pedraja-Iglesias, 2009; Alonso, 2009; Marzo-Navarro, Pedraja-Iglesias, 2010; Grybovyč, Lankford, Lankford, 2013, Sekulić et al. 2016).

The first group of questions encloses 12 assertions, which refer on tourists motives to take part in wine tourism. Respondents were rating these assertions on a scale from 1 to 7, where 1 meant “absolutely irrelevant”, and 7 meant “absolutely relevant”.

The second group of questions encloses 2 observations concerning the intention of tourists to visit wine destinations and be active participants in wine tourism. The respondents appraise these assertions on a scale from 1 (I absolutely disagree) to 7 (I absolutely agree).

The third group of questions was defined by using 3 assertions, which refer to limitations for taking part in wine tourism. These limitations refer to time necessary for taking part in wine tourism, remoteness and inaccessibility of wine tourism destinations, as well as the wine tourism costs.

Besides these questions, the questionnaire enclosed also the questions regarding the demographic characteristics of respondents (gender, age and education), as well as two profile questions: “do you consume wine?” and “have you visited some winery in Serbia so far”?

## Segmentation of wine tourists

There are numerous researches in the literature, which tend to define the wine tourists. Therefore, there is no unique stereotype of a wine tourist, as well as no unique definition of who he really is. Number of these tourists, in countries with the developed wine tourism, ranges from 5 to 30 percentage of the total number of tourists. These are “casual” tourists, who visit wineries in order to taste wine. In addition, we can also find the “sophisticated drinkers”, who are interested in getting additional information on wine and its production as well, besides wine tasting. Wineries consider that around 5% of tourists make this group, and their number depends on a winery reputation and a wine manufacturer (Charters, Ali-Knight, 2002).

In the study conducted in Italy (1996), Corigliano was identified four groups of wine tourists. The Professional: persons between 30-45 years of age, who are good wine connoisseurs and its production, interested in trying something new and ready to invest time and energy in research. The Impassioned Neophyte: persons between 25-30 years of age, they like wine, enjoy food, like to travel in company, like to find out something new and make new friendships. The Hanger: persons between 40-45 years of age, richer, interested in wine because they think that the proficiency in wine differentiates them from other people, but they know only basic things about wine, they are easy to impress, sometimes ask for a discount. The Drunker: persons between 50-60 years of age, they visit wineries in groups on Sundays, consider them as an alternative to a bar, they drink fast and ask for more, buy wine in balloons.

In conversation with wineries in New Zealand, Hall (1996) was identified three groups of wine tourists: the “wine lovers”, the “wine interested” and “curious tourists”. Dodd and Bigotte (1997) were studying visitors to the wineries in Texas and were defined two segments based on the respondents’ age and their income. The first group was made of older tourists with higher income in regard to the second group.

Di-Gregorio and Licari (2006) was identifying three segments in their research conducted in South Italy: Opinion leaders: passionate about wine and write for wine magazines. Wine tourists: their goal is to increase knowledge on wine and buy a bottle of wine in the winery. Occasional tourists: they are more interested in vacation and visit to restaurants than in wine.

Brown et al., (2006) were defined four segments: Demanding gourmet: male, self-employed, takes part in wine tourism, visits wineries and makes acquaintances in them, visits good restaurants. Hedonic aficionados: a man who often drinks wine. Prudent enthusiast: female, employed, consumes wine less than the previous two groups. Functional differentiator: retired woman.

Galloway et al., (2008) were singled out two groups of wine tourists: Higher sensation seekers: male, has high incomes, buys more bottles of wine per month, visits several wineries annually, uses the internet to get information about wineries, takes part in several activities during the visit to wineries and wine destinations. Lower sensation seekers: female with less expressed participation in activities in regard to the first group.

Brunner and Synergist (2011) were identified six segments of wine consumers in their research conducted in Switzerland: the price-conscious wine consumer; the involved, knowledgeable wine consumer; the image-oriented wine consumer; the indifferent wine consumer; the basic wine consumer; and the enjoyment-oriented, social wine consumer.

In the research conducted in Germany, Koch, et al., (2013) were determined that person between 35-45 and 45-60 years of age are two most suitable groups for wine tourism. These two groups have higher incomes in regard to younger respondents and show more interest in wine. Only 21% of respondents between 18-25 and 25-35 years of age are worth targeting, while 19% of persons older than 60 years have shown interest in taking part in wine tourism.

Salai, et al., (2013) define three wine consumer segments according to the frequency of consumption: consumers who consume wine regularly, consumers who consume wine rarely and consumers determined by habit.

Olsen et al., (2015) were identified three segments of wine consumers in the research conducted in the USA: high variety-seeking consumers, moderate variety-seeking and variety avoiders. High variety seekers are younger, hold values favouring stimulation and tolerance of risk, pay more for wine, purchase wine in more locations, prefer more varietals and consider themselves more wine knowledgeable and involved than the other two segments.

## Results and Discussion

Of the total number of sent questionnaires, 160 completed questionnaires were received. Eight respondents (5%) said that they don't like to drink wine, and therefore they were not taken into further consideration. Only those respondents who consume wine remained in the sample (152).

**Table 1.** Demographic characteristics of respondents

Demographic characteristics	Frequency	Share (%)
<b><i>Gender</i></b>		
Male	78	51.3%
Female	74	48.7%
<b><i>Age</i></b>		
Up to 25	10	6.6%
25-34	62	40.8%
35-44	66	43.4%
45-54	11	7.2%
55+	3	2.0%
<b><i>Education</i></b>		
Secondary school	13	8.6%
College	40	26.3%

Demographic characteristics	Frequency	Share (%)
University	99	65.1%
<b>Visit to wineries</b>		
Yes	90	59.2%
No	62	40.8%

Source: Authors' research

Taking into consideration the second segmentation criterion, which refers on the visit to wineries in Serbia, two groups of respondents were identified. The first group makes 90 respondents, who consume wine and have visited some winery in Serbia (59.2%). The second group of 62 respondents makes persons who consume wine, but still haven't visited any winery in Serbia (40.8%).

The first group will be called the "active" wine tourists, while it is consisted of the respondents who drink wine and have visited some winery so far and have participated in wine tourism. On the other hand, we can find the respondents who drink wine as well, but still haven't visited any winery in Serbia. These tourists will be called the "potential" wine tourists.

**Table 2.** Demographic characteristics of segments

Demographic characteristics	Active (n=90)		Potential (n=62)	
	Frequency	(%)	Frequency	(%)
<b>Gender</b>				
Male	55	61.1%	23	37.1%
Female	35	38.9%	39	62.9%
<b>Age</b>				
Up to 25	4	4.4%	6	9.7%
25-34	30	33.3%	32	51.6%
35-44	46	51.1%	20	32.3%
45-54	8	8.9%	3	4.8%
55+	2	2.2%	1	1.6%
<b>Education</b>				
Secondary school	9	10.0%	2	3.2%
College	22	24.4%	9	14.5%
University	59	65.6%	51	82.3%

Source: Authors' research

An active wine tourist is a male, between 35-44 years of age, with a university degree. On the other hand, a potential wine tourist is a female, between 25-34 years of age, also with a university degree.

**Table 3.** Differences in segment estimates

<i>Motives for participation in wine tourism</i>	<b>Active (Mean)</b>	<b>Potential (Mean)</b>	<b>t-value</b>	<b>Sig.</b>
Visit to wineries	6.28	5.72	1.724	0.091
Wine tasting	6.43	6.00	1.441	0.155
Purchasing wine	5.21	4.91	0.796	0.430
Trying different types of wines	6.26	5.78	1.614	0.111
Getting to know wine manufacturers	5.81	5.13	1.925	0.058
Getting information on wine and its production	6.21	5.50	2.229	0.029**
Taking part in wine production	4.23	3.53	1,813	0,074
Tasting local gastronomic specialties	5.62	5.03	1,750	0,086
Shops with the local agricultural and handicraft products	5.06	4.44	1.519	0.134
Opportunities for recreation and vacation	5.70	5.09	1.811	0.076
Meeting people with similar interests	5.19	4.56	1.863	0.066
Trip organization (transport, accommodation, activities)	5.91	5.34	1.679	0.100
<i>Behavioral intention</i>	<b>Active (Mean)</b>	<b>Potential (Mean)</b>	<b>t-value</b>	<b>Sig.</b>
I would gladly visit a winery in which manufactures wine I like to drink	6.64	6.03	2.436	0.019**
I would take part in wine tourism in future period	6.17	5.28	3.074	0.003**
<i>Barriers</i>	<b>Active (Mean)</b>	<b>Potential (Mean)</b>	<b>t-value</b>	<b>Sig.</b>
High costs of wine tourism	4.68	4.63	0.180	0.858
Wine destinations in Serbia are remote and inaccessible	3.64	3.88	-0.616	0.540
It takes a lot of time for wine tourism	3.57	3.72	-0.419	0.677

Source: Authors' research

The active wine tourists have rated the following assertions with the highest ratings, which point out to the basic motives for taking part in wine tourism: wine tasting (6.43), visit to wineries (6.28), trying different wines (6.28), getting information about wine and its production (6.21). They rated with something worse grades: participation in wine production (4.23), shops (5.06) and meeting people (5.19). The active wine tourists would gladly visit wineries (6.64); while on the other hand, they consider that the necessary time (3.57) and the remoteness of wine destination (3.64) are not significant barriers for taking part in wine tourism.

The potential wine tourists have rated with the highest grades the following motives for the inclusion in wine tourism: wine (6.03), trying various wines (5.78), visit to wineries (5.72), getting information about wine and its production (5.50). They rated with worse grades those assertions that refer to: participation in wine production (3.53), the existence of shops (4.44) and meeting people (4.56). Similar to the active ones, but worse rated, the potential wine tourists would gladly visit the winery that manufactures wine they consumed (6.03). The potential wine tourists don't consider that it takes a lot of time for wine tourism (3.72), as well as that they don't consider the wine destinations as distant (3.88).

**Table 4.** Basic characteristics of the active and potential wine tourists

Type of wine tourists	Characteristics
Active Wine Tourists	Male
	35-44 years of age
	University education
	Primary motives: wine tasting, visit wineries, trying wines, getting information about wine and its production.
	Secondary motives: taking part in production, interest in local shops, meeting people. They are more willing to visit a winery that produces a favourite wine and take part in wine tourism in regard to the potential wine tourists
	Barriers: time and remoteness are less significant in regard to the potential tourists in order to take part in wine tourism
	Potential Wine Tourists
25-34 years of age	
Univeristy education	
Primary motives: wine tasting, trying wines, visit to wineries	
Secondary motives: taking part in production, interest in local shops, meeting people. They are less willing to visit a winery that produces a favourite wine and take part in wine tourism in regard to the active wine tourists	
Barriers: time and remoteness are more significant in regard to the active tourists in order to take part in wine tourism	

*Source:* Authors' research

Differences regarding the assertions which refer to the motives of tourists to take part in wine tourism were established by using a t-test. Statistically significant difference appears concerning the assertion on getting information on wine and its production. The active tourists have rated this assertion with an average grade of 6.21, while the potential tourists have rated with 5.50 ( $t=2.229$ ,  $p=0.029<0.05$ ), so there have been the statistically important difference in the views of these two groups of respondents. In other words, the active tourists have expressed the greater motivation to learn something about wine and its production, i.e. the greater readiness to educate in regard to the potential wine tourists.

The statistically important differences in the attitudes of respondents occur concerning the assertions, which describe future behaviour of wine tourists. The active tourists have shown higher interest in visiting the winery that manufactures wine they consume in regard to the potential wine tourists ( $t=2.436$ ,  $p=0.019<0.05$ ), as well as the greater readiness to take part in wine tourism in time to come ( $t=3.074$ ,  $p=0.003<0.05$ ).

### **Conclusion**

Wine tourism in Serbia is in its infancy, but with great potential for development. Subsidies for vineyards, production and processing of wine have influenced the increase in the number of small winery in Serbia for the last ten years. Domestic winemakers are interested in engaging in this form of tourism. It is therefore very important to get an answer to the question “who are wine tourists”. The answer to this question will help marketers and winemakers to identify wine tourists, as well as, similarities and differences between different segments. This will enable the creation of an adequate marketing strategies in order to attract more wine tourists and generate more significant revenues.

In this regard, empirical research was conducted with the aim of defining wine tourists and identifying similarities and differences between certain segments. The empirical research results show that the primary motives for taking part in wine tourism for both groups of the active wine tourists (they consume wine and take part in wine tourism) and the potential wine tourists (they consume wine, but haven't participated in wine tourism so far) are the same: wine tasting, visit to wineries and trying different wines.

Secondary motives are also very similar: taking part in wine production, the local shops and meeting people. There can be noticed that the active tourists have rated the defined claims with higher grades in regard to the potential tourists, i.e. they have been more motivated for taking part in wine tourism. The most important difference in these two wine tourists groups' motives is in a fact that the active tourists are more motivated to learn more on wine and its production in regard to the potential wine tourists.

As far as future behaviour of wine tourists is concerned, the best rated claim for both groups was the intention to visit a winery that manufactures wine they consumed. This is important concerning future action and driving force as for the active, as well as for the potential tourists.

On the other hand, the obstacles for taking part in wine tourism, which refer on time, remoteness and costs, are rated low. The negative values of t-test were noticeable here, i.e. the obstacles were related to the destination remoteness, and time necessary for taking part in wine tourism was more significant for the potential wine tourists in regard to the active wine tourists.

The active wine tourists have shown greater readiness to revisit a favourite winery and participate actively in wine tourism in the future. On the other hand, the potential wine tourists showed less readiness to visit wineries and for wine tourism. These results point out to the necessity of using the appropriate marketing tools, aiming to motivate

the potential tourist to take part in wine tourism and their conversion from the potential tourists into the active wine tourists. Realisation of this goal is possible considering that the potential tourists find the barriers (time, remoteness, and money) are not a significant obstacle for participating in wine tourism.

The significance of this research is reflected in the empirical verification of the introduced model conceived on the basis of relevant researches in the literature. In domestic literature there are limited number of papers in this field or they are primarily of theoretical character. The limitation of this research refers to the size of the sample. In future research it is necessary to include a large number of respondents. Also, this research could be linked to the research of the attitudes of wine producers regarding wine tourism, their intention and desire to connect at regional and national level in order to promote and develop wine tourism.

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## KO SU VINSKI TURISTI? EMPIRIJSKO ISTRAŽIVANJE SEGMENTATA U VINSKOM TURIZMU U SRBIJI

*Dejan Sekulić<sup>4</sup>, Aleksandar Petrović<sup>5</sup>, Vladimir Petrović<sup>6</sup>*

### Rezime

*Cilj ovog rada je da istraži ko su vinski turisti u Srbiji. Istraživanje je sprovedeno korišćenjem anketnog metoda. U cilju identifikacije segmenata korišćenja su dva profilna pitanja: "da li konzumirate vino" i "da li ste do sada posetili neku vinariju u Srbiji". Od ukupnog broja pristiglo je 152 potpuno popunjena upitnika. Na osnovu rezultata istraživanja definisana su dva segmenta vinskih turista: aktivni i potencijalni. Aktivni vinski turisti su osobe koji konzumiraju vino i do sada su posetili neku vinariju i učestvovali u vinskom turizmu. Potencijalni vinski turisti takođe konzumiraju vino, ali nisu do sada posetili neku vinariju u Srbiji. Motivi za uključivanje u vinski turizam obe grupe su slični, dok aktivni vinski turisti su pokazali veću spremnost da ponovo posete omiljenu vinariju i aktivno učestvuju u vinskom turizmu u budućem periodu u odnosu na potencijalne.*

**Ključne reči:** vinski turizam, segmentacija, motivacija, namera posete, barijere.

**JEL:** D12, M21, Q13, L83

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## FINANCIAL AND PRODUCTION ASPECTS OF GENETICALLY MODIFIED ORGANISMS<sup>1</sup>

*Milan Beslać<sup>2</sup>, Ćorić Goran<sup>3</sup>*

### Summary

*The purpose and goal of this research is to familiarize the general community, especially agricultural producers with the problem of financing the cultivation and trade of GMO and the problems Serbia is facing in the process of joining the EU. The paper uses an experimental method, the method of analysis, synthesis, induction and deduction, and presents the results which have been obtained by surveying 163 farmers from Vojvodina. The main results of this study show that, if the law so regulates, most agricultural producers agree to produce GMOs, but only if the conditions for the traditional production do not provide acceptable yield and income. The contribution of this paper is that it has shown that GMOs are such organisms that would never have been created in nature and that they actually represent a patent for certain organizations. It has also shown that there is a need for informing and educating farmers in the field of GMOs as well as the need for further research on this topic.*

*Key words: Financing GMO, DNA, Roundup, Genetic Engineering*

**JEL:** G24, Q19.

### Introduction

Genetically, modified organisms are those organisms created artificially in a laboratory in a way that they could never be created in nature. Therefore, genetically modified organisms are patents of organizations that create them and derive all other rights from the right to the patent. Financing, production and marketing of GMOs are becoming increasingly important in the world today, despite the fact that there are contradictory attitudes of scientists on this subject. In the EU countries, which allow the sales of GMO, labeling is required so that consumers can have the knowledge that they are buying a product with a GMO or not. In Serbia, the Law prohibits the production and marketing of GMOs. For

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the purposes of this paper, a survey was carried out among 63 respondents - agricultural producers from Vojvodina. Their attitudes range from never to produce GMOs because they know their harmful consequences, to those who would produce them if it is legally allowed and if the desired income and yield could not be achieved by the production of traditional products. The research has shown that agricultural producers in Vojvodina do not have detailed knowledge about the production and effects of GMO production, which is why they need to be offered additional education, which will enable them to learn about the advantages and disadvantages of GMO production. The contribution of this paper is that it showed that the GMO is actually a patent for the exercise of all proprietary rights, as well as the right to prohibit the use of one's own seed for the next planting, insufficient knowledge of GMO farmers in Vojvodina, and that, in the next period, this topic must be given due attention and further research.

### **Definitions of GMO**

There are numerous ways of defining and explaining genetically modified organisms (GMOs). Genetically Modified Organisms are organisms created by the use of genetic engineering techniques in laboratory conditions, using the recombination of deoxyribonucleic acid (DNA) and the direct injection of nucleic acids into cells or organelles (Manojlovic, 2012). This experimental technology combines the DNA of different species, creating unstable combinations of plant, animal, bacterial and viral genes that do not occur in nature. Genes are parts of molecules of deoxyribonucleic acid that produce a specific protein.

Genetically modified organisms in the field of plant production are agricultural plants that are newly produced plants through biotechnology, which are used for animal nutrition, through the food chain and for human consumption. (Ostojic, 2012). Plants are modified in laboratories to obtain the desired properties such as better resistance to herbicides or to increase the nutritional value of the plant. Traditionally, plants with outstanding characteristics such as higher yield or resistance are obtained by crossing, but among related species.

Genetically modified organisms are organisms that contain one or more genes that are introduced in the artificial manner and in laboratory conditions from another related, non-related or distant species (Trkulja et al., 2014).

The main objective of the application of genetic engineering in plant breeding is the same as with conventional methods with the desire to obtain improved properties (Skoric, 2006). The conventional method involves transferring genetic material sexually between individuals of the same or very close plant species, and the molecular biotechnology method transfers one or more desirable genes from any evolutionary category to the same or another category of organism, thus actually creating the genetically modified organisms (Konstatinoy, Mladenović-Drinić, 2006).

There are numerous problems with genetically modified organisms (Šavarlić, 2014) that consist of crossing the genes of one species with the genes of plants and animals of the

other species (bacteria with corn, a spider with a goat, a tomato with a fish, ..), and in the future very likely with man (pigs with a man - in order to obtain such “humanoid pigs” that would be used to transplant organs in human operations. GMOs are programmed to produce insecticides themselves (e.g. GM corn) and thus kill not only harmful insects but also useful ones, such as bees, or to be resistant to total herbicide (e.g. GM soy) that destroys all flora and fauna on treated areas except the treated plants (Ševarlić, 2014). The results and nutritional studies of experimental GMO animals show extremely poor results for the health of these animals (Ševarlić, 2014).

Common to all the foregoing definitions is that genetically modified organisms are organisms whose genome is modified, in the same way that it would never happen naturally, or in classical breeding. In genetically modified organisms, the host gene has been altered by genetic constructions of distant or completely unrelated species. In this way, natural boundaries are reversed and natural heritages are changed. Thus, this method of creating a GMO is dangerous for the future of all species and even for the overall life on the Earth.

## **Historical development of genetically modified organisms**

### *The concept and the emergence of genetics*

Genetics is a scientific discipline that has evolved from biology, and its etymological name derives from the Greek word ‘gene’, which, in translation, means ‘to give birth’, that is to say that genetics is a scientific discipline that studies the inheritance and variations in living organisms. Gregor Mendel, a priest from Brno, contributed significantly to the development of genetics. In 1865, he crossed various pea varieties and assumed that there were certain units that were passed from generation to generation. In this way, he set the basic laws of inheritance. In 1869, a Belgian, F. Mischer, quite accidentally discovered deoxyribonucleic acid. Although these two discoveries at the time remained unnoticed, during the twentieth century they laid the foundation of modern genetics.

### **Further development of genetics**

Further development of genetics was influenced by Griffith, Avry, McLeod and McCarthy, who showed that hereditary changes in the bacterium of streptococcus were due to DNA. The theory of “one gene-one enzyme” was very significantly contributed by Beadle and Tatum (Dimitrijević, Petrović, 2004).

In 1952, Hershey and Martaways, investigating the Escherichia coli and T2 virus, proved that the DNA is the carrier of hereditary properties (Dimitrijević, Petrović, 2004).

On February 28, 1952, Frensis Creek announced that the secret of life was discovered by discovering the structure of DNA, (Dimitrijević, Petrović, 2004). This discovery is a crucial moment that laid the foundations for the further development of molecular genetics.

The last decade of the last century was a decade of commercialization of genetically modified organisms, especially in agriculture. In addition to commercialization in agriculture, genetically modified organisms were also used in medicine but with less success and in the year 1997 in the Roslin Institute of Edinburgh lamb Dolly was cloned, which represented the first cloning of a mammal.

### **Research: Financing Genetically Modified Organisms in Iraq and Law-Decree No. 81**

Numerous local wars in the organization, or with the direct involvement, of great powers, in essence, always result in the economic exploitation of small but rich countries.

US President George W. Bush said, when US forces were entering in Iraq, that the US was in Iraq to sow the seeds of democracy in order to flourish and expand in the area of authoritarian regimes (Engdahl, 2005). This thought was interpreted, and later really carried out in wars in Egypt, Libya, Syria, but US President George W. Bush, recounting the aforementioned thought, did not mean the overthrow of authoritarian regimes and the establishment of democratically elected governments, but as it turned out, he meant the seed of genetically modified organisms.

The full power in Iraq, political and economic, was taken over by Paul Bremer III, who was appointed the Coalition Provisional Authority (CPA). Under his leadership, 100 different economic laws were enacted that came into force in 2004. Analyzing the content of the adopted laws of the decree, the former chief economist of the World Bank and the winner of the Nobel Prize for economics, Joseph Stiglitz, said that they were an even more radical form of “shock therapy” than those imposed on countries that were parts of the Soviet Union (Engdahl, 2005).

Spreading the seeds of genetically modified organisms in Iraq is governed by Decree-Law No. 81. named: “Patent Law, Industrial Design, Classified Information, Integrated Circuits and Plant Types” (Engdahl, 2005).

In this decree, among other things, it is stated that the patent owner is guaranteed the right to prohibit the production, exploitation, application, attempt of sale, sale and import of products produced on the basis of the patent, that the registered patent is valid for 10 years and that it is forbidden for farmers to use the plant seeds of protected crops preserved from the previous harvest as well as the seed of any other crop, (Engdahl, 2005).

Some believe that Monsanto company directly influenced and wrote the definition of the provision of this law - the decree. This decree also unambiguously shows that funding for GMO production will be at the expense of those sowing these products.

### **The role of Monsanto in the financing and production of GMOs and pesticides**

The most famous representative of GMO and harmful pesticides is Monsanto. The first products of Monsanto were additives of food products such as artificial saccharin, caffeine and vanillin.

In 1976, Monsanto produced and marketed the Roundup, which became the trademark of Monsanto. In 1994, Monsanto produced the first biotechnological product called Posilac, bovine somatotropin (BsT or BST). In 1996, Monsanto placed a genetically modified soybean (Roundup Ready Soybeans) resistant to herbicide Roundup. In the same year, he also placed genetically modified cotton (Bollgard), which is resistant to insect pests. A year later, he placed the seeds of genetically modified corn (YieldGard Corn Borer), which is resistant to insects. In the same year, Monsanto modified the seeds of canola that are resistant to herbicide Roundup as well as Roundup Ready Cotton, which is also resistant to herbicide Roundup.

According to Monsanto's 1998 Vice-President, the company does not guarantee the food safety it produces, as its goal is to increase sales, and the FDA's task is to control security. This, in fact, means the total neglect of human health, and that the main goal is profit (Engdahl 2005).

In September 2016, the pharmaceutical company Bayer bought Monsanto for \$ 66 billion, with each share of Monsanto being paid at \$ 129, which is a 22% of the company's stock price.

**The price at which Monsanto was purchased amounted to 175% of the GDP of Serbia in 2016, which amounted to 37,740,000,000 US \$ (SORS 2017).**

There are numerous criticisms on Monsanto's account. Thus, in her study, The World According to Monsanto, Marie-Monique Robin (2009) says that this company does not mention any high-toxic products that have acquired tremendous wealth, or the carcinogenic substances that are destructive to both humans and the environment for decades since they leave long-lasting effects on several generations and cause problems with reproductive organs and sterility. The most important harmful pesticides are:

Polychlorinated biphenyl (PCBs) is a chemical compound over which Monsanto has a monopoly, and it has been placed in Europe under different names. This substance is very dangerous because it is carcinogenic, it does not decompose, it accumulates in the tissues of living organisms through the food chain, where it is permanently deposited. This product was first synthesized in America in 1925, and due to its toxicity was banned in 1977. The use of this product in Europe was banned in 2001 (Gavrančić, Skala, 2000).

Dioxin is a group of toxic chemical compounds which possess chemical elements such as carbon, hydrogen, oxygen, chlorine, and contain some polyhydride biphenyl. The most dangerous and poisonous so-called TCDD, which is one component of the herbicide Agent Orange used by the US in the war in Vietnam, which is produced by Monsanto. It is estimated that about three million Vietnamese people were exposed to this herbicide, and that 400,000 of them were killed and between 150,000 and 400,000 children were born with various defects. This compound also had negative consequences on US soldiers. After leading and ending a court dispute against the manufacturers of these compounds, seven companies paid \$ 180,000,000 for the damage, of which Monsanto paid 45.5% (Robin, 2009).

Roundup is a herbicide that Monsanto patented in 1969 and which is widely applied by ordinary farmers and growers of flowers considering it completely harmless. However, it has been shown that this herbicide adversely affects the health and environment of a person because it causes disorders in the reproductive system. By using this plant-protection herbicide, it easily enters the feeding chains of humans and animals. French molecular biologist Seralini conducted a research in laboratory conditions and found that GM corn treated with Roundup causes cancer and other disorders in laboratory animals. His study in 2012 indisputably demonstrated that Roundup and GMO cause damage to the liver and kidneys in laboratory rats and lead to tumors (Seralini 2012). This study was the first study the results of which were derived from the long-term feeding of laboratory animals (mice) with GMO corn NK 603. In some mice fed with corn NK603, tumors developed to up to 25% of their total weight. These results were reaffirmed in 2014 and published in the scientific journal *Environmental Sciences Europe*.

Bovine Growth Hormone is a hormone that illuminates the pituitary of a cow and which facilitates the production of milk. The consequence of the entry of this modified hormone in cows is sterility, fetal deformity and udder inflammation. Milk cows which this modified hormone was injected into developed breast, prostate and colon cancer (Radoničić 2015).

### Field survey of entrepreneurs in Serbia

If we look at the areas of agricultural land in Serbia, then we can certainly say that Serbia is an agrarian country. Namely, 58% of the total area of the Republic of Serbia is agricultural land (CIA. Gov.).

**Table 1.** Overview of used agricultural land in Serbia

Republic of Serbia	Int total	Family farms	Legal persons and entrepreneurs
	3,355,859	2,816,424	539,435
Serbia North	1,732,182	1,277,118	455,064
Belgrade	134,117	102,976	31,141
Vojvodina	1,598,678	1,174,142	423,923
Serbia South	1,623,678	1,539,306	84,372
Šumadija and West Serbia	975,672	941,359	34,313
South and East Serbia	648,006	597,948	50,948
Region of Kosovo and Metohija	-	-	-

*Source:* Statistical Office - Census of Agriculture 2012 in RS

In Serbia, the law prohibits the production and marketing of genetically modified organisms. In addition, 135 out of 169, or 80% of the entities within the Assembly of Cities and Municipalities adopted a declaration against the importation, cultivation, processing and trade of GMO and GMO products.

In order to assess the motivation of farmers for possible production of genetically modified organisms, for the purposes of this research a survey has been conducted in

which 163 farmers participated. It was carried out in direct association with agricultural producers called “100 paora plus”.

### Description of the sample

Sample coverage: 163 farmers. The total number of couples in this association was 224 out of which 61 did not want to participate in the survey or were not available. They process 156,000 ha. The analyzed 163 farmers cultivate 712,000 ha.

Geographic location of the respondents: the territory of Vojvodina (Banat, Backa, Srem)

Area of land under cultivation: 50 to 3,000 ha

Kind of culture that is sown: wheat, corn, soybean, sunflower

Survey type and method: By telephone - telephone conversation

The questions which the farmers answered:

How much surface area do they cultivate?

What kind of culture do they grow?

Are they satisfied with state subsidies?

Do they know what GMOs are?

Do they produce GMOs and if they do, which culture?

If Serbia allowed the production of GMO by law, would they produce GMO and why?

### Research results

**Table 2.** Land area treated by respondents

Surface area	> 50 ha	50- 200 ha	200-500 ha	< 500 ha
	12%	15 %	55%	18%

Source: field research by the authors

**Table 3.** The type of cultures that the respondents treat

Type of culture	Wheat	Corn	Soybean	Sunflower
	100 %			
	38%	21%	28%	13

Source: field research by the authors

**Table 4.** Attitudes of respondents regarding knowledge, production of GMOs and subsidies in Serbia

	Yes	No
Do they know what GMO is	100%	0%
Do they produce GMOs	0%	100%
Satisfaction with subsidies in the Republic of Serbia	0%	100%

Source: field research by the authors

All respondents said they knew what GMOs were, but most of them did not know the details of how GMOs were generated and what the possible dangers of using GMOs were.

None of the respondents said they would produce GMOs, stating that it was prohibited by law, although they had some knowledge that there was GMO production in Vojvodina.

Members of the Association “100 paora plus” were not satisfied with the subsidies of the Republic of Serbia, which amounted to 4,000 RSD per hectare.

**Table 5.** Attitudes of respondents on the production of GMOs if permitted by law

Would they produce GMOS in case of being permitted by law	Yes	No, Never	Maybe	Conditional
	68%	12%	9 %	11 %

*Source:* field research by the authors

This question gave the most interesting results.

Out of 163 respondents, 68% of them stated that they would produce GMOs in case of a law permit without any further consideration.

Of all the respondents, 12% of them said they would never produce GMOs. Out of these 12% who declared that they would never produce GMO, 80% were highly educated and graduated from the faculties of agriculture or agronomy. They were familiar with the negative and harmful phenomena resulting from the use of GMOs and therefore, there were no conditions that they produce GMOs. The remaining 20% were superficially familiar with the negative aspects of GMOs; they used their own production for personal nutrition and therefore did not want to “poison” themselves or anyone else.

Out of all respondents, 9% of them did not explicitly say whether they would produce GMOs. These respondents knew that there was a potential possibility of the negative consequences of the use of GMOs. Only as a last resort, if there were no conditions to achieve yield and revenue from traditional production, they would be in favor of GMO production.

A very interesting group of respondents (11%), which would not produce GMOs, but if all the others did, they would do it too. In fact, their motive was income and yield, that is, if their neighbors were to generate higher income and yield with the same costs, then they would also opt for the production of GMOs.

**Table 6.** The views of the respondents for the production of GMOs in the event of a permit by the Law

Why should they produce GMOs if allowed by law?	Lower costs	Higher yield	If America can do it so can I	If others do it so will I
	38%	21%	28%	13 %

*Source:* field research by the authors

From the previous table it is visible that 68% of 163 respondents would produce GMOs if allowed by law. However, these respondents had different reasons for doing this.

Of these respondents, 38% think that GMO production is realized with lower costs, and less work (one to two sprays and no more), higher yields and revenues can be provided. They believe that negative elements of GMO are not harmful because Americans use such products.

Of the respondents who declared to produce GMOs, 21% believe that GMO production will generate higher yields. In fact, they mistake yield with income. Namely, they consider that they will achieve higher yield per hectare due to less damage from various diseases, and at the same time they will achieve higher income as they will reduce production costs (lower number of treatments). They do not go into the costs of seed procurement and the costs of pesticide procurement etc.

For the respondents who declared that they would sow GMO, 28% of them compare themselves with the USA farmers since they say that if the USA can do it why should not they as well. They believe that the production of GMOs due to the demands of large and powerful countries will not be able to stop at the borders of Serbia because Serbia is too small and poor.

Of these respondents, 13% do not really want to produce GMOs, but they say that if everyone does it, then they will do it, too. They cannot be different from others.

### **Discussion and conclusions**

So far, research has shown that there is no evidence that genetically modified organisms are harmless to human health, or there is no evidence that there is any risk of their use. A large number of researchers among the world-renowned scientists show that GMOs cause various diseases in animals that can be transmitted to humans via the food chain. Proponents of GMO production and marketing are multinational companies that produce seeds and pesticides necessary for the production of these organisms, and they are supported by some politicians. Since GMOs represent a patent, the producers of these organisms exercise their rights in accordance with patent rights, or according to the rules of intellectual property traffic. Many world researchers have proven the existence of the harmful effects of GMOs that come from the very nature of genetic engineering, which involves mixing the genes of plants and animals. A survey on a sample of 163 agricultural producers in Vojvodina shows that most of them would produce GMOs if there was no other solution for increasing yields and revenues. Research has shown that respondents have very modest knowledge about GMOs and therefore they have no knowledge that GMO seed trade is monopolistic. They also do not think that there can be an economic blockade when they will not be able to buy GM seed and pesticides, and they will not be allowed to sow their own seed. Since they do not have the help of cooperatives and other organizations to produce and market their products, it motivates them to produce what they can produce and market easily. Nevertheless, respondents consider that subsidies and better sales organization can achieve satisfactory revenues and yields even with conventional production.

Bearing in mind the area of agricultural land owned by Serbia, the level and development of the domestic seed industry, the cost of procurement of seeds and pesticides for GMOs, and ethical, ecological and health reasons, the Republic of Serbia has no reason to amend the Genetically Modified Organisms Act to permit the production and marketing of these organisms. The production and trade of GMOs in Serbia would cause irreparable damage because domestic production of seeds, planting material and breeding cattle would disappear. The results of this study and experimental research clearly show that there are very clear risks from the use of items of food containing GMOs. GMO easily comes to the human diet through the food chain of animals. Due to all this, in the following period, it is necessary to pay great attention to this topic by continuing further research on the attitudes of farmers and the medical professionals, then paying due attention to educating farmers and researching the impact of GMO on the health of humans and animals.

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## FINANSIJSKI I PROIZVODNI ASPEKTI GENETSKI MODIFIKOVANIH ORGANIZAMA

*Milan Beslać, Goran Ćorić,*

### Summary

*Svrha i cilj ovog istraživanja je da se najširoj zajednici, a posebno poljoprivrednim proizvođačima približi problem finansiranja uzgoja i prometa GMO i problemima sa kojima se Srbija suočava u procesu pridruživanju EU.*

*U radu je korišćen eksperimentalni metod, metod analize, sinteze, indukcije i dedukcije, a prikazani su rezultati istraživanja koji su dobijeni anketiranjem 163 poljoprivrednika iz Vojvodine. Glavni rezultati ovog istraživanja pokazuju da bi, ukoliko zakonom tako bude regulisano, većina poljoprivrednih proizvođača pristala da proizvodi GMO, ali samo ukoliko se ne stvore uslovi da im tradicionalna proizvodnja ne obezbedi prihvatljiv prihod i prinos. Doprinos ovog rada je u tome što je pokazano da GMO jesu takvi organizmi koji se u prirodi nikad ne bi stvorili i da oni u stvari predstavljaju patent određenih organizacija. Isto tako pokazano je da postoji potreba za informisanjem i obrazovanjem poljoprivrednika iz oblasti GMO kao i potreba za dalje istraživanje ove teme.*

**Key words:** Finansiranje GMO, DNK, Raundap, Genetski inženjering.

**JEL:** G24, Q19.

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## THE EFFECTS RESULTING FROM THE APPLICATION OF THE CONCEPT OF THE SUSTAINABLE DEVELOPMENT OF RURAL TOURISM ON STARA PLANINA

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### Abstract

*The development of rural tourism on Stara planina (Old Mountain) has a positive impact on the economic development of the local communities in the area. However, if an adequate program of the sustainable development of tourism on Stara planina were made, that would also have positive effects as an accompanying factor contributing to the development of rural tourism. In particular, the results would show that there is a need for the preservation of the quality of the environment and the development of all resources, especially with respect to the realization of an economic profit. The aim of the paper is to detect the extent to which the effects arising from the development of rural tourism depend on the implementation of the program of the sustainable tourism development of the mountain. The method that makes the realization of a causal connection between these two phenomena possible is the linear regression analysis. The purpose of the regression analysis is to determine the shape of such a connection, i.e. the dependence between the observed phenomenon, by applying a mathematical formula and a range of corresponding assumptions. Therefore, it best describes the quantitative relationship between the variation in the observed phenomenon of reality, as well as the agent that serves to evaluate the predictive value and the dependent variable against the desired value of the explanatory variables or the effects resulting from the development of rural tourism on Stara planina.*

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**Key words:** *Stara planina, rural tourism, development effects, sustainable development*

**JEL:** *Q10, Z30, Z32*

## Introduction

The rural areas still account for a significant part of the territory of the Republic of Serbia - namely 85% (Bogdanov, 2007) and quite a substantial part of the Serbian population still lives there – 42%. Therefore, the issue of rural development and the welfare of the rural population is one of the main issues of the overall sustainable development of the Republic of Serbia. The rural areas are being seriously faced with a large number of problems, such as strong depopulation, economic underdevelopment, growing poverty and generally unfavorable conditions for life. In the past few decades, rural tourism, as well as commercial tourism, has been accompanied by many environmental, social and cultural undesired consequences; thus, there is an imposed need for the framing of this activity by applying the concepts of sustainable development. Although the modern world is faced with responsibility and the awareness of the fact that the planet must be preserved for the present and future generations, it is necessary to reconcile human needs with the preservation of nature, because it is the obligation of the present generation to leave a chance to posterity, at least to the extent that they themselves have had.

The current generation has the right to resources and a healthy environment, but it must not compromise the same rights for generations to come (Markovic, Pejanović, 2012; Jovicic, 2002). Sustainable tourism means an industry that has a minimal impact on the local culture and environment, which simultaneously promotes the creation of new jobs, the earning of adequate wages and the protection of ecosystems, (<http://www.logos.org.rs>). There is no single definition of the sustainable development of rural tourism; it can, however, be said that the sustainable development of rural tourism implies the observance of the general principles of sustainable development and ethical changes with all the participants in the tourism process. Although the concern for sustainable development is regularly presented as the foundation of the modern planning and management of tourist destinations, the question of how it is applied in practice is regularly raised (Ruhanan, 2012).

In Johannesburg in 2002, Serbia set sustainable tourism as an example of sustainable development, i.e. it presented tourism based on the concept of sustainable development (Zivkovic, 2013). According to Zivkovic, the goal of the program is to develop the legal and policy frameworks in order to support the diversification of the rural economy through tourism and to contribute to achieving the Millennium Development Goals at the national level, better connections and the organization of rural tourism by improving the capacity of local actors to provide services and production in accordance with the national strategy at the local level.

## Literature Review

In managing the sustainable development of rural tourism, tourism organizations play a very important role since their basic task is to foster co-operation among rural tourism actors in different destinations (Pechlaner *et al.*, 2012). The introduction of external control and the management of tourist facilities in registered destinations also play an important role in local socio-economic development (Akama, Chieti, 2007). When the family households engaged in rural tourism are concerned, there is a need for such cooperation, as well as the creation of a partnership network, which is certainly an interesting phenomenon, because this form of cooperation is far more effective than the traditional application of the consortium. In this way, there is a popular phenomenon known as the “integration flock”, which is an extremely important resource when the development of rural tourism is in question (Krajnović *et al.*, 2011).

The appearance of a distance in cooperation observed between individual family households and the relevant Ministry may serve as a guide to the state-level institutions that, using modern management tools and modern technology, connect with family households so as to be better acquainted with their development problems (Cawley, Desmond, 2007).

It is noted that such a significant form of cooperation exists with the institutions at the local level; it is weaker with those at the regional level and the weakest with the institutions at the level of the state (Clarke, 1996). This finding is consistent with the guidelines for the development of rural tourism and it is defined by the Directives of the European Commission (IQM) model, where the word about the strategic planning and overall management of the development of rural tourism, as well as the other forms of tourism, must come from the base or the local communities where rural tourism is being developed (Gilbert, 1989). The sustainable development of rural tourism is now an effective tool for the development of local communities; however, the tourism industry very often has no significant role at all in all of this (Akama & Chieti, 2007).

Today, modern tourists are viewed as the whole chain of the entire tourist offer, from the moment of booking tickets to their returning home. It is, therefore, necessary to introduce the concept of the TQM (Total Quality Management) as a management tool, which would be an imperative of modern business. One of the suggestions in this case was the construction of the appropriate facilities that, together with natural and cultural resources, represent the key attractions and improve the quality of tourists’ stays in the country (Cvijanovic, 2014).

The development of the programs of the sustainable development of rural tourism on Stara planina and the general tourist offer, which would provide a wide range of diverse content, should certainly be implemented in order to meet tourists’ needs. In this context, it is necessary that aggressive marketing, advertising and market performance should be implemented in order to set the goal and make both domestic and foreign tourists become familiar with the outstanding natural beauty offered by rural tourism on Stara planina. The aggressive marketing policy oriented towards the development of

this type of tourism must be consistent with the implementation of the design ideas of the tourist offer in general (Scheyvens, 2007) because tourist propaganda is one of the instruments of the tourism policy, applied in order to achieve certain goals. In that way, there would certainly be an increased fluctuation of tourists as a result of the propaganda policy, which in this case is a potential engine for the economic development (Brown, Hall, 2008) of the rural areas on Stara planina. In the opinion of the majority, the task of the local governments, as well as that of many tourist organizations and the non-governmental sectors, was to be maximally involved in this industry not only as the actors, but also as the backing bearers of the activities of propaganda. The members of the rural households that would be included in tourism, together with the accompanying infrastructure and the related activities, do not have to look for additional jobs outside their place of residence. The modern management of the household can strategically allocate the existing capacity with the aim of meeting tourists' current and future needs (Scoones, 2009; Biddulph, 2015).

The development of rural tourism on Stara planina also implies making the rural areas closer to the local community in order to protect the living environment. The strengthening of human resources in the tourism industry is also an important strategic direction in the development of rural tourism on Stara planina. The basic characteristic of employment in the tourism sector is the need for a large number of unskilled or semi-skilled, seasonal workers because there is a great need for the jobs that do not require professional qualifications. On the other hand, such a low qualification structure shows that it takes a relatively little time for their professional training and development.

Human resources in rural tourism are characterized by a high level of the age structure of the employees. Simultaneously, it reflects the state of the economy and society because all those who cannot follow the trends of modern knowledge and education are left without work engagement in other activities and, in this way, they seek salvation in the tourism industry. On the other hand, rural tourism also requires dynamism, enthusiasm and professional young people ready to respond and adapt to every challenge. The positive perception of a tourist destination and the tourist's pleasant first impression can only be encouraged by young people, those who are ambitious, professional, knowledgeable of several foreign languages and who have all the relevant information necessary for tourists.

The favorable geographical position of *Stara planina* provides recognizable importance for the development of rural tourism on the mountain, with the goal of the further economic and ecological development of the rural area and the local community. Organizing natural and cultural heritage into one territorial system is one of the factors that drive the development of a region through achieving integration between culture, the environment, characteristic and sustainable development, where the dynamic and long-term effects of an action taken by institutional organizations can effectively manage the development of rural tourism and the natural environment (Mitchell & Ashley, 2010). The development of agriculture, as an important part of the regional economy, is very important because healthy agricultural households can respond to the tourist demand

related to rural tourism. Promoting agricultural products in direct contact with tourists may not guarantee a direct economic benefit, but it does certainly provide a basis for comparing the prices and the quality of agricultural products to other rural destinations (Gibson, 2009; Lacher, Nepal, 2010; Sharpley, 2002; Walpol, Goodwin, 2000). This leads to the improvement of economic conditions and the development of the economic and non-economic activities that meet the tourist's needs, simultaneously being the key challenge for tourism service providers in rural areas, i.e. in small rural communities (Zapata *et al.*, 2011).

### **Research Materials and Methods**

The aim of this paper is to determine the extent to which the realization of a program of the sustainable development of the tourism of *Stara planina* depends on the effects of the development of rural tourism. The research study was carried out in the territory of Eastern Serbia, in the region of the foothills of *Stara planina*, in the period from April 15, 2017 to May 15, 2017. The research was done anonymously and the questionnaires were used as the research tool, the number of the validly filled ones being 250. The proposed effects that would result from the realization of the programs of the sustainable development of the tourism of *Stara planina* are as follows:

- The preservation of the quality of the environment and all the developmental resources.
- Making economic profits.
- The preservation of the social integrity of the local community.
- The preservation of the affirmation of the cultural integrity of Stara planina.
- Increased employment in the tourism sector.
- The preservation of the rural environment and the cultural heritage.
- Motivating the local population to stay in the countryside.

A five-step Likert scale was applied to the gradation of the received responses and the data processing was carried out by applying the SPSS 23.0 software package. Based on the data obtained from the conducted descriptive analysis, the determinants are defined as the survey segments. Therefore, several variables are aggregated into one single determinant that is the bearer of all of the information related to the responses of each survey segment using the arithmetic mean derived from the data on the same scale of measurement. In this way, we now obtained the descriptive statistical parameters that explain the form, the distribution and the heterogeneity/homogeneity of the data. This is a quantitative continuous random variable – the determinant, which was subject to checking whether that the same belongs to the normal distribution of the random variable. This check was performed by the application of the universal Kolmogorov-Smirnov statistical test.

After the said test had been applied, the new random variable-determinant was found not to fulfill the regularity of the random variable distribution, so it was necessary to

apply one of the basic transformation methods, the so-called “degree” transformation, after which the complete analytics and exploration for the so-called transformed random variable-determinant was repeated.

High heterogeneity was eliminated by the data transformation, so the determinant took on the appearance of the so-called Gaussian bell, as can be seen from the following tables and charts.

**Table 1.** The descriptive statistics of the determinants of the sustainable development of the tourism program of *Stara planina*

Descriptive statistics		Statistics	Post-transformation statistics	
Program of the sustainable development of the tourism of <i>Stara planina</i>	Arithmetic mean	3.7592	14.6074	
	95% average trust interval	Low	3.6806	14.0627
		High	3.8377	15.1521
	Average mean	3.9216	15.3787	
	Variations	0.478	22.983	
	Standard deviation	0.69114	4.79410	
	Minimum	1.37	1.88	
	Maximum	4.90	24.03	
	Asymmetry	-0.940	-0.039	
	Equalization	0.746	-0.383	

Source: Author’s calculation based on the survey data

Table 1 reveals the fact that the average value of the determinant is 3.7592, where the confidence interval ranges from 3.6806 to 3.8377, with the standard deviation of less than 1, thus indicating the moderate heterogeneity of the data. The average minimum value is 1.37 and the maximum is 4.90. The coefficient of the spinning asymmetry partially increased, as can be seen on the chart of the normal distribution of the frequency of the branch-sheet model, Fig. 1.

The normality test (Table 2) verified the validity of the results of the sustainable development program, where, based on the obtained results presented in the table, it was noted that the legality with respect to the parametric statistical tests had not been fulfilled. After that, the degree of transformation was established as the first and basic transformation, where a new determinant with the average value of 14.6074 was obtained in that way, within the confidence interval ranging from 14.0662 to 15.1521, the standard deviation being 4.79410, where the values of the asymmetry were reduced, which fulfills the lawfulness for the parametric statistical tests. The graphs in Figure 1 show that the obtained results are arranged according to the Gaussian curve.



**Table 3.** The correlation coefficients between the effects of the development of tourism on Stara planina and the programs for the sustainable development of rural tourism

Simple linear correlation	Determinant coefficient	Fixed determinant coefficient	Standard deviation
0.478	0.229	0.226	3.95653

*Source:* Author's calculation based on the survey data

Table 3 clearly states the simple linear correlation coefficient as the relative measurement (0.478) that indicates a certain positive link between the variables. The determination coefficient is 0.229 and the fixed determination coefficient is 0.226. The surging effects of the development of rural tourism are somewhat dependent on the realization of the program of the sustainable development of the tourism of Stara planina and in this case it is 23%. Whether this is a significant indicator or not can be concluded from the following table. The standard error of the assessment for the tested variable is smaller than the sample error, which is indicative of the fact that there is a justification of the given model.

**Table 4.** The justification of the regression model via the Anova test

Justification of the model	Square amount	df	Square average	F test	Deviation probability
Regression	1384.137	1	138.137	88.420	0.000
Residual	4664.931	298	15.654		
Total	6049.068	299			

*Source:* Author's calculation based on the survey data

Table 4. accounts for the variability explained by the justified determinant, which is statistically significant, which is confirmed by the statistical F test.

**Table 5.** The statistical parameters of the regression analysis of the sustainable development program

Statistical parameters of the model	Non-Standardized coefficients		Standardized coefficients	t	Deviation probability
	B	S.D	Beta		
Intercept/Constant	8.292	0.734		11.303	0.000
Inc. Sust. Dev.	0.449	0.048	0.478	9.403	0.000

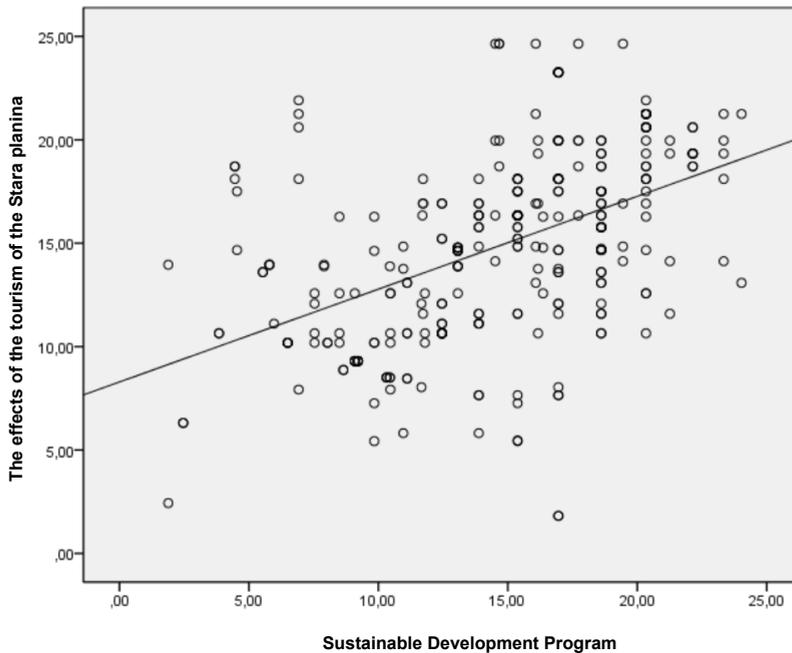
*Source:* Author's calculation based on the survey data

Based on Table 5, a conclusion can be drawn that the intercept of the regression line is statistically significant based on the t test and the probability of a deviation is far less than 0.05. The positive incline (the sustainable development of the tourism of Stara planina) is also statistically significant with respect to the effects surging from rural tourism, which is also visible on the scatter diagram below. Namely, we can ascertain

that the program is highly significant because not only by producing it, but also by having the same implemented a rise in the effects surging from the development of the tourism of Stara planina will be achieved.

The scatter diagram (Figure 2) indicates the existence of a quantitative accordance between the variations of the observed appearances. Namely, by the implementation of the program, the effects of the development grow, which confirms the existence of a direct link between the observed appearances.

**Figure 2.** The scatter diagram for the program of the sustainable development of the tourism of Stara planina



*Source:* Author's calculation based on the survey data

## Conclusion

The development of the rural tourism of Stara planina (Old Mountain) depends on many factors that might have an influence in different ways. The surging effects of rural tourism are: the quality preservation of the environment, higher employment in the tourism sector and, therefore, the preservation and achievement of an economic profit and local social integrity. The improvement of tourism development is measured by those same effects and, therefore, their realization requires the drafting of a program of the sustainable development of Stara planina, according to the survey conducted among the people from within the region, as rural tourism is an adequate alternative to mass tourism primarily because of the fact that it is focused on attracting tourists who want to spend their time in nature. Based on the indicators obtained by the statistical test, as the scatter diagram shows, a fact can be established that the program of the sustainable development of the

tourism of Stara planina is highly significant, because only the very drafting of the same, as well as its implementation, would lead to an increase in the effects that are created by development of rural tourism on Stara planina. The positive inclination of the regression line is indicative of the fact that there is an interdependence between the effects created by the development of rural tourism on Stara planina and the program of the sustainable development of the tourism of Stara planina.

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## EFEKATI KOJI NASTAJU PRIMENOM KONCEPTA ODRŽIVOG RAZVOJA RURALNOG TURIZMA NA STAROJ PLANINI

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### Sažetak

*Razvoj ruralnog turizma na Staroj planini pozitivno utiče na ekonomski razvoj lokalnih zajednica u tom području. Međutim, sa adekvatnim programom održivog razvoja turizma Stare planine nastali bi i pozitivni efekti kao prateći faktor razvoja ruralnog turizma. Posebni bi rezultati pokazali kod Očuvanje kvaliteta životne sredine i svih razvojnih resursa, a naročito ostvarenje ekonomskih profita. Cilj rada je da detektuje u kojoj meri od realizacije programa održivog razvoja turizma Stare planine, zavise efekti koji nastaju razvojem ruralnog turizma. Metoda koja omogućava da se ostvare uzročno-posledične veze između ovih pojava je linearna regresiona analiza. Svrha regresione analize je utvrditi oblik veze, odnosno zavisnost između posmatranih pojava kroz matematičku formulu i niza odgovarajućih pretpostavki. Zbog toga ona najbolje opisuje kvantitativnu zavisnost između varijacija posmatranih pojava u realnosti kao sredstva koje nam služi da se ocene i predvide vrednosti zavisne promenljive za željene vrednosti objašnjavajuće promenljive, odnosno efekata koji nastaju razvojem ruralnog turizma na Staroj planini.*

**Ključne reči:** *Stara planina, Ruralni turizam, efekti razvoja, održivi razvoj*

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## FOOD SAFETY AND QUALITY POLICY IN THE REPUBLIC OF SERBIA<sup>1</sup>

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### Summary

*Food safety and quality have a decisive impact on the placement of agro-food products on the domestic and world market. In the sector of agriculture and food industry in Serbia a range of public and private standards, mandatory and voluntary is applied, covering the different stages of the supply chain and different levels of communication (with business partners or consumers). However, still a small number of primary agricultural producers are certified to Global G.A.P., organic production and products with a geographical indication. A better situation is in food processing industry and export. Many of food processors, especially suppliers of global retail chains are, in addition to HACCP, certified to ISO (9001, 22000) and exporters to BRC and IFS standards. The loss of the market due to failure to respect the safety standards and product quality is a real danger, which must be averted by an active state support policy.*

**Key words:** *standardization, certification, competitiveness, food safety and quality*

**JEL:** *Q02, Q13, Q17, Q18*

### Introduction

Consumer demands for safe and quality products produced by sustainable production methods in an environmentally-friendly and ethically acceptable way are increasingly rigorous. Food safety and quality have a decisive impact on the competitiveness of the agricultural and food sector in the domestic and global markets and are the foundation of a good business reputation for manufacturers, processors and retail chains, especially those that manage food supply chains and develop their own brands.

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International supply chains place great obstacles in the path of information transfer, local autonomy, local systems standards and incompatible operating procedures (Houlihan, 1985). Standards play an important role in directing and coordinating the production, trade and consumption of food in the context of globalization (Bain et al., 2013; Beghin, 2014).

In addition to producing standardized products for the mass market, global retailers and processors also enter the production of value-added products for niche markets (Roth et al., 2008). This reduces the transparency of production practices, but also increases the possibility of placing these products through retail chains. Engagement in certification, promotion and quality control requires the linking of business entities in the chain and contributes to the improvement of production and income of small agricultural producers (Popović et al., 2009; Qaim, 2017).

Serbia has favorable natural conditions and tradition in the production of a wide assortment of agricultural and food products in conventional and organic production systems, as well as food production with geographical origin (Popović et al., 2011; Katić et al., 2010). By entering global retail chains into the domestic market and concluding a free trade agreement with the most important trading partners, significant market potentials for these products have been created (Popović, Grujić, 2014).

Standards are used as a basis for building consumer confidence, entering the market and developing new products and markets (Bain et al., 2013). Case studies confirm that the contribution of standards to the company's gross profit varies between 0.15% and 5% of annual sales revenue (ISO, 2014).

Public standards are embedded in legislation and may be mandatory, such as basic food safety and quality standards or voluntary, such as organic and geographical indication (GI) standards. Private standards, developed by commercial or non-commercial private entities, including firms, industry organisations, nongovernmental organisations, etc., are referred to as private voluntary standards. There may also be overlap between public and private standards where public regulations incorporate private standards and conversely, where private standards incorporate public standards (e.g. public food safety standards are often incorporated into private food safety certification systems) (Bain et al., 2013; Henson, Humphrey, 2010).

In Serbian agribusiness, a series of public and private standards, mandatory and voluntary are applied covering different stages of the supply chain and different levels of communication (with business partners or consumers) (SEDEV, 2012).

### **Basic food safety and quality standards**

The largest number of basic food safety and quality standards is formulated by international organizations, such as the CODEX Alimentarius Commission (CAC) and UNECE. CAC standards of food safety and quality, although voluntary for Member States, are most often used as a basis for the adoption of national regulations, as recommended by the WTO. The reference made to Codex food safety standards in the World Trade Organization's

Agreement on Sanitary and Phytosanitary measures (SPS Agreement) means that Codex has far reaching implications in trade disputes (Codex Alimentarius, 2017; Beghin, 2014). The UNECE quality standards provide common terminology and harmonized quality requirements to facilitate fair trade and increase transparency in the markets. UNECE standards also have the status of recommendations for national legislation and comply with WTO Agreement on Technical Barriers to Trade (UNECE, 2015).

According to the Law on Food Safety (Official Gazette of the RS, No. 41/2009), for the purpose of food and feed safety, measures based on scientific principles, international standards, guidelines and recommendations are applied to the extent necessary to protect life and health, and in a way that does not constitute a hidden restriction on foreign trade. Food and feed imported into the Republic of Serbia for the purpose of placing on the market must meet the requirements in accordance with the food regulations or the conditions recognized by the Republic of Serbia as identical to them or if there is a special international agreement, the conditions of that agreement. Food and feed for animals exported or imported for export from the Republic of Serbia must meet the requirements in accordance with food regulations, unless otherwise requested by the competent authorities of the importing country or unless otherwise determined by the regulations, standards and practice codes which are in force in the importing country<sup>5</sup>.

The Law on Food Safety prescribes the obligation to establish a food safety system at all stages of production, processing and trade in food, except on the level of primary production in accordance with the principles of good manufacturing and hygiene practice and Hazard Analysis and Critical Control Points (HACCP)<sup>6</sup>. Within the framework of pre-accession obligations, harmonization of domestic legislation in the field of food safety with EU *acquis communautaire* is being carried out, and the achievement of full compliance is expected in 2018.

There is no single legal framework in the Republic of Serbia for regulating the market for agricultural and food products. Some of the market regulation measures, such as market standards, exist but are not compatible with the EU *acquis*. The adoption of the Law on organisation of market of agricultural and food products will ensure partial compliance with Regulation (EU) 1308/2013 on the establishment of a common organization of the market for agricultural products (including market standards)<sup>7</sup>, while full compliance is expected after gaining EU membership (KEI, 2016).

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5 Owing a GOST-R certificate is a condition for placing agricultural and food products on the Russian market (TIK RF, 2017).

6 HACCP standard provides a systematic preventive approach to food safety.

7 EU public marketing standards enable the market to be easily supplied with products of a standardised and satisfactory quality, and in particular relate to technical definitions, classification, presentation, marking and labelling, packaging, production method, conservation, storage, transport, related administrative documents, certification and time limits, restrictions of use and disposal (Reg 1308/2013). Evaluation of marketing standards is planned for 2017/2018 (EC, 2017).

## Public Voluntary Food Quality Standards

In 2015, Serbia had 334 *certified organic producers* (with co-workers around 2,000) (Simić, 2017). Organic producers have favorable natural conditions for production and good prospects for placing their products, primarily on the EU and US market, but also on the domestic market (Belgrade, Novi Sad) (Filipovic et al., 2013; Simić, 2017).

Organic production in Serbia is regulated by the Law on Organic Production (Official Gazette of the RS, No. 30/2010) and the Rulebook on the control and certification of organic production and organic production methods (Official Gazette of the RS, No. 48/11, 40/2012). In May 2012, the Accreditation Body of Serbia (ATS) signed the Multilateral Agreement (LA) with the European accreditation organisation (EA) on recognising accreditations. In 2013, the European Commission placed the domestic control house Organic Control System (OCS) on the list of recognized equivalent control bodies. This enables the direct export of organic products from Serbia to the EU market without additional documentation and import licenses (Simić, 2017). Full harmonization of national legislation with the EU *acquis* in the field of organic production is expected until Serbia joins the EU (KEI, 2016).

Serbian farmers do not have possibility of *integrated production certification*<sup>8</sup>, such as farmers from countries in the region, who have adopted rulebooks on integrated farming with defined obligations of producers, technical and organizational conditions of production and rules of control, certification and product marking organization. Given the excellent natural conditions for integrated production, primarily fruits and grapes (Popović et al., 2011), the adoption of this regulation is of great importance for Serbian farmers (Subić et al., 2016).

According to World Intellectual Property Organization (WIPO, 2017a) *geographical indication* is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. Geographical indications are typically used for agricultural products, foodstuffs, wine and spirit drinks, handicrafts and industrial products. The Republic of Serbia has obligation to protect geographical indications in accordance with the Lisbon Agreement for the Protection of Appellations of Origin and their International Registration (Official Gazette of the FRY - International Treaties, No. 6/1998). Only two Serbian food products are in the international register of appellations of origin kept by the WIPO International Bureau – “Homoljski med” and “Leskovački domaći ajvar” (WIPO, 2017b).

The area of protection of geographical origin of agricultural products and foodstuffs is defined in the Law on Indications of Geographical Origin (Official Gazette of the RS, No. 18/2010). Full alignment of national legislation with EU *acquis* in this area is foreseen by the end of 2018 (KEI, 2016). According to the data from 2016, there are 36 agricultural

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8 No Community-wide regulation exists on integrated farming. The Framework Directive on the sustainable use of pesticides (Directive 2009/128/EC) only regulate the plant protection element of integrated farming, i.e. integrated pest management (IPM). National and regional authorities develop their own production and marketing standards (EC 2011). The harmonization of Serbian legislation with EU Directive 2009/128/EC is in progress (KEI, 2016).

products and foodstuffs with geographical origin registered at the national level. In the same period there were no requirements for the protection of geographical origin at the EU level, in line with Regulation (EU) No. 1151/2012 on quality schemes for agricultural products and foodstuffs (KEI, 2016).

The public voluntary high quality standard “Srpski kvalitet” (“Serbian quality”) was established in 2016 by the Regulation on the labelling of agricultural and food products with the national mark of higher quality “Serbian Quality” (Official Gazette of the RS, No 90/2016). This national high quality mark is dedicated for processed agricultural and food products in the sectors of production and processing of milk, meat, fruit, vegetables, cereals, oilseeds, grapes and honey (except spirit drinks, wines and aromatized wine products) that clearly differ from other agricultural and food products of the same category by their chemical composition, physical, microbiological and organoleptic properties, the production method, the raw materials and/or the ingredients or some other characteristic and are produced from basic raw materials that originate solely from the territory of the Republic of Serbia. In May 2017, the “Serbian quality” mark was approved for eight meat products from food processing industry (MAFWM, 2017).

This scheme of higher quality agricultural and food products is most similar to the French public voluntary standard *Label Rouge* (Code rural et de la pêche maritime, art. R.641-1à R.641.10) which in 2015, after several decades of development, possessed 425 products with an annual turnover of 1.4 billion euros (INAO, 2017; EBRD, 2017).

### **Private voluntary food safety and quality standards**

Global food producers and traders, driven by the need to develop a sustainable supply chain (Fox, Vorley, 2004; Jones et al., 2008; Smith, 2008, Lee et al., 2012) most often require suppliers to apply the following private voluntary safety and/or quality standards<sup>9</sup>:

- *GlobalG.A.P. – a global standard of good agricultural practice*

GLOBALG.A.P. also known as the Integrated Farm Assurance Standard (IFA), V5 (2015) is the internationally recognized standard of good agricultural practice for farm production. GLOBALG.A.P. certification covers food safety and traceability, environment (including biodiversity), workers health, safety and welfare and animal welfare and includes Integrated Crop Management (ICM), Integrated Pest Control (IPC), Quality Management System (QMS), and Hazard Analysis and Critical Control Points (HACCP) (GlobalG.A.P, 2017).

- *FSSC 22000 - certification scheme for food and feed safety/quality management systems*

FSSC 22000 V4.1 (2017)<sup>10</sup> is in compliance with ISO 22000/9001<sup>11</sup> requirements, sector

9 The standards that are recognized by Global Food Safety Initiative (GFSI) as competent food safety management systems (GFSI, 2017).

10 In the application from 01 January 2018.

11 ISO 22000: 2005 is based on ISO 9001 and HACCP, applicable to all entities in the chain and internationally recognized (ISO, 2017a), but not from GFSI (GFSI, 2017).

specific Prerequisite Program (PRPs) requirements and additional Scheme requirements. The Scheme is intended for the audit, certification and registration of food safety management systems<sup>12</sup> for the following scopes and product categories: farming of animals for meat, milk, eggs and honey; manufacturing of food products, (bio)chemicals, food packaging and packaging material and food and feed for animals; transport and storage services; catering; and retail/wholesale (FSSC 22000, 2017).

- BRC- *global food safety standard*

The Standard is HACCP based and incorporates food safety management systems and internationally accepted best manufacturing practices to ensure product safety and quality in pre processing handling of plant products, processing of animal and plant perishable products and ambient stable products, production of (bio) chemicals and food packaging and the provision of storage and distribution services (GFSI, 2017; BRC, 2017). The BRC Global Standard for Food Safety Issue V7 (2015) focuses on label and packing management (areas which have traditionally resulted in recalls and withdrawals), transparency and traceability in the supply chain and strengthening the system's resilience to fraud (BRC, 2015).

- IFC- *international food standard*

The IFS Food Standard (V6, 2012) is used to audit food manufacturers regarding food safety and quality of processes and products in the following scopes: processing of animal and plant perishable products and ambient stable products, animal conversion, pre processing handling of plant products, production of (bio) chemicals and provision of storage and distribution services (GFSI, 2017). The Standard is especially important for food manufacturers producing private labels as it contains many requirements related to the compliance with customer specifications (IFS, 2017).

ISO 9001:2015 is the world's leading quality management standard and can be used by any organization who want to ensure consistent product quality improvement, regardless of its size and field of activity. This standard is often introduced as a basic management system, which is relatively easy to be upgraded with other management systems such as ISO 14001:2015 Environmental Management (ISO, 2017b).

Halal and Kosher certificates are provided with the aim to differentiate products on the market in order to meet the specific requirements of certain customer categories.

A small number of primary agricultural producers in the Republic of Serbia have certificates for GlobalG.A.P., organic production and products with a geographical origin. The improvement of the current situation is expected through the financial and advisory support of the state, with more active role of the associations of producers and cooperatives and the engagement of processors, exporters and traders, primarily large retail chains in the supply chain management, in line with the concept of *sustainable food supply chain* (Lee et al., 2012; Smith, 2008). Slightly better is the situation in food processing industry

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12 As from 2015 the voluntary FSSC 22000-Q certification (add-on module to FSSC 22000 that combined FSSC 22000 and ISO 9001 certificate) is available for organizations wishing to integrate food quality management into their certified food safety scope (FSSC 22000, 2015).

and export. A large number of processors, especially suppliers to global retail chains are, in addition to HACCP, certified to ISO (9001, 22000), and exporters to BRC and IFS standards (SEEDEV, 2014).

### **Financial support to agricultural products certification**

One effect of standards proliferation worldwide is that, in particular, companies from developing countries and emerging economies have problems to comply with these standards. Another important effect is increasing marginal costs of certification and accreditation, which puts pressure on company profits in industrialized countries (Trienekens, Zuurbier, 2008).

In the terms of harmonization of national regulations with EU in the areas of the standardization and certification of agricultural products, Serbia expects support from the EU funds (KEI, 2016). Within the framework of the national and provincial support programs for rural development, the incentives are directed to registered farms for introduction and certification of food safety and quality systems (according to ISO 22000, FSSC 22000, BRC, IFS, GOST-R, GlobalG.AP, Halal and Kosher standards), organic products, products bearing the geographical indications and products with the “Serbian Quality” label (Official Gazette of RS, 8/2017, 67/2017; 41/2017; Official Gazette of APV, 69/2016, 29/2017).

Local communities can also allocate budgetary funds through their programs of agricultural and rural development policies implementation for co-financing certification of organic products and products with a geographical origin.

### **Conclusion**

The guarantee of food safety and quality is a basic presumption for successful access to the domestic and foreign markets. The Republic of Serbia is working intensively on the harmonization of food safety and quality regulations with the EU and processors and exporters, taking into account the role of voluntary public and private standards in placing their products, are investing in their introduction and certification of production. The biggest lag is in primary production, where a large number of small farmers remain out of these processes due to lack of financial resources and non-inclusion in modern supply chains. Improvement of the situation is expected through state financial and advisory support, the more active role of the producer associations and cooperatives and the engagement of processors and traders, primarily global retail chains in supply chain management in accordance with the concept of a sustainable food supply chain.

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## POLITIKA BEZBEDNOSTI I KVALITETA HRANE U REPUBLICI SRBIJI<sup>13</sup>

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### Rezime

*Bezbednost i kvalitet hrane imaju presudan uticaj na plasman poljoprivredno-prehrambenih proizvoda na domaćem i svetskom tržištu. U sektoru poljoprivrede i prehrambene industrije Srbije primenjuje se niz javnih i privatnih standarda, obaveznih i dobrovoljnih, koji pokrivaju različite faze lanca snabdevanja i nivoje komunikacije, sa poslovnim partnerima ili potrošačima. Ipak, još uvek mali broj primarnih poljoprivrednih proizvođača poseduje sertifikate za GlobalG.A.P., organsku proizvodnju i proizvode sa oznakom geografskog porekla. Nešto bolja situacija je u prehrambenoj industriji i izvozu. Veći broj prerađivača, posebno dobavljača globalnih maloprodajnih lanaca je, pored HACCP, sertifikovan i za ISO (9001,22000), a izvoznici i za BRC i IFS standarde. Gubitak tržišta usled nepoštovanja standarda bezbednosti i kvaliteta proizvoda je realna opasnost, koja se mora preduprediti aktivnom politikom državne podrške.*

**Ključne reči:** *standardizacija, sertifikacija, konkurentnost, bezbednost i kvalitet hrane*

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## PROBLEMS OF AGRICULTURAL AND RURAL DEVELOPMENT IN SERBIA AND NECESSITY OF NEW AGRICULTURAL POLICY<sup>1</sup>

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### Summary

*The Republic of Serbia has a favorable conditions for agricultural and rural development (5,097 million ha of agricultural land, 85% of the territory is rural). Serbia has a skilled and educated human resources and appropriate institutions for education (high schools, colleges, institutes), as well as a long agricultural tradition.*

*Nevertheless agriculture and villages in Serbia are in the process of decay, devastation and backwardness. Agricultural production in the period from 2000-2015 for example had positive outcome in only four years. The negative development trend was followed with de-agrarianism and demographic emptying of villages. The causes for this are numerous. The authors come to the conclusion that a new paradigm of sustainable agricultural and rural development, as well as the new agricultural policy is need.*

**Key words:** *agriculture, village, development problems, a new agricultural policy, the Republic of Serbia.*

**JEL:** *Q10, Q18*

### Introduction

Numerous problems of agriculture and rural areas of the Republic of Serbia can be reduced to development problems. Development problems are systemic in nature.

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Economic development is a complex process with a series of successive or less successive changes. Today, it comes down to the sustainable and rural development.

The UN Agenda for sustainable development by 2020 states that economic growth and development measured only by GDP or national income is not sufficient to come to a sustainable growth and development. In addition to financial development, human development is also needed, which includes education, health care and many other aspects, including those related to agro and food production. This is also the starting hypothesis in this paper.

The current (development) problems of Serbian agriculture are complex. They can be divided into several groups: (1) problems of primary agriculture; (2) the problems arising from inadequate agricultural policy; (3) the problems arising from the lack of competitiveness of agriculture; (4) the problems of education, knowledge transfer in agriculture and the availability of new technology; (5) problems arising from current concept of (un)sustainable development, (6) the problems of the villages.

### **Materials and methods**

Using the method of qualitative research, authors analyzed the problems and came to value judgments, which were then corroborated with qualitative indicators. Authors have used past long term research results, which have indicated in the list of used literature. The analysis included six of those groups of problems of agriculture in the Republic of Serbia.

### **Problems of primary agriculture**

Serbia has about 5.2 million hectares of agricultural land, of which 4.2 million hectares are arable. Per capita average is 0.56 ha, which is significantly higher than in the Netherlands or Germany<sup>5</sup>. The problem is the irrational use of this valuable resource. Due to road construction, illegal construction and alike every year fond of arable land is decreased. It is assumed that Serbia annually loses about 25,000 ha. On the other hand, over 600,000 ha remain uncultivated. In contrast, many countries such as Netherlands and Israel are “taking” every inch of land from sea or desert and turning it into arable land.

When it comes to the land problem, the uncompleted restitution is still a big problem. Since 2000 the several law drafts on restitution have been done (the latest was adopted in 2011) but the process is not completed.

The problem is, also, the state-owned land, about 800,000 ha, which is leased (at a relatively high price through bidding), but is also irrationally and arbitrary used.

The problem is that the average farm in Serbia uses 4.5 hectares of agricultural land

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5 Favorable agricultural conditions are important for so called growth based on catching-up, which is highlighted by American economist Jeffrey Sachs (The age of sustainable development, CIRSD the Official Gazette, Belgrade, 2014).

- almost four times less than holdings in the EU. Moreover, such small farms are fragmented into smaller plots of irregular shape and far apart. If we take into account the state of roads, it is clear that these farms and plots are very difficult and expensive to cultivate, especially in hilly areas, and that it is very difficult for farmers to make a profit on domestic and international markets. The only way to overcome this problem is land consolidation - merging parcels of agricultural land.

In recent decades the primary agricultural production in Serbia was in a permanent unfavorable economic situation, which is reflected in the “price scissors”, which are open at the expense of primary agricultural products, as well as the disparity of income, but also in other ways, all of which have unfavorable impact on agricultural producers (Pejanović, 2013).

Agricultural production in the period 2000-2015 achieved growth in just four years. According to the Serbian Statistical Bureau in 2015, Serbian agriculture has declined production volume by eight percent compared to 2014, instead of the planned growth of about six percent.

In the value structure of total agricultural production in Serbia plant production has a dominant share. Multi-annual average is around 67%, with corn as a major product with 25% of the total value of agricultural production. Particularly disturbing is the drastic decline in livestock production, which has a share of 35.7% in realized value of agricultural production. In the more developed EU countries share of livestock ranges from 60-70 percent. It tells about the torn livestock-farming chain, without which there is no successful development of agriculture (Pejanović, 1995).

Trends in livestock production are negative in past few decades. Just in last ten years, the number of livestock units per hectare of agricultural land decreased from 0.34 to 0.27. One of the indicators of the devastation of Serbian livestock production is export of “baby biff”. According to the data of the Customs Administration in 2015, Serbia exported only 315 tons of high-quality meat. How little it is can be seen from the fact that in 1990 50,000 tons of “baby biff” was exported from the former Yugoslavia, out of which 30,000 tons came from Serbia.

The problems are also present in other branches of agriculture (farming, fruit growing and viticulture). In the context of crop production there is unused potential in seed production, which is the world profitable branch of agriculture, for which Serbia has institutes, human capital and tradition, but underutilized and unorganized.

The problems of Serbian agriculture arise from unresolved issues of financing and lending. Due to the specifics of this production (“factory under the open sky”), as well as the strategic importance of food production, state support is necessary, which is insufficient in Serbia. Agricultural budget, for example, for 2016 year decreased and amounts only about 3% of the total budget (although the agriculture and food industries account for over 20% of the overall GDP). Consequently Serbian government reduced subsidies (although anything and everything is subsidized - from jobs to foreign

investors to large loss-making state-owned enterprises). In addition, bank loans are for a long time unfavorable.

Although favorable, water regime is insufficiently exploited. Danube-Tisa-Danube canal (with 960 km of canal network) the largest single hydro system in the world is very little used. Of the total arable land about three per cent is irrigated or close to 100,000 ha. At the same time in the world about 17 percent of arable land is irrigated.

Problem of primary agriculture exacerbates the loss of purchasing power of the population, due to the economic and financial crisis. This has led to an increase in poverty, which is reflected in consumption fall of meat, milk, butter and fruit (Pejanović, 2010). In many EU countries consumption of these more expensive food products is higher for at least 50 percent. At the same time sales of cheaper foods (bread, rolls) has increased. The fact is that consumption of all food products in Serbia in 2015 was in decline when it is compared with the multi-annual average in the previous period<sup>6</sup>.

### **The problems arising from inadequate agricultural policy**

Creation and implementation of Serbian agricultural policy is limited with numerous factors of systemic, economic, political, institutional, legislative nature. Exhausting and long transition (which lasts for more than a quarter of century) is followed by unsuccessful privatizations, corruption, social stratification, debts, partocratic division of power. It has had the effect of treating agriculture as a “social shock absorbers” of society, not as promising and profitable industry (Pejanović, 2014). This was particularly the case in the 90s of the last century (the “decade of Serbian catastrophe”). For the past 15 years, Serbian agriculture has led 12 ministers, always starting from the beginning, wandering, experimenting, with wrong strategic decisions, always skirting the agriculture and agro-economy, although agro-economic science and profession try to point that Serbian agriculture has a comparative advantage, tradition, knowledge and human resources. The numerous agricultural development strategies were and remain “a dead letter”.

Financial constraints are chronically limiting factor for agricultural and rural development of Serbia. And not just in terms of incentives, but above all in terms of investments, which are almost ceased in this area. As for the banking assets, they were “usurious” altogether. Irrationality spending of budget incentives was no fewer problems.

Although Serbia has adopted several laws (Act on Agricultural Land - 2006, 2008, 2009; Law on Agriculture and Rural Development - 2009, 2013; Law on Incentives in Agriculture and Rural Development - 2013, 2014; Law on financing and the provision of financing agricultural production - 2014), to assist and protect farmers, its assistance

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6 This is evidenced by the fact that today in Serbia only 38 kg of meat per capita is spent and about 44.000 tons of all kinds of meat is produced. In 1990 on the territory of today's Serbia around 650.000 tons of all kinds of meat was produced and 65 kg of meat per capita was consumed per year.

and protection are insufficient for more serious development of domestic agriculture, and incentives are negligible in comparison to the incentives EU farmers receive. In addition, small producers who dominate are poorly organized, divided and unable to equally negotiate with traders and processors on the terms of sale, where the state does not even attempt to protect them from abuse in the market, as does the European Union.

As a result of all this, Serbian agriculture is unattractive for domestic and foreign investment. Of total foreign direct investment in Serbia, agriculture accounts for only 0.7 to 1.6 percent.

All this leads to lagging behind of Serbian agriculture and food industry, which profits from agriculture about two billion dollars per year, as opposed to say, Netherlands which profits out of food and agriculture industry over 70 billion dollars per year.

### **The problems arising from the lack of competitiveness of agriculture**

When it comes to competitiveness, the key limiting factors of Serbian agriculture competitiveness are: unfavorable agrarian structure (4.5 ha average farm size) dominated by small farms - about 650,000 households (obsolete machinery); disorganization of agricultural commodity producers (associations, cooperatives, clusters, underdeveloped cooperation and contract processing, unregulated conditions of purchase and purchase prices, unregulated system of payments, high participation of middlemen etc.); lack of regulation of agricultural markets (monopolized markets, asymmetric market information, price instability, inefficient inspection bodies, lack of purchasing and distribution centers, underdeveloped commodity-exchange market, inefficient system of stockpiles) etc.; corruption (as a companion of bureaucratic, non-market, partocratic states dominated by monopolies - party, company, trade, especially monopolies for coercion and obligatory); inadequate role of the state (low agricultural budget, relatively low subsidies, unresolved financing and investment, underdeveloped network of advisory services, undeveloped system of recording and reporting in agriculture, lack of an integrated agricultural information system); inefficient use of land resources; relatively high price for state land lease; deagrarianization and depopulation of villages (every fourth village is on the path of extinction, in 86% of villages the number of inhabitants is decreasing); the problem of food safety; climate change (which take a heavy toll by floods and droughts).

The lack of competitiveness of agriculture, agricultural producers and agricultural products in Serbia reflects in following: national agricultural production is expensive and inefficient (cost and pricing); extensiveness of the total agricultural production (0.25 livestock units per hectare, compared to 0.98 in the EU, which is a consequence of low productivity, inefficient land policy, outdated technical equipment, low level of business integration); underdevelopment and insufficient use of irrigation systems (small percentage of irrigated land); unfavorable business environment (relatively high index of business and political instability, high level of corruption, heavy administration, etc.); product quality does not sufficiently meet the EU standards (slow introduction of

quality standards, often compromised food safety); the largest part of exported national products consist of primary agricultural products (corn, raspberries, fruit, livestock), a small share of added value (knowledge applied through technology, and marketing); agro-industrial reproduction chain has been violated and “torn” (production, processing, transport, logistics, agriculture-livestock); no unified supply and insufficient knowledge of export markets; underdevelopment of distribution phase, promotion and other marketing activities related to agricultural products; uncertain economic conditions for entrepreneurship and entrepreneurial spirit are underdeveloped (slow development of small and medium-sized enterprises in agribusiness); underdeveloped and weak system of lobbying (the agrarian lobby).

The lack of competitiveness is characterized, therefore, with unfavorable structure of exports of agricultural products, dominated by primary agricultural products, not processed products with value-added (Pejanović et al., 2005). In the structure of agriculture exports meat accounts for only about 2.7 percent. On the other hand, the import of agricultural products is high. If we analyze the basic groups of agricultural products in exports in 2014 cereals (19.8%) dominate, followed by fruits (17.9%), various beverages (7.2%), tobacco and tobacco products (5.7%), animal and vegetable fats and oils (5.2%), miscellaneous of food products, etc.

Process of branding of Serbian agricultural products is inadequate and slow (Pejanović et al., 2009). In the EU there are 1,200 protected agricultural products. Serbia has a lot of products with brand name and geographic origin at the national level.<sup>7</sup> However, the process of protection at EU level is quite complex and time consuming, and Serbian producers, obviously, do not see their interest in this. However, the price difference in the EU goes from 10 to 30 percent. Unsurprisingly Italy and France are the leaders in this area, they account for about 60 percent of total turnover. Only Italy has nearly 200 branded products.

### **The problems of education, knowledge transfer and access to new technologies in agriculture**

Regarding to this a few questions arise: *What is the quality of knowledge in Serbian country (especially in agriculture)?* The issue refers also to the question of the quality of Serbian education. The answer to this question is not, unfortunately, positive. Knowledge in Serbia, in fact, in many areas significantly lags behind developed countries. The cause is in unfavorable economic position of Serbian science and education, resulting in declining quality. Despite the relatively low percentage of allocations for science and education in GDP (from 0.30 to 0.50 percent of GDP), which is much lower than the EU average, the reduction of salaries to teachers and assistants in educational institutions,

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7 Even 52 (Užice beef prosciutto, Srem sausage, savory, tea, Kladovo caviar, Leskovac grill meat, futoški fresh and sauerkraut, pork cracklings from Valjevo, Arilje raspberries, homoljski honey, ajvar from Leskovac, Sjenica sheep cheese and lamb, Ečka carp, krivovir cheese, Požarevac sausage, Zlatar cheese, Fruška Gora linden honey ...).

as well as uncertainty about the status of researchers - say enough themselves. Except the “white plague”, this is followed by one more negativity is a serious problem in Serbia - it’s “brain drain”, the exodus of young, educated, talented people from the country, with increasing and accelerating flow. Serbia has about 3,500 unemployed agricultural managers, with bachelor, master and PhD degrees.

Inadequate is the role of the state in this area, but there is also the problem of disorganized, unregulated, uncontrolled, anarchic education market. Inflation of Universities in Serbia (10 private and 8 public universities, plus a large number of various higher education institutions) has led to the devaluation of the quality (bachelor, master and doctorate).

Transfer of knowledge in Serbia is followed by the problem of (non)functional, (non)entrepreneurial knowledge (Pejanović et al., 2013). Due to financial reasons many faculties have reduced the so-called student practice, which is a devastating for example for students of agronomy. On the other hand, in the process of transition and devastating (failed) privatization in agriculture, many agricultural enterprises disappeared in which the students of Serbian faculties successfully performed agronomic practices. Owners of many new businesses, unfortunately, have no interests or will to enter into such a form of cooperation that has multiple benefits for all. On the other hand, entrepreneurship is not enough promoted in Serbian education system, especially agrarian entrepreneurship as a new development philosophy. The problem is that at the macro level, and then at all the lower levels were not accepted ideology of the new society, of which we are, unfortunately, far away. This new ideology promote that innovation and entrepreneurship based on knowledge are the holders of economic and social development (knowledge-based society).

The transfer of knowledge and technology transfer are closely related (Pejanović et al., 2013). The problem is the slow implementation of new technologies in Serbian agribusiness. The process of technology transfer from scientific and educational institutions to the economy in Serbia is far behind compared to developed European and other countries. Institutional support to the technology transfer between universities and industry is at relatively low level. In favor of this thesis is the fact that we are at the bottom according to the number patents in Europe.

One of the new technologies in agriculture is called “Precision agriculture” or “agricultural production based on the information”. Its purpose is the economical use of water, nitrogen and other inputs in order to produce food with less environmental impact. In addition, farmers in this way can save, get better revenue and reduce waste of resources.

### **Problems arising from the (former) present concept of (un)sustainable development**

Modern food production is based on input-intensive agriculture, which means that to a large extent depends on fertilizers, pesticides, irrigation and mechanization. On other hand, all this depends on the energy of fossil fuels. Considering the impact of agriculture on the

environment an American professor Jonathan M. Harris points out the following negative effects: erosion and soil degradation; the use of fertilizers; use of pesticides; irrigation and inefficient use of water; GM foods as controversial technologies (Harris, 2006).

A serious problem is food safety. For example, there is a case of pork meat or forbidden transport of eggs through the territory of the EU, because we did not agree on the control of salmonella with European regulations. Serbia is, in fact, the only country in the region that does not mark the eggs and which due to non-compliance with EU veterinary legislation does not permit the export of eggs in the EU. The danger is biological, chemical and physical substances in food, or condition of food that can cause adverse effects on human health (Havranek et al., 2015). We should use biologics, as an alternative to chemical protection. It should also work on education and stricter control.

Just as we need to find a new energy path based on energy efficiency and fuels with low carbon content, it will be necessary to find new farming systems, which will inflict less damage to the environment and that will be ecologically sensible and sustainable.

The energy sector of Serbia expresses the high dependence on imported energy sources with low energy efficiency, both in production and in consumption. There is a low share of renewable energy sources, although Serbia has a large quantity of biomass. Energy production processing of biomass is an area that represents a significant potential of Serbia, especially AP Vojvodina, due to the fact that it is an agricultural area with large quantities of plant, primarily crop residues. In addition, Serbia is creating over 270 thousand tons of animal waste, of which only about 20% is used, which indicates the extent of pollution. Negative effects on the environment have burning of crop residues, which in Vojvodina cornfields reaches up to 60%. To do this, they is a big loss of organic matter, humus destroyed, and carbon, nitrogen and sulfur go into the atmosphere, which are important elements for the growth of crops.

Agriculture is highly exposed to the negative effects of climate change. Droughts and floods are the side effects of this global world phenomenon, which largely pays tribute in Serbia (Njegomir et al., 2016). According to estimates of the Ministry of Agriculture and Environmental Protection since 2000 that damage in Serbia amounts to more than five billion euros. In that ensures only eight percentages of the surface and estates.

### **The problems of Serbian villages**

The results of the Census in the Republic of Serbia in 2011 showed that the demographic trends are unfavorable especially in rural areas. Of about 5,965 so-called other settlements, which are automatically considered as rural, about 1,200 are in the process of disappearing. This means that 15 percent of the villages are empty and in about a thousand villages have less than a hundred inhabitants. From 1991 to 2012 Vojvodina has lost 110,000 inhabitants, Šumadija and Western Serbia 180,000 and southern and eastern Serbia lost more than 200,000 people. The forecast is that by 2050 there will be 500,000 fewer people and a quarter of the population will be older than 65 years.

**Table 1.** Villages in Serbia\*

Population	Number of villages	Share (%)
0-49	535	11.8
50-99	460	10.1
100-199	692	15.2
200-399	922	20.3
400-599	583	12.8
600-799	342	7.5
800-999	253	5.6
1,000-1,999	475	10.5
2,000-3,999	201	4.4
4,000-5,999	42	0.9
6,000-7,999	23	0.5
8,000 and more	13	0.3
Before Census in 2011	4,541	100

Source: RIS, 2011.

Note: \*Serbia without KM, Census in 2011. For municipalities Preševo, Bujanovac i Medveda the data were taken from 2002.

The birthrate in Serbia is below the simple reproduction of the nation. The birthrate in Central Serbia is 1.41, or 1.38 in Vojvodina. In Serbia every year approximately 35,000 to 40,000 people more die than it was born. In the region only B&H is under the Serbia. The predominance of the number of deaths over births is far bigger reason for the depopulation of villages, then migration itself.

Dramatically accelerates the reduction of the population in small communities. The last Census showed that the number of vacant houses drastic increases in the municipalities east, southeast Serbia and Banat. In addition, Serbia is among the 10 countries of the world with the oldest population, and in eighth place after poverty (Eurostat, 2015). According to RIS, average pension of Serbian farmers is 10,600 dinars (less than 100 euros).

Therefore, the image of Serbian villages is negative. This is proved by the following data, the results of the last Census: in 1,034 settlements in Serbia is less than 100 inhabitants; in 550 settlements is less than 50 inhabitants; in 86 percent of the villages population is decreasing; in Serbia 73 percent of the villages have no institution of culture or library; in Serbia is now about 50 empty settlements, while 85 of them have fewer than ten residents; there is about 50,000 empty houses and on another 150,000 is written that in them now no one lives; about 2,000 villages have no post; 173 primary schools have just one student; 500 villages have no asphalt road or connection with the world; 400 villages have no shops; 2,760 villages have no kindergartens; in 230 villages have no primary school; two-thirds of the villages have no ambulance.

And finally, in Serbia today has more than 200 villages without population younger than 20 years and more than half of the country's population lives in the countryside. In the last 10 years, even 370 rural settlements of Serbia have not given one baby.

So difficult living conditions, distance from cities, poor road network and almost no chance of making money besides agriculture are the most common reasons in recent decades for the devastation of villages (Pejanović, 2015). It is forgotten that they are not just for food production, but also its citizens must have a decent life. For example, in Slovenia if there are five houses and few people live in them, produce something, associated in cooperatives, it is known what and for whom they are producing. In contrast, in Serbia between 600,000 and 800,000 hectares of arable land is not used and they are mainly located in border areas. The devastation of Vojvodina villages is most notable in the southern Banat and municipalities Plandište, Alibunar and Bela Crkva.

We can conclude that it is a tragedy of Serbian villages. And tragedy of Serbian villages is actually a tragedy of Serbian people.

### **Instead of a conclusion: the necessity of a new agricultural policy**

As can be seen from the above, the current development problems of agriculture in Serbia are numerous. The causes for this are systemic and global nature and range of the unfavorable economic situation of agriculture in the current concept of socio-economic development, to inadequate agricultural policies, inadequate role of market, government and other institutions, disorganization of commodity producers, irrationality and inefficiency at all stages of reproduction, economic and environmental crisis and climate changes, as well as a number of other causes that are the limiting factors of converting comparative into competitive advantages.

When it comes to the village it is about his decay and “putting out” due to reclamation, low fertility, a long and unsuccessful transition and devastating privatization, regional backwardness and a number of other causes of the economic, political, social, demographic and environmental nature.

Logical conclusion is: to speed up agrarian and rural development of Serbia, to keep the population (who for decades is rapidly leaving villages) and employ them (especially the young and educated) in almost abandoned villages, it is needed significantly higher investments in agricultural development. Measures of agrarian policy should stimulate faster development of animal husbandry, to increase its share in the value of agricultural production, to encourage farm agribusiness, agrarian entrepreneurship and export programs. In addition, the need to increase salaries and pensions in order to increase the purchasing power of the population. In order to increase the investments it is necessary to stimulate strategic partnership, modeled as in Romania for example, which implements the strategic partnership with China at 700,000 hectares of its own land in agricultural production and scientific research in the field of biotechnology. Investments in China are involved also in agriculture of the Ukraine.

In the process of European integration, on this long and “thorny” way, we need systemic changes, structural reforms, “transition in our heads”, even change in the national culture (“social genotype”) in many areas.

The institutional changes that are necessary in the process include strengthening existing and building new agrarian institutions, such as the agrarian chamber, the cooperative sector, NGOs, agricultural universities, etc. Also, it is needed specialized agencies such as the IPARD Agency, Paying Agency for Agriculture and Agency for market intervention. In addition, it is necessary to establish a system of accounting indicators from farms as well as the integrated administrative control system of payment, all modeled on the EU example. It is necessary to formulate a unified inventory and Fund of agricultural land, in order to have knowledge of Serbian land resources, especially since September 1, 2017 shall come into force provision of Agreement on the Stabilization and Association, according to which foreigners are entitled to the unrestricted purchase of Serbian land. The establishment of these institutions will stabilize the market of agricultural products (work of the Agency for market intervention) (Jovanović et al., 2017), there will be necessary to increase the volume of investment in domestic agriculture and rural development (IPARD Agency work), will be created much-needed analytical basis for the creation of an adequate agricultural policy.

The weaknesses of Serbian system of assistance and protection to farmers Serbia will have to remove, which is one of the conditions in the negotiation process with the EU. It would be desirable also that Serbia legally regulate agricultural organizations and thus to encourage the association of farmers in them. In that way, they would strengthen its position in the market.

Thus, policy of agricultural incentives and rural development policy include changes, primarily agrarian policy change, on the one hand, and institutional changes, on the other hand. These changes should shift the trajectory of development. From extensive, uncompetitive production should move to an intense, competitive production. Otherwise, Serbia will instead to be the exporter, become importer of food, what warns us the World Food Organization - FAO. It is necessary, for example, to create and implement a development concept of regionalization and regionalization at the level of Serbia (lowland, mountain and hill-mountain region), which would increase the competitiveness of Serbian agriculture.

Further progress of agricultural development is impossible without new knowledge and innovations in technology tillage (environmental technology), production of health - safe food, networking and association of producers, modernization and improvement of food marketing. Investments in knowledge and science must be significantly bigger, as well as technical - technological solutions.

Renewable energy resources can be considered as an important factor in the fight against the reduction of energy dependence, as well as way of reducing emissions of greenhouse gases (especially carbon dioxide). Previous studies, however, show that in Serbian production costs are higher than the prices of energy products on the market, which calls into question the economic justification of investment in these plants. Therefore, these forms of energy production, for which we have resources, must be supported by the state, through various types of incentives, allowances and subsidies.

As regards the transfer of knowledge and technology should encourage both technological and organizational innovation in agrosector (through development of a system of scientific and educational institutions, development of cooperation between University and economy, government support to scientific research, a higher percentage of expenditures for education, science, research and development). It is necessary to connect universities, companies, local communities and other institutions and civil society organizations, with the aim of finding solutions for sustainable development. It should be supported the transfer of high technology from abroad (through imports of equipment and knowledge, direct foreign investments, purchase of licenses, leases and various senior and complex forms of cooperation between Serbian companies with foreign partners). It should be invested in the construction of a waste water treatment plant, raising the level of recycling, waste separation, as well as the construction of regional landfills.

The solution of the most important problems is in the concept of integrated rural development. This concept in EU is based on overall development of rural areas. Multifunctional agriculture is part of this concept, and it involves other than primary agriculture and rural development activities, especially tourism: eco-tourism (in protected nature zones), ethno-tourism (highlights historical and ethnological value), rural tourism and health, recreational and educational tourism. In rural areas is particularly important agro-tourism, which in combination with organic food production could be big chance. In this way, it can come to the fore economic, environmental, tourist and cultural effects of this concept.

Alternative for sustainable development is organic farming, as a controlled system of food production and as a production system that maintains the health of land, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions. It combines tradition, innovation and science with the aim to use the shared environment and promote sustainable relationship and a healthy quality of life. It is part of sustainable development system and is based on the use of natural materials. In this way it becomes a holistic approach to agriculture, integrated system, which allows an increase in biodiversity as a necessary measure to increase productivity and protect agroecosystems. For all these reasons it is a promising resource for development of the Republic of Serbia that is very little used (only 0.28 percent of the total utilized agricultural area or 10,000 hectares in total). This sector of food production has risen in the world four times in last 12 years and there has been no decrease even in times of economic crisis.

Research and education are a necessity caused by scientific and technical progress and agrarian revolution, which take place in the new society that is coming - a knowledge society. Climate changes are growing threat to agriculture and should be prevented. Manufacturers need to implement a series of measures aimed at adaptation to climate changes. Adaptation involves the use of good agricultural practices, ensuring the application of the concept of health and food safety. Operation in the field of climate change actually operates in the sectors of waste management, protection of biodiversity, preservation of clean air, water and soil.

What is required is a new paradigm (patterns, models) of development and behavior. It is necessary, first of all, at the macro level to adopt a national strategy of development in which agriculture, agribusiness, agro-industry should be leading branches and activities in Serbia. In this concept, rural development should be a key determinant of development. In this regard, new development philosophies are the agribusiness, agrarian entrepreneurship and multifunctional agriculture. As a result of this approach the village has the opportunity and the ability to revitalize and develop, not only as the place where the products are with good quality (integrated, organic, geographically protected), but also as a center of life (especially young farmers), labor (self-employment) and families (demographic renewal). New agricultural policy must be stable, predictable and consistent, set with the strategic development goals, previously recognized at all levels, aligned and harmonized with the EU common agricultural policy.

And finally, why is all this important? It is important because of the huge development potential of Serbia in the field of agriculture and rural areas. Quality land, human resources and tradition are factors of comparative advantage. Food, as a strategic product, the growth of the world population and demand for food are development stimulants of agriculture, agro-economy, agro-industry, agribusiness, agrarian entrepreneurship and rural development, that we need and we must take advantage of.

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## PROBLEMI RAZVOJA POLJOPRIVREDE I SELA REPUBLIKE SRBIJE I NUŽNOST NOVE AGRARNE POLITIKE<sup>8</sup>

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### Rezime

*Republika Srbija poseduje bogate uslove za razvoj poljoprivrede kao i za ruralni razvoj (5,097,000 ha poljoprivrednog zemljišta i čak 85% teritorije je ruralno). Srbija raspolaže i sa kvalifikovanim i obrazovanim ljudskim resursima i odgovarajućim institucijama (srednjim školama, fakultetima, institutima), kao i dugom tradicijom seljačke, odnosno agrarne države.*

*I pored svega toga poljoprivreda i selo u Srbiji su u procesu propadanja, devastacije i zaostajanja. Poljoprivredna proizvodnja u periodu od 2000-2015. godine, na primer, osvarila je rast u samo četiri godine. Negativni razvojni trend je praćen deagrarizacijom i demografskim pražnjenjem sela. Uzroci toga su mnogobrojni. Potrebna je nova paradigma održivog razvoja poljoprivrede i sela, kao i nova agrarna politika.*

***Ključne reči:*** poljoprivreda, selo, razvojni problemi, nova agrarna politika, Republika Srbija.

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8 Rad je deo istraživanja u okviru projekta broj III 46006 pod nazivom „Održiva poljoprivreda i ruralni razvoj u funkciji ostvarivanja strateških ciljeva Republike Srbije u okviru Dunavskog regiona“ i TR31095 „Proizvodnja sira sa dodatnom vrednošću od mleka dobijenog u organskim i samoodrživim sistemima“ koje finansira Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije. Projektni period 2011-2016.godine.

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**MARKETING AND HIGHER EDUCATION-CONDITION IN SERBIA***Saša Marković<sup>1</sup>, Slavoljub Vujović<sup>2</sup>, Aleksandar Damnjanović<sup>3</sup>***Abstract**

*The inductive research approach is directed to testing of the hypothesis: about implementing marketing management, depending on the configuration properties of a successful education, and expressed with increased customer satisfaction in Serbia. The survey results confirm that the quality of service in higher education institutions in Serbia depends on the configuration properties of a successful education. Finally, it was confirmed that the success of marketing activities directly depends on the degree of customer satisfaction. One of the main specificities of higher education, even in comparison to other industries and service, is that the service provides a number of years and what is its value after successful completion of use, lifetime. Higher education institutions are in a unique position to build good relations with existing customers directly affected by the increase in the number of users in the future tense.*

**Key words:** marketing, management, higher education institution

**JEL:** M31, M12, I23

**Introduction**

The Republic of Serbia has established a system of funding higher education institutions in which the amount of funds depends on the number of students enrolled. This is the reason that higher education institutions in Serbia are increasingly determining their work in accordance with the modern approach to the Science on business organization (Adcroft, Teckman, Willis 2010). The modern approach to education requires serious incorporate disciplines of management and marketing (Assael, 1992). Area of higher

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education institution is good example how management should insist on making a long term marketing strategy. Kotler and Keller insist on next definition (Barnes, 1993): „Marketing management can be considered as science and art of targeting the market, ability of winning and saving customers and giving them the superior qualities than the competition”. Conclusion is that in higher education institutions entering the new students has the outstanding importance (keeping the continuity of new entries) and giving them wide range of appropriate values. In terms of marketing, for higher education institutions the most important goal is to become market-oriented. This involves fostering a greater degree of collaboration between internal departments, monitoring competitors and developing a focus on a wide range of institutional publics (Conway, Mackay, York, 1994). Simultaneously, the focus of higher education institutions is a configuration value as a key factor in communicating with potential service users.

According to Kotler and Fox, there are also definite stages in the evolution of marketing in higher education. The focus has moved from “marketing is unnecessary” to “marketing is promotion” to “marketing is positioning” to the stage where in some cases marketing is seen as part of strategic planning for higher education institutions (Ellis, 2005).

The business philosophy of marketing leads us on an integrated approach by all stakeholders, not just individuals and certain groups. Kotler and Armstrong (Foskett, 1998) identify four stages that strongly influence the evolution of organizations’ marketing activities. These stages are referred to as production, sales, marketing and societal marketing. The exercise of this role requires a proactive approach to marketing that implies such thinking and operational approaches should provide efficient adaptable environment (Foxhall and Goldsmith 1998). An important feature of a proactive approach to the process of adaptation doesn’t go subsequently, but in advance, therefore, a priori. It also points to the general importance of social marketing, which is not only used in material production, but, it could be said, in the whole system of life. The business-philosophical component of marketing refers us on special way of creation, entrepreneurship and realization of business activities, so then on specificity of mental and operational access to whole organization of life (Grey, 1991, p.231).

McCarthy and Perreault consider that marketing is process of planning, determining prices, promotion and distribution of ideas, goods and services in order to exchange that satisfies individual and corporative aims (Gwin, 1990).

Foxhall and Goldsmith consider that consumer orientation stems from an organization’s adoption and implementation of the marketing mix (price, service, product, promotion, place, people, process, physical evidence), but adds that the adoption and implementation of the marketing concept has four major implications (Hayrinen-Alestalo and Peltola, 2006):

- “The success of any organization depends above all on the consumers and what they are willing to accept and pay.
- The organization must be aware of what the market wants, preferably well before production commences.

- Consumer wants must be continually monitored and measured so that, through service product and market development, the organization keeps ahead of competitors.
- Top management must achieve the integration of all the components of the marketing strategy into a single strategic plan, based on knowledge of consumer behavior.”

However, the rapid development of civilization results in continuous growth of requirements from potential users. According to Kotler (Hemsley-Brown and Oplatka 2010) and McCarthy and Perreault (Gwin, 1990), the marketing concept is based on four based principles: consumers’ orientation or the target market, long-term maximization of profitability or another measure of long-term success, total organization effort, and social responsibility. Creating a marketing concept for any institution involves respecting the necessity of the introduction of continuous change: product and business organizations. Assael underlines the importance of the marketing concept by stating that the marketing concept embodies the view than an industry is a consumers’ satisfying process, not a goods producing process (Ivanchevich, and other, 1994).

Assael (Ivanchevich, and other, 1994) and Trustrum (Kasper, 2002), agree that the basic idea of the marketing concept is to give the customers what they want. However, consumers are not always sure of their wants or what they are being offered, and are much more opened to persuasion than is commonly acknowledged by the marketing concept. This highlights the importance of a comprehensive study of user requirements. This paper was partly aimed at seeking solutions to higher education institutions so that they better meet their markets, but also to their marketing activities conducted in a more efficient manner.

### **The task of marketing management in serbian higher education**

Previously mentioned allows to formulate the task of marketing management in higher education institutions: establishing an appropriate relationship with the target user groups so as to ensure a stable market position.

*Miller, Erickson and Redman* states the main reasons for the introduction and implementation of marketing in higher education (Kotler, 1979):

- “demographic trends,
- higher responsibility of educational institution in society, and
- increase number of institutions.

Barns (*Barnes*) list some other reasons (Kotler and Armstrong 1999):

- better communication between providers and users of educational service,
- creating positive institutional image,
- improvement of educational possibilities with aim to derive additional funds, and

- better organizational efficiency and success of integration key issues of management.

Marketing in higher education institutions can achieve success if you recognize, and put the emphasis on certain properties. Rindfleish (Kohli and Jaworski 1990) believes that marketing is a process, not a campaign related to an event. Marketing concept is necessary to build a view of the situation, that is, the tendency of changes in the environment. The process of marketing in higher education institutions is pointed at „the needs, wants, and expectations of an organization’s various customers or stakeholders” (Kohli and Jaworski 1990, p.234). Accomplishing this goal is possible only with cooperation of all employees: leadership, professorial corps and other staff. It is the continuity of Marketing Management, an indicator of a good customer service on rational channeling of available and potential resources. Marketing concept far exceeds the activity of selling, which basically has the property of purchasing transaction: „Marketing includes multiple phases of activities such as forecasting, product development, position assessment, market research, branding, creation of communication materials, and public relations that enhance the institution’s long-term relationship with its “customers” or audience” (Kotler and Armstrong, 1999, p.238).

Organization of research needs (desired values of) users, taking into account the specifics of particular target groups, reduces risk, and thus the cost of implementation of marketing when using marketing instruments: „product/service, price, place, promotion, process, people and physical evidence, so, marketing-mix“ (Kotler and Fox 1985). It is believed that the higher education institutions is very great importance of the product planning.

Market research services, education, promotion, performance of sales transactions, and raising funds from donors represent a form of communication with users. Marketing management of higher education institutions involves the establishment of appropriate business organization (in terms of structure and function). Foxhall and Goldsmith consider that the adoption and implementation of the marketing concept has four major implications (Hayrinen-Alestalo and Peltola, 2006, p.251):

- “– The success of any organization depends above all on the consumers and what they are willing to accept and pay.
- The organization must be aware of what the market wants, preferably well before production commences.
- Consumer wants must be continually monitored and measured so that, through service product and market development, the organization keeps ahead of competitors.
- Top management must achieve the integration of all the components of the marketing strategy into a single strategic plan, based on knowledge of consumer behavior.”

Marketing management recognizes current situation, providing positive results of current operations and the timely creation of the basics for survival in the long term.

### **Hypotheses and research method**

The study of marketing management in higher education institutions assumes coverage of a number of factors, as it has been highlighted above. Taking appropriate measures that lead to the desired results requires management focus. Adequate answer to the question about the choice of focus hypothesis and its verification through the inductive research. It is very important to answer these questions: Is it even necessary to consider the concept of Marketing in higher education? Then, consider what and how should be done to improve the quality of services. Finally, to answer the question: Will these efforts really have the desired response - increased customer satisfaction? In that sense, set the following hypotheses:

- Higher education institutions in Serbia are implementing Marketing Management.
- Service quality in higher education institutions in Serbia depends on the configuration properties of a successful education.
- Results of marketing management in higher education institutions in Serbia are expressed with increased customer satisfaction.

When choosing a method of sampling (Kotler and Fox 1995) we was a basic set is defined the first. This was a population of colleges and universities in the territory of Serbia. Then, the method includes the frame definition, by determination the location of the contact unit. The sampling frame was formed from the list of higher education institutions, published by the Commission for Accreditation and Quality Assurance of the Ministry of Education of the Republic of Serbia. The method of quota sample was used, with the goal of the optimal selection of important characteristics for different subsets of the basic set. As this method is a combination of stratified and intentional sample, it is accessed through three stages. First, the certain basic set, then joined the determination of strata due to the expected ~ heterogeneity characteristics measured at the end of a certain sample size. The total of 747 students, studying in higher education institutions and universities in eleven cities in Serbia, were included in the interview process.

In the empirical part of the paper is applied survey research techniques and instruments were questionnaires: for staff in higher education institutions and students. Students filled it anonymously, which increased their sincerity in expressing views and opinions. Since the intention was to examine their attitudes, opinions and interests, there is belief that the determination of these properties in the context of research topics best manifested through selected and specified research techniques, and instrument. Questionnaires for staff in higher education institutions were sent randomly to specific individuals. The authors' intention was to make the selection of employees according to certain criteria which are primarily related to their familiarity with developments in the institution where they are employed. Therefore, the questionnaires were sent to employees by prior arrangement and agreement. Despite the fact that the results

obtained could do, they get their certificate and a comparative analysis using secondary data sources through a comparison with the results of the questionnaires received by the students.

Instrument designed for higher education institutions – employees, consisted of three major units that are separated by the specifics of individual research instrument (questionnaire). The first consisted of questions related to general data (total 15 questions). Second part of the instrument consisted of attitude scale, that is emerged as part of the questionnaire, in order to simplify the process of research to the respondents, Attitude scale pursued establishing the attitudes of respondents – employees compared to employees and users of educational services and general services in higher education institutions in which they work. The third and final section covers a questionnaire with 15 questions that are related to the educational process.

Instrument designed for students consisted also of three major units that are separated by the specifics of individual research instrument (questionnaire). The first consisted of questions relating to the general demographic and economic data (total of 9 questions). Second part of the instrument consisted of questions that were related to the attitudes of employees regarding relations with them (relationship and extracurricular services). Study of the attitudes of the respondents - students tended to establish attitudes of respondents in terms of satisfaction with the services provided by the staff employed in higher education institutions where they study, with emphasis on the part of the staff that makes direct contact with students. The third and final section covers a questionnaire with 10 questions that are related to education process (“the teaching”).

### Results and discussion on marketing research in higher education in serbia

Of the 65 surveyed of higher education institutions in Serbia, marketing activities are conducted in 48 institutions, or 73.8%, while the 17 institutions, or 26.2%, did not carry out marketing activities (Table 1).

**Table 1.** Does your institution relies on marketing activities?

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	48	73,8	73,8	73,8
	No	17	26,2	26,2	100
	Total	65	100	100	

Source: research by the author

Although the number of higher education institutions that conduct marketing activities is relatively high, they are mainly related to promotional activities.

**Table 2.** Average rating institutions towards the implementation of marketing

	Implementation of marketing skills	The average score	SD	T	df	importance
		AS				
Rating of your institution	Yes	2,92	0,679	-25,04	747	0
	No	4,71	0,721			

Source: research by the author

The table shows that a significantly higher score gives students to a higher education institutions that conducts marketing activities.

**Tabela 3.** Average rating institutions by ownership structure of the institutions

	Education sector	AS	SD	T	df	importance
Rating of your institution	state	3,01	,671	-21,17	747	,000
	private	4,77	,623			

Source: research by the author

From this table it can be seen that the average score of private higher education institutions is significantly higher than the state’s higher education institutions.

**Table 4.** The average quality score of exposure of teachers to the ownership structure of higher education institutions

	Department of Education	AS	SD	T	df	importance
How do you rate the quality of teacher presentations?	State	3,20	,633	-21,50	747	,000
	Private	4,12	,698			

Source: research by the author

And with this element, students of private higher education institutions, they gave higher average grade their teachers than state institutions.

**Table 5.** Correlation of quality of presentations and teachers motivation to work

		What would you evaluate the motivation of employees to work with students?					Total
		1	2	3	4	5	
How do you rate the quality of teachers presentations?	They come unprepared to class	0	43	15	0	0	58
	They have knowledge but do not know how to transfer it	5	266	99	36	0	406
	Presenting great	0	0	29	87	167	283

Total	5	309	143	123	167	747
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Source: research by the author

Chi-Square Tests

	Value	df	importance
Pearson Chi-Square	339,202(a)	8	,000

Directional Measures

			Value
Nominal by Interval	Eta		,808

As can be seen, there is a high correlation between the motivation of employees to work with the students and the quality of presentation. In following table we list the evaluation of the performance of student services given by students.

**Table 6.** The average score of student work services to the ownership structure of higher education institutions

	sector education	AS	SD	T	df	Importance
How do you rate the work of Student Services	State	2,88	,659	-31,88	744	,000
	Private	4,82	,384			

Source: research by the author

Student services in private institutions of higher education have significantly higher grade point average. That primarily contributes to the growing number of employees in students services and more time working with students in private higher education institutions.

**Table 7.** The rating of service environment according to the ownership structure of higher education institutions

	Department of Education	AS	SD	T	df	importance
How do you rate ambient of your institution?	State	2,80	,756	-25,30	747	,000
	Private	4,76	,738			

Source: research by the author

There was a statistically significant difference among the students of the state and the private sector in terms of satisfaction with buildings and rooms for classes. A lot of students are satisfied with the private sector.

**Table 8.** Correlation of quality of exposure for teachers and general evaluation of institutions. Count Cross tabulation

		How would you rate the average score of the institution where you study?					Total
		1	2	3	4	5	
How do you rate the quality of teacher's presentations?	They come unprepared to class	0	36	10	0	0	46
	They know a lot, but they do not know how to transfer knowledge	5	253	112	62	0	432
	Clearly and understandably presenting	0	0	23	81	165	269
Total		5	289	145	143	165	747

Source: research by the author

Chi-Square Tests

	Value	df	importance
Pearson Chi-Square	339,202(a)	8	,000

Directional Measures

		Value
Nominal by Interval	Eta	,512

As can be seen, between the mode of presentation for teachers and general evaluation of the institution, there is a statistically significant positive correlation. Although the students evaluated the overall motivation of the staff, the staffs in the higher education institutions district are numerous and are the main carriers of educational activities. For this reason, we make a correlation between the quality of presentations of teachers and their willingness to work with students.

**Table 9.** Correlation of performance assessment of student services and general evaluation of institutions

		How do you evaluate work of student's service?
	Pearson Correlation	,844(**)
	importance	,000
	N	747

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

There was a statistically significant positive correlation, it can be concluded that the work of student services greatly affect the overall evaluation of the institution that occupies an important place in the attitudes and perceptions of the educational services throughout the facility.

**Table 10.** Correlation between service atmosphere and general evaluation of institutions

		Average rate of your institution?
How do you rate the layout and arrangement of buildings and classes?	Pearson Correlation	,885(**)
	importance	,000
	N	747

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

As can be seen, there is a statistically significant positive correlation between the service atmosphere and general evaluation of the institution. It is interesting to note that correlation between average grades and possible recommendations to the institution in which is studying.

**Table 11.** Correlation between average grades and possible recommendations to the institution in which is studying

How would you rate the average score of your institution?	Would you recommend your institution?		Total
	yes	No	
1	6	12	18
2	5	67	72
3	96	183	279
4	193	8	201
5	177	0	177
Total	477	270	747

Source: research by the author

Based on our research, it has been a statistically significant correlation between the three elements (ways of providing services, employees and the service ambient) and general evaluation of higher education institutions, which reflects the degree of satisfaction of users of educational services.

### Discussion of results

Dispersed structure of values makes it difficult to measuring the success of higher education institutions. The criterion of high profits, of course, is important, but not enough in business of education. Success can be measured by the structure and the number of scientific papers and research projects, the achievement level of the

students, the quality of teaching and professorial corps, public reputation, and so on. Then Marketing management should ensure a balance of effort in creating value for customers (eg: too many students require increased involvement of teachers, thereby negatively affecting their scientific and research paperworks).

From the (Table 1, 2) above it can be seen that there is a higher level of customer satisfaction education services (students) who are studying in higher education institutions in Serbia, that are implementing the marketing activities and the level of satisfaction with smaller institutions that do not carry out marketing activities. Research confirms the first hypothesis. Therefore, for their survival in the market, it is essential that higher education institutions adopt and implement marketing concept.

Proving the second hypothesis required strong determination. It was determined the correlation between the degree of satisfaction of education services (students) and the three elements of the model servuqtion: ways of providing knowledge transfer (services), employees and service environment. (Termin Servuqtion means SERVICES and QUALITY. Model of Servuqtion aims to show the effects of four factors on the buyer/user services. Three factors are visible to users: environment, employees and other users, or others, and one is invisible – organization and management.) In this case, the method of providing services is related to the quality of teachers and exposure to the work of student services.

Quality of teachers in private and public institutions of higher education is perceived positively, as measured by student evaluations (Table 4). This result was confirmed by a significant positive correlation between the quality of the transfer of knowledge and motivation of teachers (Table 5). It is noted that the work of student services of private higher education institutions rated as excellent (4.82), compared to a state-owned institutions (2.88), ie., a weak evaluation of three (Table 5). And the third element, landscaping, the environment in which services are provided higher education (Table 6) shows that the institution of private property invest significantly more effort in ensuring appropriate working conditions for students and teachers. The willingness of students to recommend higher education institution (where i study) is accepted as the assessment criteria of success marketing activities. The survey results (Table 11) confirm the second hypothesis – that the quality of service in higher education institutions in Serbia depends on the configuration properties of a successful education.

Finally, the third hypothesis (that the results of marketing management in higher education institutions are expressing increased customer satisfaction) is confirmed in results of study (Table 9-11). The high degree of positive correlation characteristics of services with a general assessment of higher education institutions in Serbia shows that the success of marketing activities directly dependent on the degree of customer satisfaction.

Also, private higher education institutions have a significantly higher average grade from the state. Also, it can be seen that students give higher rating of the institution in which they study, are more likely to recommend their institution to potential students. Rating is an expression of satisfaction with the institution where the student is studying.

If the institutions are more efficient and better satisfy the expectations and needs of its customers, it also reviews user to establish higher rates. Since that meeting the expectations and efficiently meeting the user's needs of educational services is one of the main objectives of marketing in higher education institutions, from the above it can be concluded that there is a need for acceptance and implementation of marketing.

According to Rindfleish, this forces higher education institutions to increasingly focus on marketing techniques used by profit organizations [14]. According to Paulsen [20], higher education institutions, in order to remain competitive, will have to use a marketing framework consisting of the following: (1) establish its image or market position; (2) identify competition; (3) determine the needs of the various market segments; and (4) develop a marketing plan for promoting their educational services. One of the key issues to the successful development of a marketing strategy is to determine which factor students consider when they have to make a decision on which institution to attend.

### **Conclusion**

Given the length of use of educational services (three years and more), creating satisfied customers is a continuous process which is the primary task of the students regularly enrolled the next year of study, graduate and possibly continue their education through the master's and doctoral studies and after completing of the study continued cooperation with the institution where they have studied. In addition, users will be satisfied with oral spread a positive image of the institution in which they study, the potential beneficiaries of educational services. Otherwise, if the users dissatisfaction occurs, usually comes to withdrawing from the study and dissemination of the negative image of the institution.

Higher education institutions are service organizations that provide educational services to users. One of the main specificities of higher education, even in comparison to other service and industries, is that the service provides a number of years and what is its value after successful completion of use, lifetime. On satisfaction of educational services is influenced by many factors, but in most of them the dominant role of man - one who provides the service. The survey results should serve as a basis or ideas for the development of internal marketing, which should enable the recruitment, selection, training, motivation and retention of employees and encourage the best individuals. Higher education institutions are in a unique position to build good relations with existing customers directly affected by the increase in the number of users in the future tense. The advantages of this approach are multiple: increase the satisfaction of existing customers and at relatively low costs shall be the promotion of higher education and to the sources of information that has the most confidence.

Justification of determining the marketing concept, and then the success of the implementation of marketing activities assumes a complex process of inductive research. Since the results of marketing activity are intangible it involves the use of indirect criteria. In this paper, it was the accepted criterion of customer satisfaction – students in higher education institutions. Thereby, the measurement of satisfaction of

users according to different parameters tested, according to defined the hypothesis set. Therefore, future development and application of marketing in higher education in Serbia should be directed to: the satisfaction of increased needs and requirements of educational services; effective links between education and the labor market, increasing attention to improving the quality of the overall service of the institution, the development and implementation of new forms of education, development of more effective communication with the relevant environmental factors, user involvement in the assessment of the results of the educational process in order to increase their satisfaction and reduce dropout rates and the creation of partnerships between higher education institutions and their customers.

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## MARKETING I VISOKO OBRAZOVANJE-STANJE U SRBIJI

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### Apstrakt

*Smanjena ulaganja države (u javnom sektoru) u obrazovanju ili samostalnom finansiranju (u privatnom sektoru), porast broja studenata i konkurenata, negativni demografski i ekonomski trendovi u Srbiji, naglašavaju neophodnost primene marketinga, izbor adekvatne marketing filozofije i sistemski pristup rešavanju problema. Učenici koji se upisuju na visokoškolske ustanove i njihovi roditelji koji finansiraju studiranje, imaju relativno malo informacija o kvalitetu obrazovanja koje im određena ustanova pruža, kao i mogućnostima zapošljavanja nakon njenog završetka. Stoga je neophodno da se uspostavi komunikacija između davaoca usluga i korisnika i to sadašnjih, ali i potencijalnih.*

*Ključni preduslovi za razvoj uspešne marketing strategije se odnose na izbor ciljnog tržišta i koordinaciju instrumenata marketing miksa.*

**Ključne reči:** *marketing, visokoškolske ustanove, Srbija.*

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## THE EFFECT OF MARKET ORIENTATION ON BUSINESS PERFORMANCE OF SERBIAN ORGANIC PRODUCERS

*Semir Vehapi<sup>1</sup>, Marina Milanović<sup>2</sup>*

### Summary

*In the current conditions, market orientation plays a vital role in the generation of superior performances and the achievement of a competitive advantage. Even though the concept of market orientation was evaluated in various studies, there are very few such studies in the context of the Serbian economy, and in the organic food industry there are almost none. Thus the basic aim of this paper is to examine the degree of practicing market orientation in the businesses of Serbian organic food producers, and to identify a connection between their market orientation and business performance. In the paper we applied a cultural perspective in the measuring of market orientation by using the MKTOR scale as a basis. On a sample of 42 surveyed producers, it was confirmed that the elements of market orientation directly and positively affect sales growth, market share and profitability, as well as overall business performance.*

**Key words:** market orientation, business performance, producers, organic food, Serbia.

**JEL:** M31, Q13, L66

### Introduction

At a time marked by constant changes in consumer preferences, rapid technical-technological development and increasing rivalry among competitors, it is becoming essential for companies to develop an effective mechanism for reacting to market changes which in market literature is known as market orientation (MO). *Goldman and Grinstein* (2010) indicate that MO is becoming a crucial strategy for realizing and maintaining a competitive advantage in an unstable business environment. According to most authors MO represents an implementation of marketing concepts (Kohli & Jaworski, 1990; Deng & Dart 1994; Gray, Matear, Boshoff, & Matheson, 1998;

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Appiah-Adu, 1998a; Appiah-Adu & Singh, 1998; Lafferty & Hult, 2001; Guo, 2002; Caruana, Pitt, & Ewing, 2003; Agarwal, Krishna Erramilli, & Dev, 2003). However, laying the foundations for MO is not easy or simple. Namely, different authors writing from various stand point are studying the aforementioned phenomenon, which as a result leads to various definitions of the same concept. Two dominant approaches to the conceptual determination and measuring of MO stem from the work of *Narver and Slater* (1990), and *Kohli and Jaworski* (1990). According to *Narver and Slater* (1990), MO consists of three behavioral components: consumer orientation, competitor orientation and interfunctional coordination, and two decision criteria: long-term focus and profitability. Consumer orientation includes knowing the current and future needs of consumers in the target market so that the organization is able to continually deliver superior value to them. Competitor orientation refers to the monitoring and understanding of short-term strengths and weaknesses of the competition as well as their long-term abilities and strategies. Interfunctional coordination represents the coordinated use of all available resources of the organization in the creation of superior value for target consumers (Narver & Slater, 1990). According to the second approach, advocated by *Kohli and Jaworski* (1990) MO has three very important aspects: (1) generating market intelligence which includes the collection of information on the market; (2) spreading market intelligence horizontally and vertically in the organization; and (3) a response in the form of concrete activities taken by organizations in accordance with the market conditions. The definition of *Kohli and Jaworski* is based on the behavioral dimension of interpretation of MO, while *Narver and Slater* base their definition on the cultural dimension of an organization. Despite a distinctive difference, these two interpretations of MO share certain similarities. In both cases scientists point out that an important aspect of MO is the gathering of information from consumers and competitors and emphasize the importance of collective effort in the creation of value for consumers (Julian, Mohamad, Ahmed, & Sefnedi, 2014). However, *Narver and Slater* (1990) are better at comprehending the essence of the marketing concept, including in the concept of MO all the bearers of marketing concepts and emphasizing the long-term perspective of acquiring profit. From that point of view, the approach of *Narver and Slater* could be considered a more encompassing one. This approach is taken as the starting point in studying the effect of MO on business performances in this paper.

Irrespective of the different viewpoints on MO, it is certain that MO is necessary in business management and administration for the increase in business performance (Levitt, 2004). Companies use MO with the aim of achieving a competitive advantage and superior business performance (Li, Zhou, Mo, Yang, & An, 2009). Authors who have studied the consequences of MO agree that it has a positive influence on the business performance of the organization (Ruekert, 1992; Jaworski & Kohli, 1993; Deshpande, Farley, & Webster, 1993; Raju, Lonial, & Gupta, 1995; Rodriguez Cano, Carrillat, & Jaramillo, 2004; Kirca, Jayachandran, & Bearden, 2005; Ellis, 2006; Panigyrakis & Theodoridis, 2007; Olavarrieta & Friedmann, 2008; Morgan, Vorhies, & Mason, 2009; Liao, Chang, Wu, & Katrichis, 2011; Ngo & O’Cass, 2012; Gruber-Muecke &

Hofer, 2015), and especially on financial performance (Narver & Slater, 1990; Dawes, 2000; Shoham, Rose, & Kropp, 2005; Haugland, Myrteit, & Nygaard, 2007; Chao & Spillan, 2010; Rapp, Beitelspacher, Schillewaert, & Baker, 2012). *Pelham* and *Wilson* (1996, 1997a, 1997b, 1999) in several successive studies indicate the existence of a positive connection between MO and business performance at the level of small and medium sized enterprises, while *Salavou* (2002) does the same in his research, which includes small and medium sized enterprises, but within the food and beverage industry. Most of these studies on the effects of MO were carried out in developed countries. However, the positive influence of MO on business performance has been found in transition economies as well (Hooley et al., 2000; Protcko & Dornberger, 2014). In Serbia, empirical studies in this field are still too few considering that a very small number of authors dealt with MO and its effect on business performance (Milisavljević, 2005; Stanković, Đukić, & Popović, 2013). This was the first important motive for carrying out this research. The second motive was based on the huge market potential of organically produced food.

The global organic food market has undergone rapid growth over the past two decades. This market, in the period between 1999-2015 increased four times, achieving a value of 81.6 billion dollars in 2015. The demand for organic food is most prominent in North America and Europe, which together generate 90% of the overall global sales of these products. The greatest per-capita consumption was noted in Switzerland (262€), Denmark (191€) and Sweden (177€). And while developed countries appear to dominate the demand for organic food, undeveloped countries and developing countries have the opportunity to become significant producers and exporters of organic products. Most of the producers of organic food are to be found in countries such as India (585'200), Ethiopia (203'602) and Mexico (200'039) (Willer & Lernoud, 2017). In Serbia, which can in terms of organic food be considered an emerging market, there is a significantly smaller number of producers. Namely, during 2015 there were 300 registered organic food producers and processors. The methods of organic production are implemented on approximately 15'298 ha, which makes up only 0.4% of the overall agricultural land. This production capacity is in agreement with the current level of organic food consumption on the national market. The overall turnover in the organic food sector in Serbia was estimated at US\$ 40 million, while the average annual expenditures was 5 dollars per capita (Willer & Lernoud, 2014, 2017). A deeper understanding of MO and understanding of its role in the business success of the organization can lead to the increase in the number of market oriented organic food producers and thus provide quicker development of the national market. In addition, the development and application of MO in the businesses of organic producers creates the conditions for the expand of this concept in sustainable MO (Mitchell, Wooliscroft, & Higham, 2010).

## Research methodology

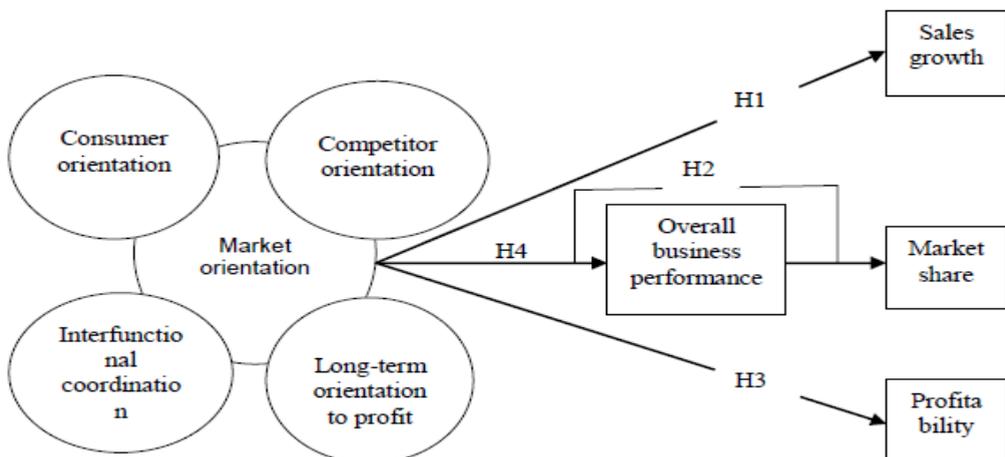
### Hypotheses and conceptual framework

Bearing in mind the fact that the implementation of MO in business contributes to a better understanding of the market, the aim that was set in the research was to study and evaluate the degree of MO in the businesses of Serbian organic food producers, and to identify the connection between their MO and business performances. During the realization of this type of goal, we formed the following hypotheses:

- H1: A higher level of MO in business has a positive influence on the growth in sales;
- H2: A higher level of MO in business has a positive influence on the market share;
- H3: A higher level of MO in business has a positive influence on profitability;
- H4: A higher level of MO in business has a positive effect on the overall business performance.

In accordance with the defined hypotheses, we developed a conceptual framework which consists of an independent and dependent variable. MO represents the independent variable, while the dependent variable is manifested through the indicators of business performance (Fig. 1). The relations among the variables which are hypothesized in this research differ from those which have been indicated in the literature to date. Namely, most of the previous studies focused on the indirect relationship between MO and business performance, including different mediating variables and/or environmental moderators which can influence the strength of this connection (Kohli & Jaworski, 1990; Jaworski & Kohli, 1993; Slater & Narver, 1994; Appiah-Adu1998b; Maydeu-Olivares & Lado, 2003; Kirca et al., 2005; Olavarrieta & Friedmann, 2008; Johnson, Dibrell, & Hansen, 2009; Raju, Lonial, & Crum, 2011; Takata, 2016). Contrary to that, this research deals with the direct effect of MO on business performance.

**Figure 1.** The conceptual framework of the connection between MO and business performance



### Questionnaire development and measures

The research presented in this paper is based on the findings obtained through quantitative analyses, through the means of a survey questionnaire. The measuring instrument used was the structured questionnaire which included 28 questions grouped into three segments. The first group of questions was aimed at studying the intensity of the application of MO in the businesses of domestic organic food producers (14 questions). The second group of questions is focused on measuring the business performance of producers (4 questions), while the third group of questions is formulated with the intention of discovering the basic data and characteristics of Serbian organic food producers (10 questions). All of the questions are represented in the form of closed-end questions with multiple-choice answers and a five-point scale.

Based on the two main approaches in the evaluation of the MO, two different scales for the evaluation of MO emerge: MKTOR (Narver & Slater, 1990) and MARKOR (Kohli, Jaworski, & Kumar, 1993). MO in this study is measured by a scale which is adjusted to suit the MKTOR scale. The reason for opting for the MKTOR scale lies in its suitability for measuring MO on different and heterogeneous markets (Hooley et al., 2000), which makes it an appropriate scale for measuring MO of transition countries, including Serbia. The scale included 14 items, 5 of which were used to measure consumer orientation, 3 to measure competitor orientation, 4 to measure interfunctional coordination and 2 items to measure the long-term orientation towards profit (table 1). The intensity of the items of MO was measured on a five-point Likert scale. The respondents through their answers indicated the extent to which they agreed with the statements on the practices of MO in their businesses. The scale ranges from 1 which means “*I completely disagree*“ to 5 which means “*I completely agree*“.

**Table 1.** The scale used to measure MO

No.	Items
1	Information on competitors is regularly gathered.
2	Our strategic goals and policies are directly aimed at client satisfaction.
3	The level of client satisfaction is regularly evaluated.
4	Our organization differentiates our market offer in relation to the differences in the needs and requirements of various clients.
5	Our organization is focused on building close and strong relationships with our most important clients.
6	Information on competitors is regularly gathered.
7	The comparison of our offer and the offer of our most important competitors is regularly performed.
8	Our organization rapidly responds to any activities of our competitors.
9	Long-term orientation to profit is a characteristic of our organization.
10	Improvement in market performance is equally important as the improvement of internal effectiveness.
11	Information on clients is transferred to all the departments and all the functions of the organization.
12	All the departments in the organization work on satisfying client needs.

No.	Items
13	The structure of our organization is flexible and enables better client services.
14	Rewarding employees is connected with market performance and client satisfaction.

*Source:* adapted from: Narver and Slater (1990)

Measuring business performance requires the differentiation between two basic principles. The first is the objective approach is based on absolute measures, while the other is a subjective approach which primarily takes into consideration performance in relation to competitors or expectations. In this research we relied on a subjective approach where the respondents were asked to rate their business performance over the last three years in relation to their expectations, on a scale from 1 to 5 (1– very poor, 5 – excellent). A subjective approach was selected due to the difficulties in gathering objective data. The measuring included four indicators:

- the market share (Narver & Slater, 1990; Ruekert, 1992; Jaworski & Kohli, 1993; Greenley & Foxall, 1997, 1998);
- sales growth (Narver & Slater, 1990; Ruekert, 1992; Slater & Narver 1994; Greenley & Foxall, 1997, 1998);
- profitability (Greenley and Foxall, 1997, 1998); and
- overall business performance (Kohli & Jaworski, 1990).

The market share was selected since it is a measure based on consumers and is an important indicator in evaluating the performance of the food industry, while increase in growth and profitability are included due to their importance in evaluating organizational effectiveness and efficiency (Gladson Nwokah, 2008, p. 282).

### **Sampling and data collection**

The target population in the research were registered organic food producers on the territory of the Republic of Serbia. The size of the population was determined by the number of producers which were included in the publically available records of the Ministry of Agriculture and Environmental Protection on producers included in organic food production with a permit to produce issued by verified control organizations for 2012, and the list included 1061 producers. Due to financial and logistic obstacles<sup>3</sup> this study could not focus on all the subjects of the target population. Thus the research was carried out on a simple random sample which included 41 producers. The sample predominantly consists of a small sized of producers (56.1%) organized primarily in the form of limited liability organizations (48.8%) and family farms (41.5%) with a majority local capital (95.1%). The largest number of production units (56.1%) can be found on the territory of Vojvodina which might be considered the main zone of production (table 2).

<sup>3</sup> The main obstacle is that most producers have the status of cooperatives and are contractually bound to a particular company – which then buys their entire stock.

**Table 2.** The structure of the sample based on geographic location, the type of organization, origin of capital and size of the organization

Category	Absolute frequency (%)	Relative frequency (%)
<i>Number of employees</i>		
2-9 employees	12	29.3
10-49 employees	23	56.1
50-249 employees	5	12.2
Over 250 employees	1	2.4
<i>Origin of capital</i>		
Mostly local capital	39	95.1
Mostly foreign capital	2	4.9
<i>Type of organization</i>		
Family farm	17	41.5
Limited liability organization	20	48.8
Stock company	1	2.4
Agricultural cooperative	0	0
Entrepreneur	2	4.9
Educational and research facility which deals with agricultural production	1	2.4
<i>Geographic location of the organization</i>		
Vojvodina	23	56.1
Belgrade	8	19.5
Šumadija and West Serbia	5	12.2
South and South-East Serbia	5	12.2
Kosovo and Metohija	0	0
<i>Overall</i>	41	100%

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

A further analysis of the national organic producers reveals other important characteristics of their business. Namely, most of the sample consists of producers whose production has organic status (58.5%), while only 28% are undergoing the process of conversion. The greatest number of respondents have been involved in this type of production for 3-5 years (34.1%), and only a few of them have been involved in organic production for longer than one decade (12.2%). This only confirms the fact that in Serbia, organic production is still in its initial phase of development. The surveyed producers mainly decide to practice both organic and conventional production at the same time (61%). The food processing industry in the national organic food sector indicates a slight improvement which is supported by the significant percentage of surveyed producers who are also involved in the production and processing of organic products (63.4%). In the case of the structure of production, 68.3% of the respondents produce plant products and only 12.2% produce animal products. With such a structure of production, the greatest number of producers is oriented towards the regional market (48.8%) and national market (31.7%).

For the realization of the goals of the research we combined an online interview and a personal interview. The questionnaire was first prepared in electronic form and distributed to approximately 120 randomly selected addresses of producers. One part of the email addresses was obtained through the National Association for Development of Organic Production “Serbia Organica”, while the other addresses were collected by browsing the internet presentations of producers as well as through telephone contacts. Considering that the response rate was low and made up only 10%, the email survey was extended to include a personal interview carried out at the 81<sup>st</sup> International Agricultural Fair held in Novi Sad<sup>4</sup>. The fair participants, who were also included in the sample, were chosen randomly, so that the personal interview included 29 producers. The overall survey lasted from May 8 until June 3, 2014, at which point the survey procedure ended.

### **Data analysis**

The obtained data were processed using SPSS 21 (Statistical Program for Social Science) computer software. The used data processing methods included descriptive and analytical statistical methods. The applied descriptive measures included relative numbers, central tendency measures (means) and dispersion measures (standard deviation). The reliability of the measuring scales was determined using *Cronbach's alpha* coefficient. In order to study the statistical significance between the categories of variables, we carried out a correlation analysis. The level of probability was considered statistically significant at the level  $< 0.05$ .

### **Research findings and discussion**

#### **Results of reliability analysis**

When carrying out the research care must be taken that the scales of measurement are reliable, that is, that there is internal scale consistency. The internal consistency of the items was measured using *Cronbach's alpha* coefficient. The value of this coefficient ranges from 0-1, where the acceptable values are all the values above 0.70 (Pallant, 2011). The value of *Cronbach's alpha* coefficient for MO is 0.908, and for business performance is 0.879. The obtained values by far exceed the borderline values, which indicates adequate reliability and internal consistency of the manifested variables.

#### **The descriptive statistics**

Once the internal consistency of the scale was evaluated, an analysis of the descriptive statistics of the scales which make up the conceptual framework was carried out. The means and standard deviation were used in the analysis. The analysis of the items within the MO scale indicates that the item “*Our organization is focused on building close and strong relationships with our most important clients*” is most pronounced, that is, that most of the participants agree with it (AS = 4.61). Contrary to that, the item “*The level of client*

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4 The 81<sup>st</sup> International Agricultural Fair was held from May 20-26, 2014

*satisfaction is regularly evaluated*' is one that the participants agreed with the least (AS = 3.34). The means for the items which make up the MO scale lead us to the conclusion that in the case of producers, generally there is a moderate to high level of MO.

Within the *Business performance* scale, the participants singled out sales growth as the indicator of performance which the most satisfied their expectations in the last three years (AS = 3.51). On the other hand, profitability is the weakest ranked indicator of business performance (AS = 3.37) (table 5). However, the difference between the means of sales growth and the means of profitability is negligibly small, which indicates that the producers are generally satisfied with the achieved growth in sales, but also the other indicators of performance (market share, profitability and overall performance) over the past three years.

### The results of the normality of distribution test

The normality of distribution was studied using the *Kolmogorov-Smirnov* and *Shapiro-Wilk* tests. Considering that the sample is <50 the results of the *Shapiro-Wilk* test were included in the analysis. The results indicate that the *Shapiro-Wilk* tests are statistically significant (table 3), so the null hypothesis that the distribution is not normal is accepted. Thus, we can conclude that the given variables do not have normal distribution.

**Table 3.** Testing the normality of distribution

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	p	Statistic	df	p
MO	.163	41	.008	.889	41	.001
Sales growth	.238	41	.000	.889	41	.001
Market share	.258	41	.000	.882	41	.000
Profitability	.282	41	.000	.808	41	.000
Overall business performance	.288	41	.000	.813	41	.000

Source: Authors' calculations

### Results of the correlation analysis

The correlation analysis was carried out to determine whether there is a connection between MO and business performance as the basic variables of the initial model, as well as to determine its strength and direction. Considering that the basic assumption of *Pearson's* correlation was not satisfied, the one which refers to the normality of distribution, in this case the connection was studied using *Spearman's rank correlation coefficient (ro)*. According to *Petz* (2004), a rough approximations of the extent of the connection, that is, *Spearman correlation coefficient (ro)* is: a) from  $\pm 0.00$  to  $\pm 0.20$  a weak or slight correlation; b) from  $\pm 0.20$  to  $\pm 0.40$  a middle correlation; c) from  $\pm 0.40$  to  $\pm 0.70$  a significant correlation; and d)  $\pm 0.70$  to  $\pm 1$  high or very high correlation.

There is a statistically significant positive correlation between MO of the organization and the increase in the volume of its sales,  $ro=0.388$ ,  $n=41$ ,  $p<0.012$  (middle correlation). A more

detailed analysis indicates that there is a statistically significant correlation between the sales growth of the organization on the one hand and the following statements: *Long-term orientation to profit is a characteristic of our organization* (a significant correlation), *Our organization is focused on building of close and strong relationships with our most important clients* (a significant correlation), *Information on clients is transferred to all the departments and to all the functions of the organization* (a significant correlation), *Information on competitors is regularly gathered* (a middle correlation), *All of the departments in the organization work on satisfying client needs* (a middle correlation), *Our organization differentiates our market offer in relation to differences in the needs and requirements of various clients* (middle correlation) and *Rewarding employees is connected with market performance and client satisfaction* (middle correlation) (table 4, column 3). All of the statistically significant correlations are positive, which means that with an increase in the value of one, there is an increase in the value of the other variable. The order of the statements is determined based on the intensity of the correlation. Therefore, hypothesis H1 has been confirmed.

There is a statistically significant positive correlation between the MO of a business and its market share,  $r=0.319$ ,  $n=41$ ,  $p<0.042$  (middle correlation). A more detailed analysis indicates that there is a statistically significant correlation between the market share of an organization on the one hand and the following statements: *Improvement in market performance is equally important as the improvement of internal effectiveness* (a middle correlation), *Information on competitors is regularly gathered* (middle correlation) and *All the departments in the organization work on satisfying client needs* (middle correlation). All of the statistically significant correlations are positive (table 4, column 4). Thus, the hypothesis that a higher level of MO of the organization has a positive influence on its market share.

There is a statistically significant positive correlation between MO of the organization and its profitability,  $r=0.456$ ,  $n=41$ ,  $p<0.003$  (a significant correlation). A more detailed analysis indicates that there is a statistically significant correlation between profitability of the organization on the one hand and the following statements: *Information on clients is transferred to all the departments and to all the functions of the organization* (a significant correlation), *Long-term orientation to profit is a characteristic of our organization* (a significant correlation), *Information on competitors is regularly gathered* (a middle correlation), *Our strategic goals and policies are directly focused on the building client satisfaction* (a middle correlation), *Information on client needs and requirements is regularly gathered* (a middle correlation), *Our organization is focused on the building of close and strong relationships with our most important clients* (a middle correlation), *All of the departments in the organization work on satisfying client needs* (a middle correlation) and *Our organization rapidly responds to any activities of our competitors* (a middle correlation). All of the statistically significant correlations are positive (table 4, column 5). Based on that, we have confirmed the hypothesis that a higher level of MO has a positive influence on its profitability.

There is a statistically significant positive correlation between MO and the overall business performance,  $r=0.379$ ,  $n=41$ ,  $p<0.015$  (a middle correlation). A more detailed analysis indicates that there is a statistically significant correlation between business

performance on the one hand and the following statements: *Information on competitors is regularly gathered* (a significant correlation), *Our organization differentiates our market offer in relation to the differences in the needs and requirements of various clients* (a middle correlation), *The level of client satisfaction is regularly evaluated* (a middle correlation), *The comparison of our offer and the offer of our most important competitors is regularly performed* (a middle correlation) and *Improvement in market performance is equally important as the improvement of internal effectiveness* (a middle correlation). All of the statistically significant correlations are positive (table 4, column 6). Once again we proved the hypothesis that the higher level of MO has a positive effect on overall business performance.

**Table 4.** The correlation between MO and indicators of business performance

		<b>Sales growth</b>	<b>Market share</b>	<b>Profitability</b>	<b>Overall performance</b>
MO	ro	<b>.388*</b>	<b>.319*</b>	<b>.456**</b>	<b>.379*</b>
	p	<b>.012</b>	<b>.042</b>	<b>.003</b>	<b>.015</b>
<i>Items of MO</i>					
Information on client needs and requirements is regularly gathered.	ro	.118	.197	<b>.361*</b>	.287
	p	.463	.217	<b>.021</b>	.069
Our strategic goals and policies are directly aimed at client satisfaction.	ro	.252	.304	<b>.368*</b>	.302
	p	.112	.053	<b>.018</b>	.055
The level of client satisfaction is regularly evaluated.	ro	.211	.159	.090	<b>.351*</b>
	p	.185	.321	.575	<b>.024</b>
Our organization differentiates our market offer in relation to the differences in the needs and requirements of various clients.	ro	<b>.360*</b>	.184	.263	<b>.373*</b>
	p	<b>.021</b>	.249	.096	<b>.016</b>
Our organization is focused on building close and strong relationships with our most important clients.	ro	<b>.461*</b>	.308	<b>.358*</b>	.204
	p	<b>.002</b>	.050	<b>.022</b>	.202
Information on competitors is regularly gathered.	ro	<b>.378*</b>	<b>.352*</b>	<b>.377*</b>	<b>.434**</b>
	p	<b>.015</b>	<b>.024</b>	<b>.015</b>	<b>.005</b>
The comparison of our offer and the offer of our most important competitors is regularly performed.	ro	.088	.151	.255	<b>.343*</b>
	p	.583	.347	.108	<b>.028</b>
Our organization rapidly responds to any activities of our competitors.	ro	.058	.056	<b>.339*</b>	.269
	p	.718	.726	<b>.030</b>	.090

		<b>Sales growth</b>	<b>Market share</b>	<b>Profitability</b>	<b>Overall performance</b>
Long-term orientation to profit is a characteristic of our organization.	ro	<b>.444**</b>	.234	<b>.427**</b>	.203
	p	<b>.004</b>	.141	<b>.005</b>	.204
Improvement in market performance is equally important as the improvement of internal effectiveness.	ro	.145	<b>.383*</b>	.142	<b>.319*</b>
	p	.366	<b>.014</b>	.377	<b>.042</b>
Information on clients is transferred to all the departments and all the functions of the organization.	ro	<b>.425**</b>	.231	<b>.439**</b>	.192
	p	<b>.006</b>	.146	<b>.004</b>	.229
All of the departments in the organization work on satisfying client needs.	ro	<b>.366*</b>	<b>.325*</b>	<b>.357*</b>	.247
	p	<b>.019</b>	<b>.038</b>	<b>.022</b>	.119
The structure of our organization is flexible and enables better client services.	ro	.160	.229	.274	.217
	p	.316	.150	.083	.172
Rewarding employees is connected with market performance and client satisfaction.	ro	<b>.352*</b>	.258	.172	.257
	p	<b>.024</b>	.103	.283	.104
* rho – the Spearman correlation coefficient; p – statistical significance; *Statistical significance at the level 0.05; **Statistical significance at the level 0.01					

Source: Authors' calculations

### Conclusion - implication, limitations and future research directions

This study provides empirical evidence that MO of organic food producers has a positive effect on their business performance. The positive effect of MO on selected indicators of performance has been confirmed for all the indicators of performance (sales growth, profitability and the market share) as well as the overall business performance. At the same time, the strongest positive influence of MO is realized on profitability, and the weakest influence on sales growth. Of the individual items of MO, the most significant ones for the improvement of business performance are the following: *Information on the competitors is regularly gathered, Our organization is focused on building close and strong relationships with our most important clients, Information on clients is transferred to all the departments and all the functions of the organization and Long-term orientation to profit is a characteristic of our organization.* This indicates that customer orientation, competitor orientation and interfunctional coordination are equally important dimensions of MO, while long-term profitability is the ultimate goal of market orientated companies.

The results of this research could aid organic food producers in Serbia to realize the importance of MO as a key factor of performance improvement. The producers should first attempt to continually gather information on the needs and requirements of current and potential consumers. What is more, producers should rate the satisfaction of their clients regularly, and care for their clients even after the completion of sales and provision of services. In addition, management should gather information on direct and indirect competitors, at the same time monitoring their activities, strategies and products. The essential information on clients and competitors needs to be distributed through all the levels of the organization. During regular staff meetings, the obtained information on clients and competitors could be analyzed, and new ways of organizing responses to current market information could be suggested. If the organization were to respond by providing greater value to the clients than the competitors, it could acquire the favor of and trust of the clients. Loyal consumers usually return to purchase once again and become immune to the pressure of competitors thereby generating increased sales for the organization. The result is an increase in the market share. Greater sales growth and a greater market share in comparison to the competitors leads to greater income and thus greater potential profitability.

In addition to its significant contribution to the improvement of management theory and practice, the empirical study has several limitations which do not significantly diminish the quality of the obtained results. The first potential limitation of the research results is the knowledge that the questionnaire might have been completed by individuals who are not in charge of marketing, which might be a consequence of the choice of an online survey. The second potential limitation refers to the fact that no moderating variables were included in the study on the connection between MO and business performance. Thirdly, there is the possibility that the surveyed producers, with or without the intention of being prejudiced in offering responses, evaluating the claims in the questionnaire by overestimating their market power. The limitation of this, as well as most other studies, lies in the lack of any monitoring of marketing activities of producers over time. Finally, a relatively small sample could limit the validity of the conclusions drawn in relation to the research questions.

Based on existing research and the previously cited limitations, in this study we suggested several possible directions for future research. Mainly, the connection between MO and business performance should be studied over a period of time exceeding three years, which made up the studied interval of business performance in this study. Along with the development of the organic food market, the connection between MO and business performance should be studied and analyzed in a wider context. This means that the goal of upcoming research should be to study factors which could be moderators of the influence of MO on the business performance of organizations. In the case of business performance, there is much room for further research both in the selection of the measures of performance and the means of their measuring. Starting from a multidimensionality in performance, we should take into consideration the inclusion of other nonfinancial measures of performance which could help in the evaluation of short-

term results. In addition, further studies might include both objective and subjective approaches to measuring performance. This certainly includes the public being allowed access to financial reports of the analyzed organizations.

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## UTICAJ TRŽIŠNE ORIJENTACIJE NA POSLOVNE PERFORMANSE PROIZVOĐAČA ORGANSKE HRANE IZ SRBIJE

*Semir Vehapi<sup>5</sup>, Marina Milanović<sup>6</sup>*

### Rezime

*U savremenim uslovima tržišna orijentacija ima vitalnu ulogu u generisanju superiornih performansi i kreiranju konkurentne prednosti. Mada je koncept tržišne orijentacije bio izučavan u različitim studijama, postoji jako malo takvih istraživanja u kontekstu srpske privrede, dok u kontekstu industrije organske hrane gotovo i da ih nema. Stoga je osnovni cilj rada da istraži stepen prihvatanja tržišne orijentacije u poslovanju proizvođača organske hrane u Srbiji i da identifikuje vezu između njihove tržišne orijentacije i poslovnih performansi. U radu je primenjena kulturološka perspektiva u merenju tržišne orijentacije korišćenjem MKTOR skale kao osnove. Na uzorku od 42 anketirana proizvođača, potvrđeno je da elementi tržišne orijentacije direktno i pozitivno utiču na rast prodaje, tržišno učešće i profitabilnost, kao i na ukupne poslovne performanse.*

**Ključne reči:** *tržišna orijentacija, poslovne performanse, proizvođači, organska hrana, Srbija.*

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## CHALLENGES AT STARTING AN AGRIBUSINESS IN THE HILLY-MOUNTAINOUS REGIONS OF SOUTHWEST SERBIA

*Suad Bećirović<sup>1</sup>, Šemsudin Plojović<sup>2</sup>, Enis Ujkanović<sup>3</sup>, Senadin Plojović<sup>4</sup>*

### Summary

*To identify the concrete challenges faced by potential entrepreneurs in agribusiness, a field research was conducted using unstructured interviews to interview 113 farmers from the municipalities of Novi Pazar, Raška, Sjenica, Tutin, Nova Varoš, Prijepolje, Priboj and Ivanjica. The received answers were classified into five groups: infrastructural conditions, access to public services, farm enlargement, market access and availability of funding sources. To solve these problems, the authors propose, among others, investment in infrastructure, change in the taxation of agricultural land, reforming agricultural cooperatives and designing new financial instruments according to the needs of farmers and local specificities. The role of modern cooperatives, where active farmers, land owners and investors will contribute their knowledge and capital, are especially emphasized by the authors.*

**Key words:** agribusiness, land tax, cooperatives, mountainous area, southwest Serbia.

**JEL:** Q13, Q14, Q15

### Introduction

Agriculture has a significant role in Serbian economy. In 2006, the agricultural sector had a share of 11.4% of GDP, whereas it decreased slightly to 9.3% in 2014. (World Bank, 2017a) The high share of agriculture in GDP and the fact that agriculture is a labor-intensive industry makes the agricultural sector one of the most important employers in Serbia. In 2006, almost every fifth employed person in Serbia worked

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in the agricultural sector, whereas this number decreased eight years later to 17.1%. (World Bank, 2017b)

Agricultural production in Serbia makes also a large portion of Serbian exports. In 2006, the share of food, drinks and tobacco exports in total exports was at 18.7%, with an increase to 19.8% in 2014. On the other hand, agricultural products make only 6.4% of total imports in Serbia (SORS 2007; 2015). The agricultural trade surplus is important for the country known for its negative trade balance. In the period 2013-2016, agricultural imports and exports to the EU were rising continuously reaching an export value of €1,223 million, with imports at €1,035 million, causing the positive trade balance of €188 million (EU, 2016).

Despite these positive developments, the 2012 Census of Agriculture ascertained two very disturbing facts regarding land resources: 1) agricultural land of agricultural holdings (3,861,477 ha) covers less than half (49.8%) of the territory of Serbia (7,759,200 ha) and 2) even 424,054 ha or 11.0% of this land is not utilized. (Ševarlić, 2012).

In the eight municipalities covered by this research, 20.3% of the agricultural land is not utilized. The municipality of Sjenica has 26,782 ha of non-utilized agricultural land, which makes 33.5% of the total agricultural land. In the municipalities of Novi Pazar and Ivanjica about 27% of the agricultural land is unused and in Raška 15.5%. However, in the municipalities of Prijepolje, Priboj, Nova Varoš and Tutin less than 10% of the agricultural land is not utilized (Census of Agriculture, 2012). This shows a great disproportion within the observed municipalities, although they all have great agricultural potential. Especially Sjenica offers vast pastures, which are unfortunately not utilized in a sufficient manner.

It is quite clear that this unused agricultural land could be cultivated again, for example in organic food production where the hilly-mountainous areas of southwest Serbia has a comparative advantage, which could lead to increased employment and an increase in exports of agricultural products. The unused land could be also used for honey production by planting acacia, lime and chestnut (Ševarlić, 2012). But the questions arise: why do people avoid such investments? Can farmers from southwest Serbia compete in the open market? Will they be able to adapt to international standards in agriculture? Can they compete with genetically modified products, once their import is allowed in Serbia, or will they be ready to pay license fees for using patented seeds? To give the answers to these questions, we want to present the results of our research in the following sections.

### **Materials and Methods**

Southwest Serbia faces different development constraints, especially a high unemployment rate and an increasing depopulation of villages. At first sight, it would seem logical that one part of the population, particularly the younger ones, should start an agribusiness, since southwest Serbia offers vast portions of high-quality agricultural land, which is often uncultivated. However, empirical evidence shows that this is not the case. Therefore, the goal of this paper is to analyze the problems faced by small farmers who are willing to start an entrepreneurial venture in agriculture.

In identifying the challenges faced by potential entrepreneurs in rural areas two methods were used. First, the authors used existing research and data from the Serbian Ministry of Agriculture, Forestry and Water Management (MAFWM), the World Bank, the European Union (EU) and the Statistical Office of the Republic of Serbia (SORS). The authors also rely on their previous research on the development of agribusinesses as well as on the experiences of other countries in this field.

Second, to identify the concrete challenges faced by potential entrepreneurs in agribusiness, a field research was conducted, according to phenomenological methodology proposed by Berglund (2007), where the authors used unstructured interviews with active and formerly active farmers to fundamentally study their problems, needs and thoughts about their way of life and their expectations. Existing research served as a good starting point for the conversation with farmers. The applied method of unstructured interviews gave respondents room to speak freely, so the authors were able to gain new insights about the life of the farmers in southwest Serbia.

**Figure 1.** Municipalities covered by this research (marked in grey)



*Source:* Map adapted from SORS (2016a).

The authors interviewed 113 randomly selected farmers, of which 86 were active and 27 non-active farmers, abandoning their venture during the last two years, from the municipalities of Novi Pazar, Raška, Sjenica, Tutin, Nova Varoš, Prijepolje, Priboj and Ivanjica (Figure 1). At first sight, the number of 113 farmers seems quite high for a qualitative research. However, keeping in mind that many active farmers often have a lower level of education and are relatively elderly persons (above 50 years), the interviews were of different length and quality. Interview duration was highly varying – from five minutes to 60 minutes, with an average duration of 20 minutes. At short interviews, the authors only received general slogans than concrete answers to their

questions. The authors often observed that the farmers face certain type of challenges, but were not being able to explain in detail the problems they face.

In order to gain trust of the farmers, the authors avoided any taping of the interviews, but captured information by taking notes. This notes were analyzed according to data analysis method proposed by Giorgi, mentioned in Berglund (2007), comprising of re-reading the protocols, dividing them into isolated “meaning units”, translating the protocols into standard language and synthesizing and analyzing the transformed meaning units. To reduce subjective interpretation by the interviewers and the interviewees, the authors compared the collected data with the existing research and official data.

Finally, the authors have even gone a step further, in addition to identifying the challenges in developing entrepreneurial ventures in agribusiness and suggested possible models to overcome these challenges.

## **Results and Discussion**

To analyze the challenges, small farmers face in southwest Serbia, we classified all meaning units from the executed interviews into five groups: 1) infrastructural conditions, 2) access to public services, 3) farm enlargement, 4) market access and 5) availability of funding sources.

To show the process of forming meaning units from the collected notes, the authors will present major excerpts from the collected data. Furthermore, to make a clear distinction between the statements of the farmers and the authors, farmers’ accounts are presented using direct quotes.

### **Infrastructural conditions**

Southwest Serbia is isolated from major road networks. The city of Novi Pazar is 170 km away from the closest entry point to the major motorway Belgrade-Niš. Another problem is the quality of the main roads between urban centers. The lack of an adequate road infrastructure leads to longer delivery times for fresh agricultural products, which leads to an income decrease for farmers. This can be seen from the following example explained by one of the interviewed farmers: “When I pick my high-quality raspberries, I have eight kilometers to Novi Pazar, [of which] four kilometers [are] on unpaved road. This journey takes me half an hour. When I arrive at the destination to hand over the fresh raspberries, the quality has already decreased, so I can sell them only as second class.”

Another important infrastructural condition is poor electric power quality. The voltage and current are very unstable. This often leads to a failure of electric motors, which impedes the use of technology in these areas.

**Table 1.** Examples of farmers' statements with regard to infrastructure

Farmers' statements	Generalization	Synthesis
"We do not have asphalted roads." "Transport to market takes too long." "We have high transportation costs."	Lack of quality road infrastructure	Distribution of agricultural products is difficult due to: <ul style="list-style-type: none"> <li>• Lack of asphalted roads in rural areas</li> <li>• Lack of quality roads between urban centers</li> <li>• Distance of motorways</li> </ul>
"Look, how far we are from the motorway."	Distance of motorways	
"Electricity often disappears."	Power supply is not stable.	Lack of quality power supply reduces the use of electrical machines.
"Voltage is too weak to start electric devices."	Offered voltage is too low.	
"We do not have a fast internet."	Internet connection is bad.	Lack of fast internet connections complicates information supply.
"We have only slow internet on mobile [phone]."		

Source: Own illustration

The third important type of infrastructure is communication infrastructure, especially the internet connection. Internet can be used for many purposes, among others for the sale of products and to gather valuable information about prices and subsidies. But, generally a slow internet connection is offered in the villages of southwest Serbia, due to the small number of potential users.

### Access to public services

**Table 2.** Examples of farmers' statements with regard to access to public services

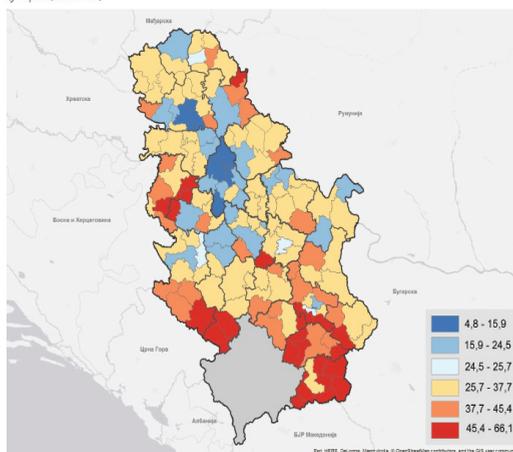
Farmers' statements	Generalization	Synthesis
"Our children have to walk several kilometers to school and without meeting anyone."	Schools are far away from individual houses, without public transport.	Young couples leave rural areas due to: <ul style="list-style-type: none"> <li>• Lack of quality education.</li> <li>• Lack of public transport to school.</li> <li>• Lack of other children, impeding socialization</li> </ul>
"Teaching classes are very small."	Small teaching classes due to a small number of children.	
"Teachers cannot come to school during bad weather."	Bad infrastructure to school.	
"Cannot go to doctor regularly."	Hospitals and other medical services are far away from rural areas.	Basic medical needs cannot be satisfied in rural areas.
"Have to go to town for any medicine."		

Source: Own illustration

The poverty rate in southwest Serbia is one of the highest in the country and in the municipalities covered by this research rates from 35.9% in Ivanjica to even 66.1% in Tutin (Figure 2).

**Figure 2.** Poverty Map of Serbia (Poverty rate in %)

Слика 2: Мапа сиромаштва у Србији у 2011. години: стопе ризика сиромаштва (у процентима)



Source: SORS and World Bank, (2016).

Rural poverty is probably one of the worst forms of poverty, because the individual is placed away from different public services (schools, hospitals, roads etc.). A sizable percentage of interviewees, especially the young couples with small children, highlighted the problem of the distance of the school from houses. During the last years, media is increasingly writing about the phenomenon that pupils must travel even 16 km to the school, under very difficult circumstances. The lack of quality roads does not allow the use of busses for the children, so these pupils go on foot or ride a horse. Due to emigration from villages, pupils travel several kilometers without meeting a person (Telegraf, 2017, January 17). Another consequence of emigrations is a decrease in the number of pupils, so teachers have often only one or two children for teaching in one school class, which affects the quality of education and increases the costs for the state (Mulić-Softić, 2015, February 21).

The authors propose forming a national distance learning program for children in rural areas where parents would be paid a certain amount for their work as supervisor for distance learning. To facilitate the process of socializing with other children and to monitor the success of distance learning, meetings in the local school should be organized periodically.

### Farm enlargement

The utilized agricultural land per agricultural holding is very small and divided into many small pieces, which is often surrounded by non-utilized land. The average utilized agricultural area (UAA) per holding in the researched municipalities is 5.07 ha (from 3.01 ha in Raška to 9.74 ha in Sjenica), which is slightly below the national average of 5.44 ha (SORS, 2013a). It is quite clear that a size of 5 ha per holding is too small to develop a profitable agribusiness. Only 1.5% of the total agricultural holdings own land

the size above 20 ha, cultivating 27.5% of UAA in these eight municipalities. On the other hand, holdings possessing less or equal to 10 ha of farmland make 91.4% of all agricultural holdings and cultivate 53.8% of the UAA (Table 4).

**Table 3.** Examples of farmers' statements with regard to access to the farm size

Farmers' statements	Generalization	Synthesis
"We have only small land."	Agricultural holdings are very small.	Small agricultural holdings imply a low profitability.
"My land is divided into many pieces."	Small land is not concentrated, but distributed on a large area.	
"Land is not utilized, but I cannot use it."	There is much non-utilized land in the region.	

Source: Own illustration

**Table 4.** Size of Agricultural Holdings in the Municipalities Covered by Research

Size of Agricultural Holding	Number of Agricultural Holdings	% share	Owned agricultural land (in ha)	% share
0 ha	87	0.22%	0	0.00%
≤ 1 ha	9,184	22.70%	5,403	2.63%
> 1 - ≤ 2 ha	7,879	19.48%	11,880	5.79%
> 2 - ≤ 5 ha	12,663	31.30%	42,393	20.66%
> 5 - ≤ 10 ha	7,160	17.70%	50,654	24.69%
> 10 - ≤ 20 ha	2,870	7.09%	38,473	18.75%
> 20 - ≤ 30 ha	423	1.05%	10,397	5.07%
> 30 - ≤ 50 ha	144	0.36%	5,433	2.65%
> 50 - ≤ 100 ha	33	0.08%	2,149	1.05%
> 100 ha	12	0.03%	38,397	18.71%
SUM	40,455	100.00%	205,179	100.00%

Source: SORS, 2013a

To increase the competitiveness of agricultural holdings, it is necessary to increase the utilized farmland per holding. Therefore, the authors propose a change of tax policy towards owners of non-utilized agricultural land.

Under the current circumstances, many inhabitants of rural areas leave their farmland and move to urban areas or even go abroad. However, their owned agricultural land is not sold, because they will only receive a relatively small amount for their real estate in rural areas, due to a low demand. Many migrants from rural to urban areas believe it is not worth to sell 5 ha of farmland to be able to buy a 0.1-acre plot in an urban area. The same is true for leasing farmland, where the prices are also relatively low. A distinctive feature is the case of restituted land, which is often not used intensively, because many of the former owners, or their heirs, have moved to other parts of Serbia or even have emigrated. It is necessary to change tax policy to make the hoarding of non-utilized land expensive.

The Property Tax Law (RS Official Gazette, Nos. 26/01, 45/02, FRY Official Gazette, No. 42/02, RS Official Gazette, Nos. 80/02, 135/04, 61/07, 5/09, 101/10, 24/11, 78/11, 57/12 - US, 47/13, 68/14) offers tax exemptions for agricultural and forest land, which is being put to its original use and buildings intended and used for primary agricultural production, in conformity with the law dealing with agricultural land (Art.12). In the authors' opinion, utilized agricultural land should be exempted from the property tax and the Property Tax Law should replace the term "agricultural land" with "non-utilized agricultural land" (Art. 2, Art. 6).

Furthermore, it is necessary to change the tax base for non-utilized agricultural land, which is determined by the municipality according to useful area and the average price per square meter of corresponding real estate in the zone in which the real estate is located (Art.5, Art. 6.) The authors propose the minimum tax base for non-utilized land in amount of 25% of the tax rate for building plots.

So, let us assume the following case. We assume that a person owns 5 ha of non-utilized agricultural land in the City of Novi Pazar sixth and seventh zone, respectively. According to the average prices determined by Decision on the determination of average prices for square meters of real estate for determining property tax for 2017 on the territory of the City of Novi Pazar (OG NP, No. 9/2015) and a tax rate of 0.3% imposed on land (Property Tax Law, Art. 11), the owner must pay annually 7,350 RSD (€59.53) in the sixth zone and 4,500 RSD (€36.45) in the seventh zone. It is quite clear that in such a case there is no burden on the owner to sell or lease the farmland. Therefore, if the above proposed tax rate was applied a land owner would have to pay 218,700 RSD (€1,771.28) and 139,912.50 RSD (€1,133.17), respectively. Under such circumstances, a land owner will certainly be ready to lease or sell his farmland, which will lead to increased land utilization and farm enlargement.

### **Market access**

Market access means that the farmer is present with an offer and can continuously interact as a supplier with the customer, and that the customers are informed about the conditions of the offer. The market situation for farmers from the hilly-mountainous region of southwest Serbia is not favorable. Analyses of the interviews with farmers indicate small production quantities and a lack of support in marketing of agricultural products that lead to a low return on investment. Farmers also claim that the terms of sale are dictated by middlemen and large customers, such as processors and retailers, who take the biggest part of the profit margin. This claim can be confirmed by empirical data shown in table 6.

Farmers, who want to avoid selling to intermediaries, sell their products locally directly to customers, causing large transport costs and logistical efforts for them, which results in a low return of their sales. Another problem is storage, which is not owned by farmers, causing additional losses. And finally, farms are managed mainly by older owners who are not interested in new agribusiness investments.

**Table 5.** Examples of farmers' statements with regard to access to market access

Farmers' statements	Generalization	Synthesis
"We only receive a small price for our products."	Profit margin of agricultural products is low.	Low profits due to: <ul style="list-style-type: none"> <li>• Low prices</li> <li>• Small production quantities</li> <li>• Lack of good marketing</li> </ul>
"I have only small quantities to sell."	Small production quantities.	
"Our milk and meat are organic, but we receive the same price as others."	Lack of product branding.	
"Middlemen do not pay a fair price."	Distribution dependent on middlemen.	
"Where should I store my products? Markets are far away."	Lack of necessary equipment.	Lack of know-how due to: <ul style="list-style-type: none"> <li>• Insufficient education</li> <li>• Absent modern techniques</li> <li>• Outdated and insufficient equipment</li> </ul>
"We don't have modern technology."	Lack of modern techniques and technology.	
"I don't know what and how to cultivate to sell at best."	Lack of knowledge about agriculture.	
"I look what others plant and then we will see how it works."		
"What new techniques should be applied?"		
"I don't know how to apply for state support."	Lack of knowledge about legal rights.	Necessary legal and administrative support
"I have to pay too much for bookkeeping."	Necessary administrative support.	

Source: Own illustration

**Table 6.** Price Development of Raw milk and Milk in Serbia 2006-2015 (Prices in RSD)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Average Sales price of Raw Cow's Milk per liter	15.18	18.44	23.70	20.80	22.57	28.54	30.33	32.84	32.59	31.64
Average Retail Price of Cow's Milk per liter	37.25	43.96	56.61	52.57	55.57	66.85	70.01	81.24	83.58	84.33
Share of Raw Milk Price in Retail Price	40.8%	41.9%	41.9%	39.6%	40.6%	42.7%	43.3%	40.4%	39.0%	37.5%

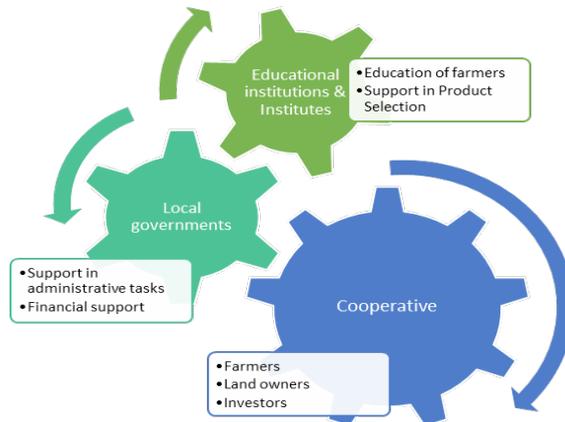
Source: SORS, 2007-2016

We can sum up the business challenges faced by small farmers in the following way: a) product selection, b) production quantity, c) applied technology, d) education; e) marketing, f) capital. All these factors are interrelated and imply the need for the professionalization of agricultural holdings in southwest Serbia.

According to our observation, the willingness of farmers to cooperate is relatively low. The question arises how to motivate people to work together to efficiently use agricultural land, provide high-quality products, which will lead to higher returns and an increased self-confidence? An important way is the establishment of new model of agricultural cooperatives. The general goals of such a new cooperative should be: introducing entrepreneurial spirit and market-oriented agribusiness, increasing utilization of agricultural land, implementation of modern techniques in agriculture (Praća et al., 2017), enhancing farmers' knowledge, developing an efficient marketing strategy for agricultural products and attracting new investors.

The authors propose an equity-based cooperation, based on two different examples: a) a theoretical proposal by Al-Harran et al. (1996) and b) a real cooperative: the Mondragon Corporation from Spain (Fernandez, 2016). In these cases, members are employees and owners of the cooperative, which is rather organized as kind of joint-stock company. The cooperation should include active farmers, owners of non-utilized agricultural land and investors (Figure 3).

**Figure 3.** Schematic representation of the proposed cooperative



Source: Own illustration

Mondragon Corporation describes itself as “a co-operative business organization that competes on international markets using democratic methods in terms of its company organization, job creation, both the human and professional development of its workers and a commitment to the development of its social environment” (Fernandez, 2016).

Farmers can bring in their land to this new cooperative, or owners of non-utilized land can become shareholders. Moreover, investors with financial capital can contribute to this new cooperative. If potential members did not have sufficient money to become a member, they should be given an interest-free grant by the municipality or the central government, which will be used as revolving funds, to be loaned out to new members. Accumulated capital from earned profits will be used for the repayment of these loans (Al-Harran et al., 1996). In our proposal, every farmer would become a shareholder by

either investing financial or real capital into the cooperative. The raised financial capital will be used for acquisition of fixed and current assets.

It is necessary to balance the interests and power of all members. This can be achieved with a democratic organizational concept of the cooperative with a dominant role of the general assembly and elected executive board. To avoid the dominance of a certain individual or group in the cooperative, a member can only have a maximum of 10% of votes, independent of the capital invested and all-important decisions need a qualified majority of two-thirds or three-quarters (Fernandez, 2016).

Every member must have trust in the functioning of the cooperative. This can only be achieved by receiving exact information about the results achieved (Al-Harran et al., 1996). Members must fulfil two roles simultaneously: first, they are employees and second, they are shareholders. Therefore, they will receive two types of compensation: monthly payment for their work contribution dependent on the type of job done in the cooperative and a variable part linked to the earned profit of the cooperative (Fernandez, 2016).

The lack of skilled farmers is one of the major obstacles for agricultural development in southwest Serbia. There are only two secondary schools (Sjenica and Novi Pazar) and one bachelor program at the State University of Novi Pazar offering courses in the field of agriculture. It is necessary to set up the course for agricultural technicians at least one more secondary schools in southwest Serbia in cooperation with the Ministry of Education. Therefore, a center for long-life learning should be established to provide informal training to members of the cooperative, where courses will be taught in cooperation with secondary schools, universities and professionals.

The local self-government could allocate employees to the cooperative in the form of public-private partnership and provide administrative services to the cooperative such as accounting, financial management and marketing. For example, in the City of Novi Pazar, the service for local economic development has 14 employees and there is also an agricultural consulting service that has 6 employees. Both these services are part of the local self-government. By providing administrative support, the local self-government becomes a partner in the cooperative and can also earn a profit from the cooperative by giving necessary capital to finance the expenses of the administrative part of the cooperative.

Special importance in the cooperative has the marketing division. This division should develop an efficient marketing strategy to sell at better prices due to economies of scale and direct sales to retailers and wholesalers. Finally, cooperation with agricultural institutes will be necessary regarding product selection, especially for producing organic food.

**Availability of funding sources**

**Table 7.** Examples of farmers’ statements with regard to access to funding

Farmers’ statements	Generalization	Synthesis
“I don’t know how to apply for state support.”	Lack of knowledge about legal rights.	Required administrative support and education for farmers.
“We don’t qualify for state support due to bureaucracy.”	Complex bureaucracy for state support.	
“Interest rates on loans are too high.”	Financing costs are too high.	Financial engineering necessary to meet the needs of farmers.
“Costs for guarantees are too high, despite low interest rates.”		
“Cannot receive a loan due to outdated data.”	Complex bureaucracy for receiving loans.	
“Our religion prohibits loans with interests.”	Specific needs of population.	

Source: Own illustration

The availability of funding sources is one of the biggest challenges starting an entrepreneurial business, or starting a venture at all. The availability of funding sources is one of the major challenges for farmers in the hilly-mountainous regions of southwest Serbia. According to the Law on incentives in agriculture and rural development (OG RS, Nos. 10/2013, 142/2014, 103/2015 and 101/2016) following types of incentives are offered: 1) direct payments, 2) incentives for rural development measures, 3) special incentives and 4) credit support. To distribute these subsidies efficiently, it is necessary to educate farmers about them. Especially, organic production, where the hilly-mountainous areas of southwest Serbia have a competitive advantage, should be fostered by the MAFWM and the municipalities.

Regarding credit support, the major question is the question of interest rates. The line Ministry signed in 2016 an agreement with several Serbian banks and insurance companies for providing subsidized loans to farmers (MAFWM, 2016). At first sight, this is a positive development, keeping in mind that interest rates for loans in Serbia are quite high. But the interviewees complained about the costs for bank guarantees summing up all the costs of the loan, the farmer has similar costs as he would have when taking a commercial loan without subsidies. Additionally, farmers are often not able to obtain a bank guarantee, because of outdated cadastral data and not attractive collateral, such as agricultural land or farm animals. Banks regard both types of collateral as risky, because they are difficult to sell due to a low demand.

To solve this problem and to facilitate the financing of pre- and postharvest operations, the Law on financing and securing the financing of agricultural production (OG RS, No. 128/2014) allows farmers to use their agricultural products as collateral even before harvest, and to obtain working capital as credit from local banks and suppliers. This law solves partly the problem regarding collateral. It is much easier for a farmer to provide future agricultural products, which have a certain market value,

than farmland as collateral. However, it must be kept in mind, that small quantities are produced and therefore profitability is relatively low.

There are also at least two problems with this regulation. According to the Law (Art. 26), if on the day of maturity of creditor's claim that is secured by the pledge on future agricultural products such agricultural products are not existing on the production site, the pledgee acquires, *ex lege*, a statutory pledge on all agricultural products owned by the pledger and produced at the production site, regardless of culture and sort, in the quantity sufficient for the settlement of creditor's receivables. Another problem lies in the lack of market access. Without market access farmers will have not sufficient revenues to repay their debts, leading to the loss of the harvest due to debt settlement or the sale of farmland or other fixed assets.

Moreover, another factor, often ignored in practice, is the fact that some farmers in southwest Serbia avoid interest-based financing due to religious reasons, which again leads to additional challenges for those farmers.

We believe financial products in agriculture must be linked to the production process, i.e. there should be a permanent connection between the real and the financial sector, so every financial contract will cause an increase in agricultural production (Bećirović, 2011). This is the case, for example, with leasing contracts. According to the estimates of the Association of Leasing Companies in Serbia for the year 2013, around 50% of purchases of new combine and approximately 40% of acquisitions of tractors were financed by leasing (Radović, 2013). Leasing contracts have many advantages for farmers, such as avoiding taking over a huge debt, modernization of equipment and no guarantee costs. Another advantage is that farmers will receive the object immediately and paid rents can be adapted according to the generated farmer income of the farmer.

There is also the possibility to purchase assets directly from the manufacturer or from a specialized trader on deferred payment. A sale on deferred payment is beneficial for traders and manufacturers, because it provides additional income for them and sellers can adapt prices according to the crediting period, so their profitability and liquidity will not suffer due to the deferred payment. The major advantage is that these financing contracts can be easily administered, a factor that minimizes both risk and cost from a financial institution's viewpoint (Elharika, 2003).

The discrepancy of revenues and expenditures in agriculture must be considered in the development of appropriate financial instruments. This problem can be solved through the sale of agricultural production through prepayment. In this case, a particular object with an agreed specification will be delivered in the future and the agreed full price must be paid in advance at the time of concluding the contract.

Prepayment has advantages for the buyer and the seller. It protects the farmer from price fluctuations, because the price is paid in advance. On the other hand, the buyer knows exactly how much the underlying transaction will cost, and the quantity of the products that will be delivered on maturity date. Furthermore, because the buyer pays

in advance for the product, the agreed price should be lower than in a spot transaction. Depending on the price development, the buyer can have a profit from this transaction. Potential buyers, who would be willing to carry out such contracts, could be the Serbian Directorate for Commodity Reserves that would purchase agricultural products for their needs. It is also possible that agricultural cooperatives purchase in this way agricultural products from small farmers. Moreover, agricultural products can be bought by an investment fund.

According to theory, asymmetric information is one of the major reasons for inadequate supply of farm loans by conventional banks, because it is too costly to collect information on and monitor scattered potential agricultural borrowers (Elharika, 2003). But asymmetric information is not only a problem for financial institutions, but also for farmers. Farmers often avoid classical loans and prefer moneylenders' due to a complicated crediting process and legal procedures, high interest rates and the need for collateral and a guarantor (Al-Harran et al., 1996). To increase the client base of financial institutions it is necessary that financial contracts are easy to understand and the procedure should be clear to all stakeholders.

It is important to mention that if fundamental problems in agriculture are not resolved and governments force banks to offer a certain amount of loans to agriculture, this will only lead to high default rates and to unsustainable financing of agriculture. It is also necessary to pay attention to efficient credit decision making and loan administration to ensure that loans are repaid in full and in time, so unproductive farmers should not receive loans, and therefore not waste taxpayers' money.

### **Conclusions**

There is lots of potential for agribusiness in southwest Serbia. The region has significant agricultural resources and is well-known for organic dairy and meat products in whole Serbia and far beyond. To use this agricultural potential efficiently, the authors have identified and analyzed the challenges faced by farmers using qualitative research method. As is the case with much qualitative research, the results are not generalizable in the statistical sense, but the ambition was to increase understanding of how farmers perceive and deal with the challenges at starting an agribusiness in the hilly-mountainous regions of southwest Serbia.

To master these challenges, an integral approach to development is necessary, which must include farmers, state authorities and investors. State authorities play a key role in solving infrastructural problems, developing a new fiscal policy, including a new tax policy regarding non-utilized agricultural land and subsidies, and supporting farmers and cooperatives with professional knowledge.

However, the key for agricultural development are agricultural holdings, especially modern cooperatives, where active farmers, land owners and investors will contribute their knowledge and capital. By a process of concentration, cooperatives should cultivate sizable portions of agricultural land. A special characteristic for southwest

Serbia is that this region has big diaspora, ready to invest money in their homeland. By having larger agricultural holdings, the current subsidies in agriculture will have a full effect, especially due to the mutual dependence between market access and finance.

This process of concentration will increase production quantities, which will again increase profitability by providing high-quality food for wealthy consumers and attract investors to raise the necessary funds to finance modern equipment and a professional management. Profitable agricultural holdings and cooperatives will increase motivation for the state to increase investments in infrastructure, which will facilitate the opening of factories for the processing of agricultural products. The resulted increased welfare will increase the willingness of citizens to live in rural areas.

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## IZAZOVI POKRETANJA AGROBIZNISA U BRDSKO-PLANINSKIM PREDELIMA JUGOZAPADNE SRBIJE

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### Sažetak

*Da bi se identifikovali izazovi sa kojim se susreću potencijalni preduzetnici u agrobiznisu, sprovedeno je empirijsko istraživanje korišćenjem nestrukturiranog intervjua sa 113 poljoprivrednika iz opština Novi Pazar, Raška, Sjenica, Tutin, Nova Varoš, Prijepolje, Priboj i Ivanjica. Dobijeni odgovori su klasifikovani u pet grupa: infrastrukturni uslovi, pristup javnim uslugama, ukрупnjavanje poseda, pristup tržištu i dostupnost izvora finansiranja. Da bi se rešili ovi problemi autori, između ostalog, predlažu investicije u infrastrukturu, promenu načina oporezivanja poljoprivrednog zemljišta i kreiranje novih finansijskih instrumenata prema potrebama poljoprivrednika i lokalnim specifičnostima. Uloga modernih zadruga, u koje će aktivni poljoprivrednici, vlasnici zemlje i investitori uložiti svoje znanje i kapital, je posebno istaknuta od strane autora.*

**Ključne reči:** *agrobiznis, porez na zemljište, kooperative, planinsko područje, jugozapadna Srbija.*

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## SIGNIFICANCE OF FINANCIAL LITERACY FOR THE AGRICULTURAL HOLDINGS IN SERBIA<sup>1</sup>

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### Summary

*The aim of this paper is to analyse the level and the significance of farmers' financial knowledge or literacy, as well to propose measures for the improvement of financial skills in agricultural holdings.*

*According to the paper's results, the level of farmers' financial knowledge is low; at the state level there hasn't been established satisfying financial education of farmers. It is necessary to establish continuous education programs in this field through agricultural extension services; at the state level, it is important to improve the coordination between different state bodies that conduct an educational program in agricultural sector, as well as the science research results and to make an educational material available to farmers.*

*When considering the significance of financial literacy, it is usually analyzed from the perspective of adult people. However, recent studies indicate the importance of increasing financial literacy already at the level of youth or children. This theoretical concept is currently being accepted in the activities of the Government of the Republic of Serbia. In this regard, the Ministry of Economy has decided to introduce entrepreneurship to primary school through numerous projects.*

**Key words:** *financial knowledge, extension service, finance models, agriculture.*

**JEL:** *Q14, I22*

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## Introduction

Traditionally neglected sector of agriculture in Serbia got into the limelight of the media and economic experts during the period of current global economic crises, primarily because of the pronounced surplus of agricultural and food products in foreign trade ratio. However, agricultural export is generally related only to some products, such as cereals, fruit (raspberries) and sugar. This leaves room for significant improvement in foreign trade, both in scope and structure, where the emphasis should be on processed products, which yields much higher profit ratio.

Agriculture, and especially the primary agricultural production, is characterized by a series of specificities (seasonality and organic character, slow capital turnover etc.), due to which it is more demanding in regard to other economic activities from the financing point of view. The abovementioned specificities cause the need of engagement of significant financial sources in agriculture in short term, which remain tied for a long time in the process of production (Vasiljević, Zakić, 2006).

It is unquestionable that limited sources of financing can be distinguished as one of the key problems for Serbian farmers. Due to the lack of its own funds, farmer usually depends on other sources of funding, such as bank loans, government subsidies etc (Peraušić, Cvijanović, 2006). However, an average farmer in Serbia does not have sufficient level of financial literacy, which significantly hinders the access to additional sources of funding.

When considering the *importance of financial literacy*, first it is necessary to begin by defining what it means in practice. The terms financial literacy, financial knowledge and financial education often are used interchangeably in the literature and popular media (Huston, 2010).

One of studies in this area indicate that “people who are financially literate are able to make sound financial decisions for themselves and their families, to make informed choices between different financial products and services, to budget and to plan ahead, to build up some savings, to protect themselves against financial risks, to invest prudently (if they have sufficient money) and to understand their rights and responsibilities” (Boekhold, 2016). OECD study “*Improving financial literacy*” has shown that in the modern globalized world, in the absence of financial education, there is a greater tendency to over-indebtedness and bankruptcy (OECD, 2005).

Traditionally speaking, the need for financial literacy is something that is commonly associated with the adult. The global financial crisis has led to a completely different perception. The crisis has shown that a large number of individuals worldwide have lost entire property as a result of insufficient financial knowledge.

World Bank study from 2011 made a clear recommendation that financial education should be introduced in the formal education system since the lower grades of elementary school. Also, according to the Ben Bernanke - President of the FED (2010), “one of the key lessons of the financial crisis is the importance of financial literacy. In addition to improving the decision-making process about personal finances, teaching pupils about basic economic principles will help them to better understand and easier to cursor over a number of key issues...” (Fabris, Luburić 2017).

It is very important to note that there is also a recent UNICEF study “*Child Social and Financial Education*”. According to UNICEF, as the most important UN organization that deals with children’s rights, “promoting financial education and a positive financial

culture in children and youth is essential to ensuring a financially literate population capable of making informed decisions” (UNICEF, 2013).

Relying on positive experience worldwide and mentioned recommendations of UNICEF, the Ministry of Economy of the Republic of Serbia has decided to introduce entrepreneurship to primary school through numerous projects. This program is still in its infancy and it would be important that other ministries are included in it, which applies particularly to the Ministry of Agriculture of the Republic of Serbia, based on the aspect of increasing the financial literacy of future farmers.

### Key issues of financial literacy in Serbian agriculture

The research in this paper started from the hypothesis that agricultural producers in Serbia do not have a sufficient level of financial literacy, which significantly affects the opportunities of growth and development of agricultural enterprises (Andžić et al., 2016).

In Table 1 is shown the level of managers’ training of farmers in the Republic of Serbia. The most of them have only *agricultural experience obtained from practice* and there is 378,940 (60.0%) of them in the Republic of Serbia according to the Census of agriculture, and the least are educated managers in the field of agriculture. Only 4% of them finished an agricultural secondary school or college/university in the field of agriculture. Of total number of managers, 35.3% have finished some other secondary school, college or university that are not associated with the agricultural profession.

**Table 1.** The level of managers’ training of agricultural holdings, 2012

	Republic of Serbia	
	Number of persons	Structure, %
Agricultural experience gained by the practice	378,940	60.0
Course in the field of agriculture	4,270	0.7
Agricultural secondary school	16,120	2.6
Other secondary school	191,591	30.3
Agricultural college or faculty	8,992	1.4
Other college or faculty	31,639	5.0
<b>Total number of managers in AHs</b>	<b>631,552</b>	<b>100.0</b>

Source: Census of Agriculture, 2012: Agriculture in the Republic of Serbia, SORS, Book II

Taking into consideration all mentioned data, it can be notice that the educational structure of a manager in agricultural holdings in the Republic of Serbia is extremely unfavourable. On the other hand Table 1 also show that 4,270 managers in agricultural holdings in the Republic of Serbia have attended courses in the field of agriculture, which indicates the existence of a desire for improvement and further education in the field of agriculture (Zakić, Kljajić, 2016).

In the field of agribusiness, education and extension represent the significant factors of business modernization. In support to this conclusion is the confirmed fact that the investments in extension (and agricultural research) make around 40% of an average

rate of return, which is much more than other investments in agricultural development (Van den Ban, Hawkins, 1996).

When the financing literacy in agriculture (observed in a wider sense) is taken into consideration, there could be distinguished several key areas that could be the most significant for farmers in Serbia:

1. Agricultural finance and accounting,
2. Agricultural record keeping,
3. Agricultural production and sales planning,
4. Bank loans,
5. Forms of farmers' associations,
6. Commodity exchange.

As a first step, of the most importance in increasing the financial literacy of farmers is training in the field of agricultural finance and accounting. At first, it would imply an explanation of the most important financial terms, such as: fixed and working capital, depreciation, long-term and short-term liabilities, revenues and expenditures, profit and loss, liquidity, solvency, cost-effectiveness, bookkeeping principles etc.

It is important that farmers learn the essentials in different *calculation* of agricultural products' cost price, which is a precondition of every long-term planning. Very often, farmers in Serbia start a long-term production without calculation of agricultural products' cost price, expected revenues and other elements of simplified business plan. The required level of training in the field of agricultural finance and accounting would be determined by the target group of farmers: farm size, activities, investment plans etc.

Financial cost-benefit analysis of different investment activities, which can be a purchase of expensive equipment or the decisions on mineral fertilizers quantity, is of most importance because the highest yield is not the most profitable at the same time (Živanović et al., 2016).

Of great importance within the financial stage of education is the improvement of knowledge in the field of different incentives (at the state, province and local level) which are available for farmers. The correlation between the financial literacy and success in claiming subsidies can be noticed, first of all, due to the need for filling different supporting documentation that requires basic financial skills.

Beside lack of financial planning, the most of agricultural holdings in the Republic of Serbia do not keep records on work processes that they perform during the period in vegetable production, as on the specific parcels, as well as on the entire production area. The result is a lack of precise data on the implemented agro-technical measures, consumed outputs, quality and quantity of obtained yields and environment at the holding level.

In this respect, of great significance is the Fields Book, which is an instrument (data source) of production management. It is intended for recording the implemented agro-

technical measures, production cost and the obtained yields on parcels, and records for grown crop, fruit and vegetable cultures. In the Fields Book producers enter data in detail that refers to the performed soil analyses (physical, chemical, mechanical), type of soil, fuel consumption, fertilizing methods and a type of used fertilizer, phyto-sanitary protection, irrigation method and a norm, as well as all other operations, for every culture and parcel separately. The Fields Book indicates in a way on the literacy of a manager who manages an agricultural holding (Zakić, Kljajić 2016).

Long term production planning requires market analyses. A farmer can anticipate price trends for several different products and select the most favourable sowing structure by using the market information systems like STIPS (Agricultural marketing information system of Serbia). Besides the selection of production, a market analysis plans also determine a time of maturity of products (in crop farming and fruit growing a few days earlier production can make several times higher price of products).<sup>5</sup> While selling agricultural products, the financial knowledge and proficiency in marketing channels and marketing techniques are important for success of agricultural products sale. Marketing channels have a multiple role on the market of agricultural products, helping in overcoming different discrepancies (such as spatial, informational, territorial, etc), leaving farmers more opportunity to improve their financial knowledge (Nikolić, Popović, 2016).

In terms of limited own financing resources and incentives, it is necessary for farmers to receive education in the field of bank loans. It could imply education in: types of credit/loan (commercial, subsidized, credits granted on commodity notes as collateral, etc.), types of interest rates (fixed interest rate and variable interest rate), the loan approval procedure at the bank, forms of loan provision (mortgage and pledge), types of interest rates (an effective and nominal interest rate, a reference rate, etc.), payments instruments etc (Zakić, Kljajić, 2016). Limited confidence in the banking sector was formed as a result of high interest rates, relatively small total amount of agricultural credits which leads to high fixed costs of granting and repayment of loans, lack of expertise and experience of banking staff in dealing with agricultural producers but also the lack of experience and expertise of farmers in developing and presenting business plans. In this sense, any program for improving the financial literacy needs to be aimed significantly towards training courses for making business plans (Subić, Kuzman, 2016)

Of great importance is also the increase in knowledge level in the field of association (cooperatives and clusters). Starting from developed countries experience, but also some developing countries, we can conclude that the cooperatives could have significant role in the development of agricultural production.

The cooperative movement in Serbia (before Second World War) has a long and fruitful tradition. After a phase of relative neglect of cooperatives in past decades, today

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5 According to an insight into the multi-year price trends of products on the market information systems like STIPS, farmer decides about the time of maturity of products; in which period price is the highest, taking care of increased costs of earlier production and possibly increased risk of production.

cooperatives are facing different challenges. To enable the reestablishment of a healthy and prosperous cooperative sector in the country, a conducive legal framework needs to be introduced and effectively implemented in Serbia. To this goal, Serbia's Law on Cooperatives was officially adopted by the National Assembly (December 2015).

The membership and participation of agricultural cooperatives in Serbia is comparatively low. For example, there were over 1400 agricultural cooperatives registered in the country in 2012 (mostly situated in central Serbia and in the Vojvodina) with over 31,000 members, which represents only a minority of Serbian farmers. As a result, cooperatives' full impact on social inclusion, employment and linkages between producers and modern value chains in the country is yet to be attained.

Besides insufficient cooperative education of farmers in Serbia, there is obvious unsatisfying engagement of academics and the neglect in the educational system at all levels, and especially at university level.

Renewal of cooperatives in the coming period should go towards: (a) the development of specialized cooperatives (agricultural, fruit, vegetable etc.); (b) improvement of production, especially of processing and storage capacities of cooperatives, (c) collaboration with other cooperatives and creation of specialized cooperatives associations, which would in this way, achieve economies of scale and increased market and bargaining power (Popović, Paraušić, 2016).

Agricultural cooperatives could have an important role in the improving the state of financial literacy, although at the moment they have relatively low level of implementation of ICT technologies. Only 80 percent of agricultural cooperatives have a computer, and 20% of those coops do not have an internet connection (Ševarlić, Nikolić, 2012).

In order to increase financial literacy from the aspect of association, the education of farmers should involve following areas: significance and different forms of association, presentation of impressive results of a cooperative sector in developed countries, a presentation of the new Law on Cooperatives, expected incentives which are often announced in media etc.

Finally, of great importance could be training in the area of commodity exchange and its role in the management of business risk of agricultural enterprises, the instruments of non-standardized futures market (forwards) and standardized futures market of commodity reserves (futures deal and options), the role of a clearing house as a warrantor, the system of pre-harvest financing etc (Zakić et al., 2014). This "advanced level" of education can be important as for small individual farmers as well as for owners and managers of big corporate companies in the field of agribusiness.

It is therefore expected of science to transfer necessary knowledge and skills to agricultural holdings, and by the adoption, they would be in a position to plan more efficiently, organize, fund and manage the production process, save on inputs, produce a greater amount of healthy-safe products respecting the principles of environmental protection, and sell successfully everything manufactured on the local and regional

markets; in one word, to be able to independently affect the strengthening of their business sustainability.

Unfavourable age structure of farms managers is one of the limiting factors for the improvement of financial and computer literacy on holdings. According to Census of Agriculture data (2012) in the Republic of Serbia, the highest share of family agricultural holdings managers was over 65 years of age and was amounted 32% of total number of managers. Family agricultural holdings are characterized by devastated and elderly village – about 200,000 family farms have no population younger than 25 years; to about 80% of these holdings no active farmers (Zakić, Zakić, Mirović, 2014)

There is no easy answer when it comes to motivating young people to stay or return to the rural area. There could be considered variety of projects, but of the great importance are potential special subsidies for those farms that have a younger workforce. In this sense, of great importance are programs to increase the financial literacy level of young people and even school children. As mentioned, the Ministry of Economy has decided to introduce entrepreneurship to primary school through numerous projects. With the support of Ministry of Agriculture, it would be significant to further develop those ideas with agricultural entrepreneurship educations, especially in rural areas.

### **Methodology**

In this paper was used the following methodology:

- Desk research method,
- Interviews with the leading experts in this field,
- Review of domestic and foreign literature,
- Survey that included farmers, scientific-research institutions in the field of agro-economy, agricultural extension (AE) and the policy makers in the field of education in an agricultural sector.

### **Results and discussion**

A field research - a survey was carried out in the period from February to March in the year 2017, which has included:

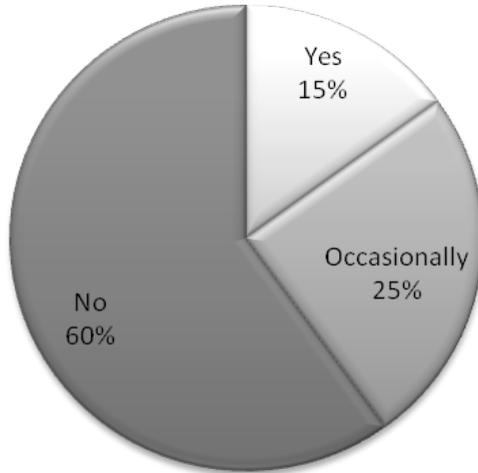
1. Farmers,
2. Scientific-research institutions in the field of agro-economy,
3. AEs,
4. The policy makers in the field of education, the Ministry of Agriculture and Environmental Protection (MAEP) and the Ministry of Education, Science and Technological Development of the Republic of Serbia (MESTD).

#### *1. Results of the farmers' survey*

For the purpose of this survey 30 holders of family agricultural holdings were interviewed. These were the questions:

- Do you have all necessary financial skills that I need?

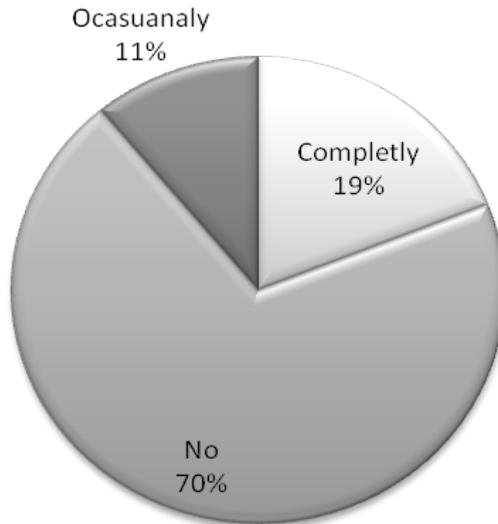
**Graph 1.** Possession of financial skills



*Source: author's calculation*

- Do you keep a record on costs and expenditures in a holding?

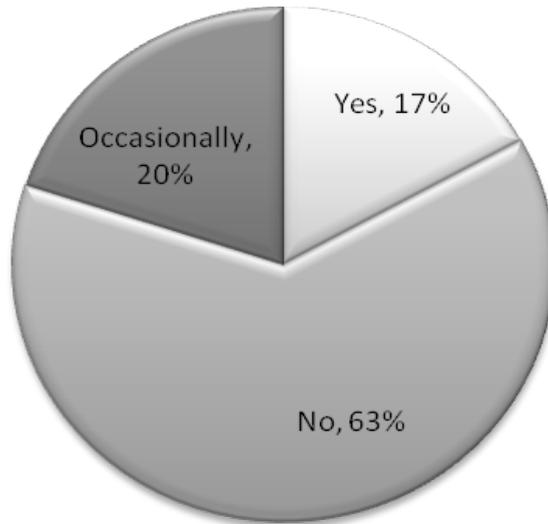
**Graph 2.** Existence of record on costs and expenditures in a holding



*Source: author's calculation*

- Do you perform an investment analysis before you invest?

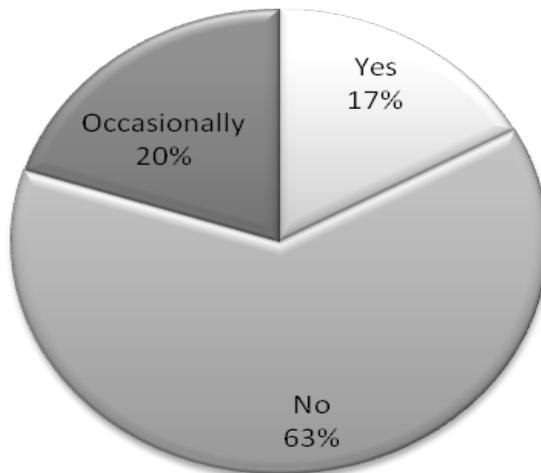
Graph 3. Performance of investment analysis before you invest



Source: author's calculation

- Do you use STIPS or some other data on multi-year price trends of a product or reports and forecasts on price trends while you plan production?

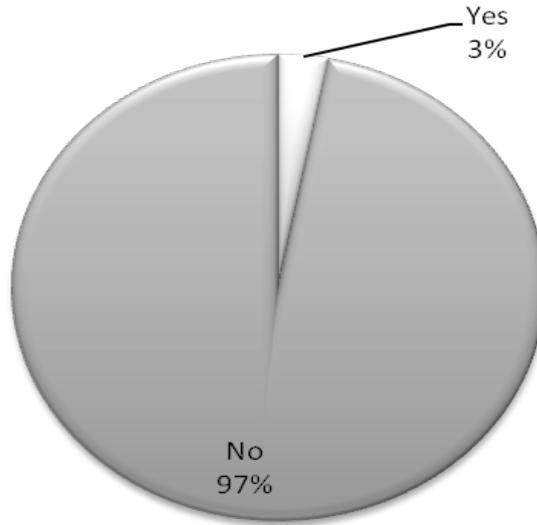
**Graph 4.** Use of STIPS or some other data on multi-year price trends of a product or reports and forecasts on price trends while you plan production



Source: author's calculation

- Did you attend education in the field of financial knowledge and records on an agricultural holding?

**Graph 5.** Attendance on education in the field of financial knowledge and records on an agricultural holding



*Source: author's calculation*

- Suggestions for the improvement of financial knowledge on agricultural holdings?
- ❖ Organizing continuous training by the AEs.
- ❖ Support of consultants in the field concerning the investment analyses.

## *2. Results of a survey conducted by a scientific-research institution in the field of agro-economy*

For the purpose of this research were interviewed the Faculty of Agriculture in Zemun, Institute of Agricultural Economics and the Institute for Economic Research. The questions were as follows:

- Evaluation of the farmers' financial knowledge?

The possible responses were: good, moderate and poor, and all of respondents were answered that knowledge in the field of finances was pretty poor.

- Is there any training for individual farmers in your scientific institution?

All respondents answered negatively.

- Are there any suggestions for the improvement of financial knowledge on agricultural holdings?
- ❖ Continuous training of farmers in the field of finances and records on a holding by the state authorities in which the scientific institutes and faculties would be included.
- ❖ Linking the right of using some subsidies and done training of farmers.
- ❖ Improvement of coordination in planning the research and education program

among the policy holders in this field (MAEP, MESTD, Provincial Secretariat for Agriculture, Forestry, Water Management and Science).

- ❖ Unified publishing of educational material and the scientific research results funded by the budgetary funds or donations.
- ❖ Forming a regional database with an educational material and the scientific research results among countries in the region (e.g. EU NORDIC system).

### 3. *Results of a survey conducted by the AEs*

For the purpose of this research, eight AEs were interviewed. The questions were as follows:

- Is there a need for the improvement of farmers' financial knowledge?

All respondents answered that there was a great need for the improvement of farmers' financial knowledge.

- Are there any suggestions for the improvement of financial knowledge on agricultural holdings?
  - ❖ Introduction of a continuous training of farmers in the field of finances and records on a holding by the AEs.
  - ❖ Introduction of a continuous training of agro-consultants in the field of finances and records on a holding by the AEs.
  - ❖ Employment of a large number of consultants of agro-economic profession.
  - ❖ Linking the right of using some subsidies and finished training of farmers.
  - ❖ Unified publishing of an educational material and the scientific research results funded by the budgetary funds or donations.

4. The survey results of policy holders in the field of education, the Ministry of Agriculture and Environmental Protection (MAEP) and the Ministry of Education, Science and Technological Development of the Republic of Serbia (MESTD).

- Is there a need for the improvement of farmers' financial knowledge?

The respondents answered that there was a great need for the improvement of farmers' financial knowledge.

- Is there any continuous training by your institution in the field of farmers' financial knowledge?

The respondents answered negatively, but with a note that MAEP has organized training related to the improvement of financial literacy and record on agricultural holdings in 2016.

- Are farmers involved in planning the scientific projects and educations?

MAEP performs interviewing of consultants, but not farmers as well, through the state extension service while planning educations for the following year. In planning educations and scientific researches none of institutions perform the public hearings with farmers.

- Are there any suggestions for the improvement of financial knowledge on agricultural holdings?
- ❖ Continuous training of farmers in the field of finances and records on a holding by the state authorities in which the scientific institutes and faculties would be involved.
- ❖ Linking the right of using some subsidies and finished training of farmers.
- ❖ Improvement of coordination in planning the research and education program among the policy holders in this field (MAEP, MESTD, Provincial Secretariat for Agriculture, Forestry, Water Management and Science).
- ❖ Unified publishing of an educational material and the scientific research results funded by the budgetary funds or donations.

### **Discussion**

According to the conducted research, we can say that the great importance for successful business in an agricultural sector is the financial knowledge of farmers.

The conducted researches at the level of farmers' financial knowledge, as well as the Census of Agriculture results from 2012, show a very low level of financial knowledge and records on holdings. Low level of education on holdings disables a selection of the optimal investments, whether it is about a significant investment in purchasing equipment or daily financial decisions which dosage of fertilizer to apply. Holdings with a low level of financial knowledge claim subsidies more difficult, due to a need for making the investment analyses, which are the subject of subsidies and the other one, while planning production without financial knowledge planning is done "randomly" - instead of observing the price trends in previous years, as well as the projection of future price trends. Management of an agricultural holding's business risk should base on the scientifically proven techniques, aiming to decrease the risk of insolvency and bankruptcy of a holding. The financial knowledge in the field of market and trade in agricultural products are necessary in order to sell successfully products, by which would increase the bargaining power of farmers and improve the sale of products. In regard to the realization of an education program in the field of financial knowledge, the MAEP has realised a program of farmers' education in the year 2016 based on the financial literacy, but this program hasn't been continued in 2017.

It is necessary to train farmers continuously in the field of finances and records on holdings by the state authorities in which would be involved scientific institutes and faculties, but also the continuous training of agricultural consultants.

Additional employment of experts of agro-economic profession in the AEs would be very important since there are a small number of experts in this field and a large number of agricultural holdings.

Linking the right of using some subsidies with finished course would contribute to a higher

farmer's attendance to AEs training (usually winter schools).<sup>6</sup>

In the Serbia several institutions have educational and scientific programs in agriculture i.e. Ministry of Agriculture, Ministry of Science, Province of Vojvodina Secretariat for Agriculture, Province of Vojvodina Secretariat for Science. This programs are not fully coordinated between this institutions and with aim to avoid overlapping of program' subject it could be advised to establish coordination body within the Ministry of science to coordinate educational and scientific programs between those four institutions.

Unified publishing of an educational material and the scientific research results, financed by budgetary funds and donations, is of great importance. In this way, it could provide farmers and professional public an insight into the educational material and the scientific research results on one place.

Uniting all scientific and educational material in a regional database that is available to the public is the practice in EU for countries which have similar agro-ecological conditions and especially similar speaking area.

### **Conclusions and recommendations**

It is evident that an average farmer has insufficient level of financial literacy, which significantly complicates their business. As a first step in overcoming this problem, it is inevitable to determine the primary educational fields. However, it is important to mention that the education program cannot be the same for every farmer.

Financial knowledge enables the optimal use of financing sources and the decrease of risk of holdings' liquidity.

The possibility of claiming the measures of support in agriculture increases by the application of modern achievements and knowledge in the field of finances, which is especially significant for using the EU pre-accessing funds.

In the sale of agricultural products, the financial knowledge, proficiency in marketing channels and marketing techniques are important for successful sale of agricultural products.

The implemented research of farmers' financial knowledge level, as well as the results of Census of Agriculture in 2012, show a low level of financial knowledge and records on holdings. Low level of education on holdings disables a selection of the optimal investments. Holdings with a low level of financial knowledge claim subsidies more difficult, due to a need for making the investment analyses.

According to the conducted research can be given the following recommendations:

- Continuous implementation of education related to the farmers' financial literacy.
- Inclusion of institute and faculties in continuous training related to financial

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6 Due to a small number of consultants, in this way by attending the group trainings, would increase the efficiency of AEs.

education.

- Continuous training of consultants and the employment of experts of agro-economic profession in the AEs.
- Linking the right of using some subsidies with finished courses would contribute to the higher farmer's attendance to AEs training.
- Introduction of training programs in the field of entrepreneurship already at the level of primary school.
- Improvement of coordination in planning the research and education program among the policy holders in this field (MAEP, MESTD, Provincial Secretariat for Agriculture, Forestry, Water Management and Science). Currently the coordination is not completely established and there is a possibility of overlapping the projects, which could be improved through the establishment of a coordinating body within the ministry authorized for science by all involved institutions.
- Unified publishing of an educational material and the scientific research results, which are financed by budgetary funds and donations.
- Establishment of a regional database in which would be available and in one place all published scientific and educational material of the region countries.

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## ZNAČAJ FINANSIJSKE PISMENOSTI ZA POLJOPRIVREDNA GAZDINSTVA U SRBIJI

*Vladimir Zakić<sup>7</sup>, Vlado Kovačević<sup>8</sup>, Jelena Damnjanović<sup>9</sup>*

### Rezime

*Cilj rada je analiza značaja posedovanja finansijskih znanja, nivoa finansijskih znanja poljoprivrednika, kao i analiza sa predlogom mera za unapređenje finansijskih znanja na poljoprivrednim gazdinstvima.*

*Prema rezultatima rada nivo finansijskih znanja poljoprivrednika je nizak, a na državnom nivou nije uspostavljena zadovoljavajuća edukacija poljoprivrednika u ovoj oblasti. Neophodno je uspostaviti kontinuirane programe edukacije u ovoj oblasti preko poljoprivrednih stručnih službi; na državnom nivou neophodno je unaprediti koordinaciju različitih državnih organa koji sprovode program edukacije u poljoprivrednom sektoru, kao i rezultate nauke i edukacioni materijal učiniti dostupnim poljoprivrednicima.*

*Kada se razmatra značaj finansijske pismenosti, ona se obično analizira iz perspektive odraslih ljudi. Međutim, nedavna istraživanja ukazuju na značaj povećanja finansijske pismenosti već na nivou mladih i dece. Ovaj teorijski koncept je trenutno prihvaćen u aktivnostima Vlade Republike Srbije. U tom smislu, Ministarstvo privrede je odlučilo da kroz brojne projekte otpočne promociju preduzetništva u osnovnim školama.*

**Ključne reči:** *finansijska znanja, savetodavna služba, modeli finansiranja, poljoprivreda.*

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## PROTECTION OF LAND IN THE REPUBLIC OF SERBIA AND ECOLOGICAL SECURITY WITH REGARD TO STRATEGIC AND LEGAL FRAMEWORKS

*Željko Bjelajac*<sup>1</sup>, *Marijana Dukić Mijatović*<sup>2</sup>, *Željko Vojinović*<sup>3</sup>

### Summary

*It is widely known that ecological and socioeconomic functions of the land are the basis for social and economic well-being. Despite this fact, land is still a relatively neglected natural resource, which can be concluded by analyzing the pressures on the land and the lack of systematic monitoring, which involves considering the situation and defining the program for its protection. In addition, insufficient allocations for solving these complex problems are evident, which, in addition to the inefficiency of the start-up, an-institutional and legal framework for land protection in the Republic of Serbia, ultimately lead to degradation of environmental security. Bearing this in mind, this paper emphasizes the need of adopting effective land protection measures in order to preserve ecological security, that is, an environmental management system that would reflect the tendency to eliminate negative environmental and human health impacts.*

**Key words:** *land, land degradation, land protection, environment, ecological safety.*

**JEL:** *Q11, Q15, K32*

### Introduction

It is usually said that the story of the land is older than the story of human. The bondage of human to land has been immortalized in numerous film achievements, poems and novels. That's why the rule has always been that the "land as a gift" is transferred to the next

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generation in the best possible conditions. However, most people do not treat the land in an adequate way, despite the fact that fertile soil is the key to our existence and has a vital role in our survival, as it is linked to our food supplies. Healthy/fertile soil guarantees the survival of plants because it provides them with the nutrients they need for survival. Plants ensure the survival of people, because the nutritional ingredients needed for survival of all living organisms, including humans, come directly or indirectly from plants. Therefore, care of the soil is extremely important, because without healthy soil there would be no plants, without plants there would be no food, and without food, which is our basic physiological need and is necessary for our survival, there would be no us. According to statistics, the Republic of Serbia is among the European countries with favourable land resources. The area of the Republic of Serbia (without the region of Kosovo and Metohija) is 7,748,400 ha. Compared to the total area of the state, 46% is agricultural land, 29.1% are forests and 13.3% are meadows and pastures. The land of the Republic of Serbia is diverse, due to the positive influence of the climate, vegetation and micro fauna, and in relation to other countries, the cultivation of crops is possible over 200 days a year on two-thirds of the land. Bearing in mind the fact that soil protection plays a key role in the perspective of our environment, solving environmental problems must be strategically thought out, and decision makers must focus on the problem of land protection, in particular the reduction of contaminated land. In the Republic of Serbia, there are about 400 potentially contaminated and really contaminated soils that can endanger health safety in the country. The results of previous research in Serbia are identified as the main causes of public utility landfill, industrial-commercial sites and industrial waste landfill, with additional danger for the exposure of the Serbian population that resulted from the use of depleted uranium ammunition NATO forces used during bombing of military and civilian targets in 1999 in some parts of Serbia. Finally, endangering the environment and protecting it are multifaceted problems of humanity. The lack of harmony between nature and man has created various and many dangers that degrade the existing civilization achievements, inflict great damage on people, their life and health, their physical integrity and many other values. Therefore, the importance of protecting the environment is imposed as the most important global challenge for modern society. Hence, the positioning of ecological security as a significant security sector, in recent times, is a necessary and “healing” need. In order to reduce the threat to environmental elements and protect health of the population, a number of strategic documents in the field of agriculture and rural development have been adopted in the Republic of Serbia in the past few years.

### **Strategic and Legal Frameworks for Land Protection in the Republic of Serbia**

Clearly defined strategic, institutional and legal frameworks have significant contributions to the development of the agricultural sector. After endangering environmental security in certain countries and regions, awareness of decision makers, managers and politicians about nature protection have increased. Therefore, the newly emerging situation at the global level has influenced the development of the scientific field of environmental management - aiming to manage the environment through the adoption of a number of strategies defining the principles and criteria of nature protection. Among the group of important documents in this domain, in national frameworks, a

special place is taken by the Strategy of Agriculture and Rural Development of the Republic of Serbia for the period 2014-2024, adopted by the Ministry of Agriculture and Environmental Protection.<sup>4</sup>The Strategy states that each state has the responsibility to define the framework of political and institutional changes that contribute to more efficient development of the agricultural sector and the well-being of rural residents. In order to adequately fulfil this role, the state's obligation is to respond to the current challenges by a stable, long-term and efficient policy. In this respect, the development of this Strategy is motivated by the need to respond to the new concept of agricultural policy on internal and external challenges, such as:

- 1) The need to reduce technological development lag in competitor countries and enable more efficient confrontation of the agricultural sector with the effects of climate change;
- 2) The necessity of increasing the efficiency of the food chain and the competitiveness of the food sector;
- 3) Providing a stable income and business environment for farmers and other entrepreneurs;
- 4) Achieving the economic, ecological and social goals of sustainable development, where multifunctional agriculture and rural development take a special place;
- 5) The willingness to respond to the demands arising from the process of joining the World Trade Organization and the European Union.

To successfully address these challenges, the Strategy aims to define:

1. Directions of future development of agriculture and food industry, based on the concept of sustainable development, which affirms the preservation of the environment and sound management of natural resources;
2. A model of support that would lead to acceleration of development of the agro-food sector, which has significant potentials for increasing production volumes and a long-term sustainable growth of competitiveness in an environment wider than local-regional one;
3. The directions of future reforms of agricultural policy and institutional framework, in the three most important segments. In addition to the aforementioned Strategy in the Republic of Serbia, there is an extensive legislation on environmental protection, which directly or indirectly affects the protection of land and systematic monitoring of land quality:
  - National Strategy for Sustainable Use of Natural Resources and Goods (The Strategy was published in the “Official Gazette of the Republic of Serbia” No. 33/2012 of 15 April 2012);

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4 Ministry of Agriculture and Environmental Protection, Agriculture and Rural Strategy 2014-2020 available at: <http://uap.gov.rs/wp-content/uploads/2016/05/STRATEGIJA-2014-2020-.pdf>

- Decree on the Program for Systematic Monitoring of Land Quality, Indicators for Assessing the Risk of Land Degradation and the Methodology for Development of Remediation Programs (“Official Gazette of RS” No. 88/10);
- Law on Land Protection (“Official Gazette of the Republic of Serbia”, No. 112/2015);
- Law on the Spatial Plan of the Republic of Serbia from 2010 to 2020 (the Law was published in the “Official Gazette of the Republic of Serbia” No. 88/2010 of 23 November 2010);
- Decree on Determining Activities Whose Performance Affects the Environment (the Regulation was published in the “Official Gazette of the Republic of Serbia” No. 109/2009 and 8/2010);
- Decree on the Establishment of the List of Projects for which the Impact Assessment is mandatory and the List of Projects for which an Environmental Impact Assessment may be required (the Regulation was published in the “Official Gazette of the Republic of Serbia” No. 114/2008 of 16.12.2008);
- Law on Environmental Impact Assessment (The Law is published in the “Official Gazette of the Republic of Serbia”, No. 135/2004, 36/2009);
- Law on Strategic Environmental Impact Assessment (The Law was published in the “Official Gazette of the Republic of Serbia”, No. 135/2004 and 88/2010);
- Law on Environmental Protection (the Law is published in the “Official Gazette of the Republic of Serbia”, No. 135/2004 and 36/2009);
- Law on Packaging and Packaging Waste (“Official Gazette of RS”, No. 36/2009);
- Law on Amendments to the Law on Environmental Impact Assessment (“Official Gazette of RS”, No. 36/09);
- Law on Amendments to the Law on Environmental Protection (“Official Gazette of RS”, No. 36/09);
- Law on the Prohibition of the Development of the Production of Chemical Weapons Storage and Use and its Destruction (“Official Gazette of the Republic of Serbia”, No. 36/09 of 15 May 2009);
- Law on Protection and Sustainable Use of Fish Fund (“Official Gazette of the Republic of Serbia”, No. 36/09 of 15 May 2009);
- Law on Protection against Ionizing Radiation and on Nuclear Safety (“Official Gazette of RS”, No. 36/2009 and 93/2012);
- Law on Air Protection (Official Gazette RS, No. 36/09, 10/13);
- National Strategy for Sustainable Development (Official Gazette RS, No. 55/05, 71/05 - correction and 101/07);
- Decree on the Conditions for Monitoring and Air Quality Requirements (Official

Gazette of RS, No. 11/10, 75/10, 63/13);

- Decree on Determining Zones and Agglomerations (Official Gazette of RS, No. 58/11 98/12);
- Decree on Determining the Air Quality Control Program in the State Network (Official Gazette of RS, No. 58/11).

### **Land as the Most Important Natural Resource for the Republic of Serbia**

Land is the most important natural resource for all countries. That is why its protection is vital for the survival of people and their surroundings. “Healthy land” in Serbia should be viewed not only in the context of quality and safe nutrition of the population although in the contemporary human culture food safety is one of the basic preoccupations (Bjelajac et al. 2015) this open space is needed to protect the supply of drinking water and clean air, promote a healthier, more active way of life, preserve habitats for original plant and animal species, and provide places for breeding and breeding birds. So, by taking care of the open space, we protect both forests and fields, plants, birds and animals that are essential for balance and biodiversity. At the same time, we provide conditions for children, young people and the elderly to have access to an open space for recreation, spiritual growth and health promotion activities.

Different types of soil have been created in the territory of Serbia under the influence of diverse composition of the climate, water and rock, and the quality and quantity of humus were taken as indicators of their quality; out of these, most important are:

- Crnica/Humuša -The most fertile soil in Serbia, rich in humus. It is most widespread in Vojvodina, Stig and in one part of Mačva;
- Gajnjača - Fertile and compacted clay soils, which are mostly cultivated on the low mountains of the South periphery of the Pannonian Basin and the basins of the South Morava;
- Smonica/Glinuša - It belongs to our most fertile soils.It is rich in humus and is widespread in the lower parts of Šumadija, the largest part of Mačva, at the bottom of the basin and in the valleys of Timok, the South Morava and the Western Morava;
- Aluvijalnozemljište/Peskuša - It occurs along all rivers. It consists of river deposits, silt, sand and gravel deposited during floods. It belongs to fertile soil rich in nutrients and is easily processed;
- Pepeljuše - Our most widespread and least fertile ground with little humus. It can be found in our mountainous regions. It is the land of forest vegetation;
- Crvenica - It was formed from an insoluble part of the limestone. It is locally distributed in the Starovlaška and Raška highlands, the Metohija Basin and Eastern Serbia.

**Table 1.** Types of soils in the Republic of Serbia with basic data on their characteristics

Type of soil	Surface area (ha)	Worthiness	
		limitations	productivity
Kamenjar (litosol)	77,757	serious	unproductive
Eolski pesak (arenosol)	86,000	worthy	poor to medium well
Krečnjačko-dolomitna crnica (kalkomelanosol) i smeđe-krečnjačko (kalkokambisol)	910,000	worthy to medium well	poor to medium
Humusno-silikatno zemljište (ranker)	324,000	moderate to worthy	productive for meadow-pasture production
Černozem	1,200,000	without	highly productive
Smonica (vertisol)	680,000	moderate	productive
Eutrično smeđe-gajnjača (eutrični kambisol)	437,000	moderate	productive
Distričnosmeđe-kiselosmeđe (distrični kambisol)	2,607,000	worth	poor to medium productive
Zemljišta na serpentinu (ranker eutrično smeđe)	268,000	worthy to medium	poor to medium productive
Pseudoglej	500,000	moderate to worthy	conditionally productive
Aluvijalno zemljište (fluvisol) i ritska crnica (humoglej)	675,000	without restriction to serious	Conditionally highly productive (melioration)
Solončak i solonjec (zaslanjena i alkalizovana zemljišta)	233,000	worthy	poor to medium productive
Ukupno	8,836,757	-	-

Source: Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 (“Official Gazette of the Republic of Serbia”, No. 88/2010)

As it is noticed from the enclosed soil cover of Serbia, it is specific to a large number of systematic units that were created as a result of complex conditions of development and land development, which resulted in very diverse land: from fertile plains in the north, lime and base soils in the east, clay soils on the mountains and hills in the southeast, to humusy, clayey, sandy, humus-silicate, etc.

From the table above, which describes the types of soil in Serbia, we can notice that the largest territorial distribution from the productive land has černozem with 1,200,000 ha, smonica with 680,000 ha and aluvial land with 675,000 ha. Out of the less productive land, the most widespread isdistillate brown soil with 2,607,000 ha. It is interesting to note that after fifty years, for the first time in 2012, the Agricultural Survey in the Republic of Serbia was conducted. The inventory was carried out in accordance with the World Census Program and the Eurostat’s Methodology. The goal of implementing the Agricultural Census was to obtain a clearer picture of the state of the agricultural sector, as well as to create an internationally comparable database and a statistical registry of RS agriculture. According to the results of the Agricultural Census 2011/2012 in

the Republic of Serbia, there is a total of 3,437,423 ha of agricultural land, out of which 73.1% are arable and gardens, 20.7% meadows and pastures, 4.8% orchards, 0.6% vineyards, 0.7% house gardens and 0.1% other plantations. In the group of arable land and grassland, the production of grain is mostly represented, and only then the production of vegetables and industrial plants. The total area of grain on the territory of Serbia in 2016 was 595,118 ha with an annual yield of 4.8 t / ha. In the category of permanent plantations, there are mostly orchards and growing of berries.<sup>5</sup>

**Table 2.** Worthiness structure of the productive land in Serbia

Type of worthiness	Površina(km <sup>2</sup> )				Struktura(%)			
	Serbia	Vojvodina	Serbia	KiM	Serbia	Vojvodina	Serbia	KiM
1	11.650	9.688	1.675	287	14,4	51,4	3,2	2,8
2	9.357	3.284	5.481	592	11,6	17,4	10,6	5,8
3	10.522	3.823	5.383	1.316	13,0	20,3	10,5	13,0
4	8.682	355	7.133	1.194	10,8	1,9	13,8	11,8
Total suitable for processing	40.211	17.150	19.672	3.389	49,8	91,0	38,1	33,4
5	11.073	531	9.002	1.540	13,7	2,8	17,4	15,2
6	20.144	889	17.185	2.070	25,0	4,7	33,2	20,4
7	8.069	193	5.232	2.644	10,0	1,0	10,1	26,1
8	1.178	72	604	502	1,5	0,5	1,2	4,9
Total Unsuitable for processing	40.464	1.685	32.023	6.756	50,2	9,0	61,9	66,6
Total productive surface	80.675	18.835	51.695	10.145	100,0	100,0	100,0	100,0
Infertile	7.686	2.671	4.273	742	-	-	-	-
Total	88.361	21.506	55.968	10.887	-	-	-	-

Source: Spatial Plan of the Republic of Serbia 2010-2020 (“Official Gazette of the Republic of Serbia”, No. 88/2010)

### Key Indicators of the State and Land Degradation in the Republic of Serbia

It is understood that the land is, above all, a natural resource that can be renewed by reasonable use. However, despite the higher level of standards and technology in

<sup>5</sup> Statistical Office of the Republic of Serbia, Census 2012, <http://pod2.stat.gov.rs/ObjavljenePublikacije/Popis2012/PP-knjiga1.pdf>.

soil processing, drastic changes in soil because of pollution occurred, primarily due to adynamic degree of urbanization and industrialization. Although land belongs to renewable resources, man is increasingly endangered by the activity of the land fund, where in addition to pollution, a special problem is the permanent destruction of arable land. In addition, land contamination is not an isolated problem concerning one country or region, but rather a global problem that is widespread. Land contamination usually arises from localized sources of pollution, such as industrial facilities, and through diffuse pollution from atmospheric precipitation such as acid rain, the spread of chemicals from farms and the same soil erosion that can reduce nutrient levels. Local land contamination is present in the areas of intensive industrial activity, inadequate landfills, mines, at sites of different incidents. Land is an important natural resource, which is difficult to maintain and regenerate, unlike other natural resources. Land degradation, which involves a set of processes caused by human activity, greatly diminishes the quality of the land. The once-damaged quality of the soil is difficult to regenerate. Large areas of land are degraded by irrational and inadequate use. Land degradation results from loss of nutrients, erosion by water and wind, desertification, shading, chemical pollution, radionuclide waste pollution, mechanical degradation in soil processing, loss of humus, etc. Land loss occurs with poorly planned expansion of urban and suburban settlements, construction of infrastructure and industrial facilities. Degradation may have a mild degree of damage to soil resulting from the inadequate application of agro technical and hydrotechnical measures applied in agricultural production.<sup>6</sup>

European Environment Agency (EEA)<sup>7</sup> follows the indicators that are important for monitoring changes and creating environmental policies. Based on the Corina Land Cover (CLC) database from 2000, 2006 and 2012, the indicator of changes in land use patterns is monitored. This indicator indicates changes in agricultural, forest and another land, such as deforestation, extension of residential areas or tourist facilities, drying of wet habitats, etc. To map changes over time, there are 44 classes of land cover that specifically indicate how decisions made across Europe lead to a change in the landscape's appearance. The results of the CLC database show that in the period from 2000-2012 several changes in the use of land use have been determined, for a total of 1.15% of the total territory. The largest changes were recorded in urban areas in the pasture and mixed agricultural area (37%), arable land and permanent plantations (33%), as well as forests and transitional forest area (28%).

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6 <http://vssp.edu.rs/wp-content/uploads/2017/03/Prirucnik-Bezbednosno-upravljanje-ljudskim-resursima.pdf>, str.1-55

7 European Environment Agency, <https://www.eea.europa.eu/publications/land-recycling-in-europe>).

**Table 3.** Changes according to the CLC database

SURFACE CHANGES 2000-2012	
Pastures and mixed agricultural areas	37%
Arable land and permanent plantations	33%
Water basins	0,8%
Natural grasslands	0,2%
Forests and transitional forest area	28%
Wetlands	0,3%

Source: EEA, Corina Land Cover (2012)

The use of land in Serbia is accompanied by a number of different problems, such as the fragmentation of the plot, the extent of use, the insufficient introduction of organic matter and degradation processes caused by the action of nature and man. The solution of the problem is in the more intensive use of land, the consolidation of the property, the greater introduction of organic matter and the reduction of degradation processes. Land map in RS is determined on the basis of the Report published by the Environmental Protection Agency,<sup>8</sup> pointing out that the main causes of land destruction are:

1. Erosion
2. Soil contamination
3. Reduction of organic matter
4. Land acquisition by construction
5. Reduction of land biodiversity
6. Salinization
  - **Erosion:** The biggest cause of soil degradation is erosion. According to the National Environmental Program<sup>9</sup> in the territory of Serbia, erosive processes are currently present (even up to 80% of the territory is occupied). The data show that AP Vojvodina in the territory has 85% erosive processes with an average loss of land greater than 0.9 t / ha per year. Due to water erosion  $\frac{1}{4}$  of the land particles are lost.

8 Environmental Protection Agency, [http://www.sepa.gov.rs/index.php?menu=204&id=201&akcija=showXlinked\\_nopagenum](http://www.sepa.gov.rs/index.php?menu=204&id=201&akcija=showXlinked_nopagenum)

9 National Environmental Program (2010), [http://www.zzps.rs/novo/kontent/stranicy/propisi\\_strategije/ Nacionalni\\_program\\_zastite\\_%20zs.pdf](http://www.zzps.rs/novo/kontent/stranicy/propisi_strategije/Nacionalni_program_zastite_%20zs.pdf)

- **Contamination of soil:** When we talk about potential sources and the way of contamination of the soil then this pollution can come through:<sup>10</sup>
- Air pollution, atmosphere - emissions from technological processes, emissions from burning fossil fuels, residential buildings, emissions from exhaust gases of cars, emissions from combustion of biomass, forests, etc. Pollutants in the form of gases, vapours, aerosols or dust reach the surface of the soil by washing with rain, and aerosols and particles directly by sedimentation;
- Pollution from wastewater - wastewater from technological processes, domestic waste water, polluted water due to agricultural activity, etc. Pollutants present in liquid and ground water pollute the land this water gets in contact with;
- Solid waste pollution from the economy, households and agriculture, which is one of the most significant ways of pollution.

Heavy metals, released in the air in the form of rain and gases, reach the Earth. Such a type of soil contamination affects agricultural crops and the quality of the fruit that endangers health food safety. Therefore, in the last few years, special attention has been devoted to testing soil quality and its contamination. The results of previous research have shown that most of the land in Serbia is not contaminated. (Protic et al 2003) In Serbia, copper contamination is present due to anthropogenic activities, most often in the vicinity of mines, vineyards and fruit trees. Heavy metals also contain the concentration of nickel in soils formed on the walls, such as soils in mountainous areas such as Zlatibor, Meljena and Suvobor, near the river Ibar, around Vrnjačka Banja, parts of Eastern and Central Serbia. The average lead content is present in parts of Central Serbia, especially in parts of the Belgrade-Niš highway and along the western Morava stream. Zinc is widespread in sandy, carbonate and highly acidic soils. While the arsenic is characteristic of the land in the vicinity of Valjevo, Čačak, Trstenik and Planina Čemerno. After all, one should not ignore the fact that the environmental and health consequences of NATO bombing in 1999, due to the use of depleted uranium missiles, are unimaginable. Namely, prior to the contamination of a certain part of its territory, Serbia was one of the cleanest green oases of Europe, with great opportunities for healthy food production.

**Land acquisition by construction:** Unlike the land in rural areas, land in upland areas is threatened by the consequences of human behaviour. As an outbreak of land degradation in urbanism environments, pollution of water and air, which is accompanied by dust and exhaust gases, are listed. Also, the problem is the spread of urban centres, the construction of airports, roads, industrial zones, hydroelectric power stations, etc. The results of the survey have shown that about 5,900 ha of agricultural land is lost annually.<sup>11</sup> In some urban areas, land is so burdened that it requires special treatment and monitoring.

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<sup>10</sup> [www.gov.me/files/1247500271.doc](http://www.gov.me/files/1247500271.doc).

<sup>11</sup> Agency for Environmental Protection, Report on the state of land in the RS (2009) [http://www.sepa.gov.rs/download/Stanje\\_zemljista.pdf](http://www.sepa.gov.rs/download/Stanje_zemljista.pdf)

**Reduction of organic matter:** Organic matter greatly contributes to the quality of the soil. Research has shown that anthropogenic activities significantly affect the reduction of organic matter such as inadequate application of organic fertilizers, overtime grazing, natural disasters (droughts, floods, fires). Reducing the content of organic matter, the soil becomes subject to compactization (hardening), which restricts the growth of plant root, While the soil has less ability to retain water in its composition and becomes dependent on irrigation at the same time, such soil becomes vulnerable to the precipitations of swelling of water through the field on mild slopes between depression and higher terrain) and susceptible to erosion.

**Salinization:** Salinization is an excessive accumulation of salt in the soil composition. The largest coverage of saline soil is in AP Vojvodina, with a share of 12%, while 2% of the land in Central Serbia is in the alkaline group.

**Pestel Analysis of the State of Land Resources in Serbia**

Pestel is an acronym derived from the following words: political factors, economic factors, sociological factors, technical and technological factors, legislative factors. It studies the macro environment and is the basis for strategic planning. In order to be able to create an adequate strategy for the protection of land resources in Serbia, we need to collect enough data to analyze the macro environment. PESTEL analysis is certainly the first step in creating a strategy, and through which we can obtain all the necessary information on political, economic, social, technical, technological, environmental and legislative (legal) environment, which are key factors in this analysis. An unstable macro environment can be a significant obstacle to effective action, and the subject analysis can help us to identify all potential threats and chances, as well as the benefits and disadvantages of the state of land resources in Serbia.

**Table 4.** Pestel analysis of the state of land resources in Serbia

Factors	Advantages	Disadvantages
Political	-Partly harmonized national regulations with EU legislation and international conventions -Existence of relevant institutions: the Ministry of Agriculture and Environmental Protection (Environmental Protection Agency, Agricultural Land Administration) and the Provincial Secretariat for Urban Planning, Construction and Environmental Protection	- Incomplete political framework -Lack of specific planning documents -Limited competence of local self-government in decision-making on land resources management - Incomplete restitution process

Factors	Advantages	Disadvantages
Economic	<ul style="list-style-type: none"> <li>– Source of raw materials: water, clay, sand, gravel, minerals and various types of fuel</li> <li>– Development of rural economy</li> <li>–Support to diversification of farm income</li> <li>–Improvement of the state of the infrastructure</li> <li>– Favorable ratio of available area per inhabitant and employed in agriculture</li> <li>– Low labour cost</li> <li>–High competitiveness of crop and vegetable production in the regional market</li> <li>– The competitiveness of some products in the wider international market</li> <li>– The privatization process has been largely completed</li> </ul>	<ul style="list-style-type: none"> <li>–Nondisclosure of funds for implementation of planned provisions.</li> <li>– Negative impacts and consequences of the economic crisis.</li> <li>–Lack of funding for systematic research on quality control and soil fertility</li> <li>–Insufficient budget allocated to address the problem of soil contamination</li> <li>–Dissatisfaction of the local population with material status if expropriation measures are being implemented</li> <li>–Further decline in standards and purchasing power in the country and the environment</li> </ul>
Social	<ul style="list-style-type: none"> <li>–Function of geographical and cultural heritage and physical and cultural environment</li> <li>–Enables/provides space for the construction of facilities - infrastructure</li> <li>– Growing organic production sector</li> </ul>	<ul style="list-style-type: none"> <li>–Different forms of degradation (exploitation of mineral resources, intensive urbanization, industrial processes, traffic, agricultural activity, erosion processes, etc.)</li> <li>– Low level of soil awareness as an important element of the environment</li> <li>–Uncontrolled, unplanned, unlawful and inadequate occupation of (fertile) land (eg landfills, tailings)</li> <li>– Land conversion</li> <li>– Small size of farms and fragmentation of plots</li> <li>– Increasing the area of unused agricultural land</li> <li>–Adverse age and education structure of labour in agriculture</li> <li>– Creating pillars</li> </ul>

Factors	Advantages	Disadvantages
<p><b>Technical and Technological</b></p>	<ul style="list-style-type: none"> <li>-Some progress in the systematic collection of data on the state of land (preparation of inventories of contaminated sites, publication: Report on the state of land in the Republic of Serbia - SEPA, Program for systematic monitoring of soil quality on the territory of the Republic of Serbia)</li> <li>- Monitoring land use indicators: changes in land use, soil erosion, organic carbon content in soil and management of sealed locally within the National List of Environmental Indicators (SEPA)</li> <li>- The inclusion of Serbia in the creation of the Geochemical Atlas of Europe for agricultural land</li> <li>- Existence of a pollutant cadaster</li> <li>- Benefits for irrigation</li> <li>-Significantly improved technology in some subsectors</li> <li>- A large number of scientific and educational institutions that can be involved in the system of knowledge creation and transfer</li> </ul>	<ul style="list-style-type: none"> <li>-Low level of technical, technological and institutional development</li> <li>-Insufficient technical equipment of institutions (quality of equipment and conditions for research) primarily to obtain analytical data acceptable to EU standards, and are related to different types of soil contamination</li> <li>-Insufficient scope of cooperation with professional institutions in Europe and the world (data exchange, cooperation on projects and staff development)</li> <li>-Lack of systematic monitoring in certain parts of the territory of the Republic of Serbia, and incomplete comparison of results from previous years</li> <li>-Lack of harmonized methods of collecting and analyzing samples, as well as data presentation</li> <li>- Incomplete information for analyzing the situation and the pressure on the land</li> <li>- Uncoordinated and unrelated work of institutions dealing with land survey and those engaged in the exploitation of other natural resources from the land (energy, ore, etc.)</li> <li>-Lack of agricultural infrastructure (field roads, irrigation, drainage, windbreaks)</li> <li>-Unsatisfactory condition of equipment and mechanization</li> </ul>
<p><b>Ecological</b></p>	<ul style="list-style-type: none"> <li>- Basic element and resource</li> <li>- Production of biomass</li> <li>- Conservation of species and genetic biodiversity</li> <li>-Accumulation, filtration and transformation of nutrients and water</li> <li>- Reservoir of biodiversity and carbon</li> <li>- Favorable natural conditions</li> <li>- The ability to produce healthy food</li> <li>- Good quality and structure of agricultural land</li> </ul>	<ul style="list-style-type: none"> <li>- Intentional or accidental introduction of allochthonous invasive species of flora and fauna</li> <li>- Damage caused by the influence of biological agents</li> <li>- natural disasters</li> <li>-Erosion, salinization, loss of nutrients, chemical pollution from bioindustrial sources, mechanical compaction (heavy machinery), locking, loss of fertility, trampling</li> <li>- Trend of loss of agricultural land</li> </ul>

Factors	Advantages	Disadvantages
Legislative	<ul style="list-style-type: none"> <li>–Law on Environmental Protection (Official Gazette of the Republic of Serbia, No. 135/04)</li> <li>–Law on Agricultural Land (Official Gazette of the Republic of Serbia, No. 62/06, 65/08 - other law and 41/09)</li> <li>–Rulebook on permitted quantities of hazardous and harmful substances in soil and irrigation water and methods for their examination (Official Gazette of the Republic of Serbia, No. 23/94)</li> <li>–Rulebook on the National List of Environmental Indicators (Official Gazette of the Republic of Serbia, No. 37/11)</li> <li>–National Strategy for Sustainable Use of Natural Resources and Goods (Official Gazette of the Republic of Serbia, No. 33/12)</li> <li>– National Strategy for Sustainable Development (Official Gazette of RS, No. 55/05)</li> <li>– National Environmental Program</li> <li>– Decree on the program for systematic monitoring of soil quality, indicators for assessing the risk of land degradation and the methodology for the development of remediation programs (Official Gazette of RS, No. 88/10)</li> <li>–Decree determining the criteria for determining the status of a particularly endangered environment, the status of a threatened environment and for determining the priorities for rehabilitation and remediation (Official Gazette of the Republic of Serbia, No. 22/10)</li> </ul>	<ul style="list-style-type: none"> <li>–Incomplete legal regulations in the area of monitoring and protection of land</li> <li>– Lack of strategic documents in the domain of land resources</li> <li>– Non-enforcement of laws</li> <li>– Low or non-existent legal provisions for pollution and inadequate management</li> <li>– Insufficient coverage with inspection services</li> </ul>

Source: (Djordjević, 2016)

As noted, the PASTEL analysis allows us to examine the key factors in the macro environment, that is, those that have an impact on the realistic view of the state of land in the Republic of Serbia. After identifying the key factors, that is, the advantages and disadvantages contained therein, it is possible to create different scenarios, by which it is certain to predict the state of the land in the immediate future, with particular reference to the trends in the key factors of change. Also, each analysis, even this one, serves to create appropriate strategies, that is, documents that will contain all the necessary guidelines and help us achieve the set goals.

### **Measures for soil protection in order to preserve ecological safety**

Serbia, as well as all countries in the world, faces numerous crises related to environmental degradation, caused by various pollutants and other influences, due to irresponsible and inappropriate human activities. Addressing numerous challenges, risks and threats requires general social consensus and comprehensive efforts, and many solutions are taken with a reserve as hard to achieve. Therefore, it is right to ask, what can the institutions and an individual do in the context of security / ecological culture, and specifically contribute to the development and improvement of environmental protection. It is evident that inadequate use of natural resources has led to contamination of soil, water and air, which caused changes in the life of each individual and influenced the decrease in the life span of a modern man. At the same time, soil protection measures cannot be seen in isolation and beyond the context of overall environmental protection measures.

A healthy and safe environment is conditioned by the adoption of numerous and complex solutions in relation to( Bjelajac, 2017):

- Preventing new sources of pollution of the environment;
- Reduction of sources of pollution of the environment;
- Production and storage of chemicals and radioactive materials;
- Environmental impacts from the field of exploitation of ores;
- Increases in the percentage of industrial complexes in urban areas that have sewage networks and sewage treatment plants;
- Commercialization of secondary raw materials and recycling of waste,
- Storage, transport, treatment or safe disposal of medical equipment waste;
- Recovering of polluted and degraded lakes, bars, canals and parts of the river in urban areas;
- Improvement of air and water quality in urban areas;
- Improvement of sewerage in urban and rural areas;
- Efficient and sustainable use of land resources and reduction/loss of agricultural land due to various reasons;
- Improving the efficiency of water resources use and reducing water shortages;
- Increase in forest coverage and forest quality improvement;
- Increase in the quantity and quality of nature reserves;
- Active measures for the protection of rare and endangered plant and animal species;
- Fostering the ability to respond to climate change and reduce greenhouse gas emissions;
- Increasing the efficiency of energy use and encouraging investment in renewable energy sources for the purpose of energy efficiency and energy savings (water, wind, solar thermal, photovoltaic and geothermal sources, wave, tidal and asymmetric energy);

- Creating strong changes in environmental responsibility responses on all instances (industry, businesses, people);
- Strengthening the ability to implement environmental protection laws;
- Developing an ecological industrial economy;
- Increase of investments in the field of environmental protection;
- Accelerating international integration and cooperation in the field of environmental protection;
- Increasing the scope of scientific-technological research, and their applications for development and environmental protection;
- Control of fertility and use of fertilizers, and determination of the content of harmful substances;
- Raising awareness of the importance of land security. The Land Safety Model links sustainable development and land functions into a single system. In this way, the safety of the land becomes the basis and inseparable part of the system and thus affects the ecological safety;
- Prohibitions of disposal of waste material, sludges, etc. on fertile soil;
- Land remediation contaminated with depleted uranium missiles due to the NATO bombing.

It is a flagrant fact that environmental issues are vital for the existence of human beings. In a wider sense, these are issues in the field of security culture, and in the narrower sense, they relate to the field of ecological culture. Solving complex relationships between people, their health and their environment should become an imperative, which through joint efforts will enable effective sustainable development, in the capacity to meet the needs of present generations, while preserving the potential and opportunities for future generations.

### **Conclusion**

Care of the environment is of crucial importance for the existence of a modern man, the sooner the protection of the key elements of our environment is important for human health. The ability to breathe clean air, to provide clean drinking water and healthy food from non-contaminated soils are the basic needs for our well-being. Therefore, the negative environmental impacts on health are the main concern of environmental and health practitioners around the world. With environmental protection and adequate regulation, we can perceive and limit what goes into our atmosphere, groundwater and land. We can ensure that all inhabitants get clean water that does not harm health, that the air we breathe is free of contaminants, that the land in which we grow crops necessary for food products is free from harmful substances. Contaminated soil is a land that, due to harmful substances (on or below it), poses a significant risk to human health. Land can be contaminated in various ways, for example, through industrial activities, waste disposal, etc., including the content of natural substances such as

metals or gases at levels that are harmful. In Serbia, among other things, there are evident negative consequences due to the NATO bombing and use of depleted uranium ammunition, and contaminated land has caused an increase in the number of cancerous diseases. However, it seems that the importance and need to address this problem does not seem to be properly understood. By reviewing the results of previous research, we note that RS has a high-quality land due to favourable climate, vegetation and micro fauna. According to the Statistical Office of the Republic of Serbia (2014), out of the total of 5.06 million hectares of agricultural land, about 65% is used as arable land (more precisely, 3.3 million hectares), out of which 7% per year remains untreated area or coal. It is very important to emphasize the fact that in Serbia 2/3 of crop cultivation can be done 200 days a year. However, despite certain advantages, awareness of environmental protection and the prevention of land degradation remains low compared to the developed countries of Europe. Decision makers, as well as citizens, ignore the fact that land quality significantly affects the agricultural sector and the economic development of the country. In the literature, the results of previous research implied that the land is still insufficiently protected natural resource in which insufficient investments are made in the Republic of Serbia. The “purification” of the land requires great financial investment, and on the other hand, it improves the quality of life of citizens. Based on the analysis of the situation in this domain, despite the seemingly comprehensive legal framework, it is noticeable that one of the problems is incomplete and ineffective legal regulations in the field of environmental protection. Although in the last decade the country is engaged in more active environmental issues in order to meet EU integration requirements, the experts’ opinion is that Serbia is lagging behind in relation to the EU in both normative and realistic terms. Finally, the solution to these complex problems is urgently sought in the promotion of environmental security, which should deal with the connection between environmental and human security issues, which means eliminating negative impacts on human health. Environmental safety tends to cover not only the current environmental degradation problems but also to “illuminate” new threats so that we can create appropriate strategies and pass on to a healthy planet for the next generations.

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## ZAŠTITA ZEMLJIŠTA U REPUBLICI SRBIJI I EKOLOŠKA BEZBEDNOST SA OSVRTOM NA STRATEŠKI I PRAVNI OKVIR

*Željko Bjelajac*<sup>12</sup>, *Marijana Dukić Mijatović*<sup>13</sup>, *Željko Vojinović*<sup>14</sup>

### Rezime

*Opšte je poznato da su ekološke i socioekonomske funkcije zemljišta osnova za socijalno i ekonomsko blagostanje. Uprkos toj činjenici zemljište je još uvek relativno zanemaren prirodni resurs, što se može zaključiti kroz analizu pritisaka na zemljište i nepostojanje sistematskog monitoringa, koji podrazumeva sagledavanja stanja i definisanja programa za njegovu zaštitu. Pri tom, evidentna su nedovoljna izdvajanja za rešavanje ovih složenih problema, što uz nedelotvornost starteškog, institucionalnog i pravnog okvira zaštite zemljišta u Republici Srbiji, naposljetku vodi ka degradiranju ekološke bezbednosti. Imajući u vidu navedeno, ovaj rad potencira nužnost donošenja delotvornih mera za zaštitu zemljišta u cilju očuvanja ekološke bezbednosti, odnosno takav sistem upravljanja životnom sredinom koji će odražavati tendenciju da se eliminišu negativni uticaji u odnosu na životnu sredinu i zdravlje ljudi.*

**Ključne reči:** *zemljište, degradacija zemljišta, zaštita zemljišta, životna sredina, ekološka bezbednost*

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## Прилог бр. 3

**СПИСАК РЕЦЕНЗЕНАТА ЧЛАНАКА У  
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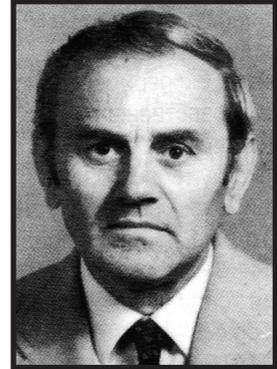
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## OPROŠTAJNI GOVOR NA KOMEMORACIJI 05.07. 2017. godine povodom preminulog prof. dr Radošlava V. Radojevića (19.08.1930. - 19.06.2017.)

Poštovani članovi porodice, uvažene kolegice i kolege, draga rodbino i prijatelji, danas smo se okupili da se još jednom podsetimo na život i delo dragog prof. Radojevića.

Prof. dr Radošlav V. Radojević je rođen 1930. godine u mestu Dragovu, opština Rekovac, SR Srbija. Osnovnu školu je završio u mestu rođenja, nižu školu u Čupriji, a srednju poljoprivrednu u Gnjilanu. Nakon završene srednje škole, regulisao je vojnu obavezu tokom 1951/52. služeći u školi za rezervne oficire.



Po povratku iz tadašnje JNA, zaposlio se i pet godina je radio na stručnim i rukovodećim radnim mestima, najpre u Zemljoradničkoj zadruzi u rodnom mestu Dragovu, a zatim na Poljoprivrednom dobru „Šumadija“ sa sedištem u Kragujevcu.

Na Poljoprivredni fakultet se upisao školske 1957/58., a diplomirao 1961. Po završetku studija, radio je kao honorarni saradnik na predmetu Kalkulacije, a januara 1962. je izabran za *stalnog asistenta* Poljoprivrednog fakulteta. Školske 1962/63. upisao je III stepen studija na Grupi za ekonomiku preduzeća, a 1970. je odbranio magistarski rad pod naslovom: „*Variranje troškova i rezultata poslovanja važnijih ratarskih useva*“.

Godine 1968. obavio je petnaestodnevni studijski boravak u Čehoslovačkoj na Višoj poljoprivrednoj školi u Pragu, a 1978. četvoromesečnu specijalizaciju u Holandiji u Međunarodnom poljoprivrednom centru u Vageningenu i 1978. petnaestodnevni studijski boravak u Bugarskoj u Plovdivu.

Doktorsku disertaciju je odbranio na ovom fakultetu jula 1976. na temi: „*Rezervni fondovi kao izraz varijabilnosti dohotka poljoprivrednih organizacija*“.

U zvanje docenta za premet EKONOMIKA MELIORACIJA biran je 1977., reizabran 1981, za vanrednog profesora 1982., a za redovnog profesora izabran je 1988. godine. Tokom radnog veka na ovom fakultetu, prof. Radojević je izvodio predavanja i vežbe za više predmeta: Kalkulacije za studente *Agroekonomskog, Ratarskog, Stočarskog i Voćarsko-vinogradarskog odseka*, Ekonomiku melioracija za studente *Odseka za melioracije i zaštitu zemljišta*, Ekonomiku i organizaciju zaštite bilja za studente *Odseka za zaštitu bilja* i Ekonomiku investiranja za studente *Agroekonomskog odseka*. Rukovodio je studentskom praksom, izvodio praktičnu obuku i učestvovao u realizaciji letnje prakse iz ekonomskih disciplina za studente *Agroekonomskog odseka*.

Pored nastave na matičnom fakultetu, dve godine od 1978. do 1980. predavao je Ekonomiku melioracija na *Poljoprivrednom fakultetu Univerziteta u Novom Sadu*, a šest godina od 1989. do 1995., izvodio je nastavu za predmet Ekonomika uređenja erozionih područja na *Šumarskom fakultetu Univerziteta u Beogradu*. Prof. Radojević je bio izuzetan pedagog, predavač, ispitivač, ostavio je neizbrisiv trag i pamtiće ga brojne generacije studenata.

Kao samostalni autor i koautor objavio je preko 90 bibliografskih jedinica, od kojih 30 naučnih radova, 16 naučnih studija, 6 stručnih radova i više od 40 projekata. Rukovodio je ili bio član komisije za izradu brojnih diplomskih radova, mentor ili član komisije za ocenu i odbranu magistarskih teza i doktorskih disertacija, a i potpisnik je više referata za izbore u nastavna zvanja na fakultetu.

Svojim radom i doprinosom, svrstan je u vodeće naučne radnike u oblasti *Ekonomika investiranja u melioracijama*. Kao istaknuti i priznati naučni radnik, svoju univerzitetsku karijeru krunisao je razvojem nastavne discipline Ekonomika melioracija. Pored naučnog, stručnog i pedagoškog rada, trajan pečat afirmacije njegove univerzitetske karijere ostvaren je kroz saradnju fakulteta i privrede. Kao rukovodilac, koordinator ili član tima na relaciji *nauka – struka - praksa*, krajem 70-ih i tokom 80-ih godina prošlog veka, pripremao je i učestvovao u realizaciji preko 40 investicionih projekata koji se odnose na odvodnjavanje, navodnjavanje, podizanje višegodišnjih zasada, planiranje i projektovanje optimalne strukture poljoprivredne proizvodnje i druge.

Uz naučni, nastavni i stručni rad, prof. Radojević je obavljao brojne poslovodne, (samo) upravne i društveno-političke funkcije u Institutu, Fakultetu i van njega. Bio je direktor Instituta za agroekonomiju, šef Katedre za teoriju troškova i računovodstvo, član komisije za unapređenje nastavnika Nastavno-naučnog veća beogradskog Univerziteta i delegat Skupštine RZU.

Dobitnik je Povelje Fakulteta povodom 60 godina postojanja i rada Fakulteta.

Prof. Radojević nije bio samo naučni radnik i nastavnik, već i narodni čovek, pristupačan za svakoga. Posedovao je visoke kvalitete ljudskosti. Plemenitost, jednostavanost, skromnost, optimizam, vedar duh, elokvencija i radoznalost su krasili njegovu ličnost. Vođen ljubavlju i poštovanjem prema ljudima, širinom i vedrinom slobodnog ljudskog duha, bio je čest, poznat i rado slušan govornik na raznim skupovima i događajima. Ukratko, bio je veliki čovek!

Fakultet je bio njegov dom u koji je ugradio deo sebe, deo svog života. Dom koji je mnogo voleo, za koji je neraskidivo bio vezan i kome se redovno vraćao, pa i onda kada je penzionisan, od 1995. godine.

*Šta reći?* Životni put i delo prof. Radojevića je primer jednog celovitog, sadržajnog, svestranog, sveobuhvatno ispunjenog ovozemaljskog života. Potekao je iz seoske poro-

dice skromnih materijalnih mogućnosti, nosio se sa životnim nedaćama, iskušenjima i uzlaznom trnovitom putanjom, mukotrпно radio, mnogima pomagao, a prelazeći lestvicu po lestvicu, izgradio je vrhunsku univerzitetsku karijeru i uz rad, stvorio i održao čestitu porodicu. Nakon penzionisanja, od 1995. godine, u porodičnoj harmoniji, a posebno pri odgajanju i brizi tokom odrastanja dragih unuka, Ivane i Marije, prof. Radojević je ubirao zaslužene plodove svog minulog rada. A onda, ove godine, kao da mu je neko nagoveštavao da je izmirio sve ovozemaljske obaveze prema porodici, najbližima, prema kolegama i prijateljima, i najavljiavao je svoj odlazak.

Dana, 19. juna 2017. prof. Radojević je preminuo u 87. - oј godini života.

Članovima porodice prof. Radojevića, još jedno iskreno saučešće u bolu zbog fizičkog gubitka staratelja, a na čast i ponos da im služi sećanje i uspomene na uzornog supruga, oca, svekra i dedu.

Za Fakultet, nauku i struku, kolege, prijatelje i poznavaoce prof. Radojevića, ostaju trajno utkane zasluge i dela dostojanstvenog profesora i uglednog naučnog radnika, a meni kao bliskom saradniku i direktnom nasledniku, pripala je posebna privilegija i obaveza da sledim i razvijam njegove duhovne ideje.

**Neka mu je večna slava i hvala!**

**Prof. dr Zorica Sredojević  
Institut za agroekonomiju  
Poljoprivredni fakultet u Beogradu-Zemunu**



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*Anđela Marković<sup>2</sup>, Petar Petrović<sup>3</sup>, Mirko Mirković<sup>4</sup>*

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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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## Introduction

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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

Source: Petrović, 2012;

Note: Values within the table are calculated without Value Added Tax (VAT)

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**Format strane (paper size):** *Width* 170 mm x *Height* 240 mm; **Margine:** gore/dole 20 mm, levo/desno 18 mm; **Layout:** *Header* 1,25cm, *Footer* 1,25cm; **Orientation:** Portrait. Preferira se **obim radova** do maksimalnih 30.000 karaktera (bez razmaka), odnosno 15 stranica. Radovi ne bi trebalo da budu kraći od 10 stranica. U zavisnosti od kvaliteta rada Uredništvo može prihvatiti i duže radove. Molimo Vas da radove pripremate na računaru u programu **Microsoft Word XP** ili nekoj kasnijoj verziji ovog programa.

U nastavku sledi detaljan **Šablon** (tehničko uputstvo) za pravilnu pripremu radova za časopis Ekonomika poljoprivrede. Molimo Vas da maksimalno moguće poštujuete tehnička pravila data sledećim šablonom.

**ŠABLON: NASLOV RADA (CENTRIRAN, TNR SIZE 12, BOLD, SVA SLOVA VELIKA, MAKSIMALNO DVA REDA)<sup>1</sup>**

*Anđela Marković<sup>2</sup>, Petar Petrović<sup>3</sup>, Mirko Mirković<sup>4</sup>*

**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.*

*Izbegavajte korišćenje indeksa i specijalnih simbola u apstraktu, odnosno definišite sve skraćenice u apstraktu kada se prvi put upotrebe. Nemojte citirati reference u apstraktu.*

*Autori iz Srbije šalju naslov rada, rezime rada, ključne reči i podatke o sebi i na srpskom jeziku na kraju rada, ispod listinga korišćene literature. Tekst srpske i engleske verzije apstrakta i ključnih reči se moraju podudarati u svakom pogledu.*

**Key words:** *navesti, maksimalno, pet, ključnih, reči.*

**JEL:** *Q16, M24* ([www.aeaweb.org/jel/jel\\_class\\_system.php](http://www.aeaweb.org/jel/jel_class_system.php))

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## Introduction

Molimo Vas da striktno poštujuete uputstva o formatiranju i stilove date u ovom šablonu. Ne menjajte veličinu fonta ili razmak redova da biste ubacili više teksta u uslovno ograničeni broj stranica.

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Molimo Vas da poštujuete osnovna načela strukturiranja naučnih radova, odnosno trudite se koliko je to moguće da Vaš rad ima sledeće segmente: Uvod, Cilja rada i korišćena metodologija, Rezultati rada sa diskusijom, Zaključak, Literatura.

Tokom pisanja rada treba koristiti slova **Times New Roman (TNR)**, veličina fonta (**font size**) **11**, ravnanje teksta **Justify**, a tekst rada pisati bez proreda (**Line Spacing Single**), sa razmakom od **6 pt između pasusa, bez uvlačenja prvog reda**. Radovi se pišu isključivo na engleskom jeziku. Preporučljivo je rad pisati u trećem licu jednine ili množine uz korišćenje aktivnog oblika. Pre slanja rada, obavezno proveriti pravopisne greške putem spellchecker-a za engleski jezik.

**Podnaslovi** se pišu fontom **Times New Roman**, veličina fonta (**font size**) **11, bold, centrirano**, samo prvo slovo veliko, razmak podnaslova i teksta iznad 12 pt (**before 12 pt**), a razmak podnaslova i teksta ispod 6 pt (**after 6 pt**). Molimo Vas koristiti prikazani stil pisanja u ovom šablonu.

Molimo Vas da definišete **skraćenice i akronime** prilikom prvog pojavljivanja u tekstu rada, čak i u slučaju da su već bili definisani u apstraktu rada. Ne koristite skraćenice u naslovu rada osim ukoliko se one apsolutno ne mogu izbeći

Radi unosa **jednačina i formula** u rad, koristite Microsoft Equation Editor ili dodatak za pisanje jednačina MathType ([www.mathtype.com](http://www.mathtype.com)). Ne preporučuje se korišćenje ugrađenog editor jednačina iz programa Word 2007. Proverite da li ste definisali sve simbole u jednačini (neposredno posle jednačine).

**Reference** (autori citata) se navode direktno u tekstu rada u sledećem obliku (Petrović, 2012; ili Petrović, Marković, 2012; ili Mirković et al., 2012). Ne navodite ih kao indekse u četvrtastoj zagradi [3] ili u fusnoti. Trudite se da fusnotu koristite samo u slučaju bližih objašnjenja određenih pojmova, odnosno razjašnjenja realnih ili hipotetičkih situacija. Nemojte vršiti numeraciju stranica.

**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 tabele. 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).

Kod pisanja zaključka rada, molimo Vas imajte na umu da iako **Zaključak** može dati sažeti pregled glavnih rezultata rada, nemojte ponavljati apstrakt na ovome mestu. Zaključak može objasniti značaj rada, dati preporuke za dalje delovanje ili predložiti dalji rad na obrađivanoj temi.

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