INSTITUTE OF AGRICULTURAL ECONOMICS, BELGRADE, SERBIA

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SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT IN TERMS OF THE REPUBLIC OF SERBIA STRATEGIC GOALS REALIZATION WITHIN THE DANUBE REGION

- Science and practice in the service of agriculture -

Thematic Proceedings

Belgrade, 2020

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THEMATIC PROCEEDINGS

Belgrade, 2020

Publisher:

Institute of Agricultural Economics, Belgrade, Serbia

Editors:

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Marko Jeločnik, Ph.D.
Jean Vasile Andrei, Ph.D.

Technical arrangement and printing:

SZR NS MALA KNJIGA +
Zetska Street no. 15, 21000 Novi Sad, Serbia
Phone: +381 (0) 21 64 00 578

Technical preparation and page breaking:

Vladimir Sokolović

***Number of copies:* 300**

ISBN (print) 978-86-6269-081-4
ISBN (e-book) 978-86-6269-082-1

Publishing of Thematic Proceedings was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

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PREFACE

The Thematic Proceedings was prepared as the result of the scientific research on the integrated and interdisciplinary project no. III 46006: *Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region*.

Thematic Proceedings includes selected papers presented at the International Scientific Conference – Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region: Science and practice in the service of agriculture, which was hold in Belgrade on 12-13th December 2019.

Thematic Proceedings includes the articles from Serbia, as well as the invited and other articles prepared by foreign authors, which are associates of the IAE Belgrade and whose institutions have close scientific, professional and technical cooperation with the IAE Belgrade.

The Thematic Proceedings addresses the wider audience scientifically and practically focused to all segments of agriculture and rural development.

Publisher and editors are not responsible for the content of the scientific papers and opinions published in the Thematic Proceedings, as they represent the authors' point of view.

Publishing of Thematic Proceedings was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

In Belgrade
February, 2020

Editors:
Jonel Subić, Ph.D.
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DEMAND FOR INVESTMENTS IN THE FIELD OF WATER SUPPLY AND SEWAGE DISPOSAL IN RURAL AREAS IN POLAND

Adam Wasilewski[1], *Marek Wigier*[2]

Abstract

Significant investments in the development of the water supply and sewage network, made mainly after Poland's accession to the European Union, did not fully satisfy the demand of rural areas for devices of this infrastructure. Therefore, the purpose of the research was to assess the demand of rural areas for the expansion of the water supply, sewage and sewage treatment plants. The preparation of the study was based on the data of the Local Data Bank of the Central Statistical Office as well as data and information obtained during surveys carried out in all municipalities included in rural areas (2,175). The survey was conducted in the form of an electronic questionnaire posted on a website prepared for this purpose (CAWI) in 2017 (water supply) and in 2018 (sewage). The final effect of the research was the estimation of the costs of water supply investments in 2 variants, in the case of water supply investments.

Estimates show that the total cost of connecting to all households' water supply network (variant 1 of the analysis) would be around EUR 2.2 billion, and in the optimal option (95% of the property) - EUR 1.6 billion. The total estimated cost of investment projects in rural areas, associated with the full satisfaction of the needs of the population in terms of access to the sanitary sewage system in all villages - is EUR 4.4 billion, including in villages with less than 2,000 inhabitants - EUR 3.6 billion, while in villages with a population of over 2,000 - around EUR 0.8 billion.

Introduction

The level of infrastructure development is one of the main factors determining the proper functioning and development of settlement units. Due to the functions and features it possesses, infrastructure is one of the most important factors determining the quality of life of residents. It also has an impact on the directions and pace of development of the local economy (Sierak, 2017). At the same time,

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the level of its development has a direct impact on the quality of the natural and cultural environment. Infrastructure is a set of basic devices, organizational systems and institutions, whose presence is necessary for the proper functioning of the economy in a given area and the organization of life of its inhabitants (Ginsbert Gebert, 1976). The main elements of municipal infrastructure include the water supply and sewage system. The functioning of the water and sewage infrastructure finds expression in direct (access to the network) and indirect (taking the form of external benefits) effects. These benefits, creating a state of certain location convenience, favour faster economic development of areas covered by the operation of infrastructure devices (Ginsbert Gebert, 1976).

Since the beginning of the 1990s, improving the condition of the local technical infrastructure has been recognized as one of the priority areas of activity in rural development programs in Poland. The need for quantitative and qualitative development of water and sewage infrastructure is also a consequence of Poland's membership in the European Union and the consequent need to harmonize legal acts. The following should be mentioned here: provisions on water quality (Water Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and provisions on waste water management (Council Directive 91/271/EEC concerning waste water treatment). This concerned in particular the devices used to supply the village with water as well as sewage disposal, collection and utilization. Since beginning of the economic transformation and as part of pre-accession funds, and already during the EU membership, Poland obtained significant financial resources to finance these activities (Piasecki, 2019).

The development of water and sewage infrastructure was a basic factor conditioning both the improvement of civilization conditions of the rural population and the activation of transformation processes in the economic structures of the village. In general the Polish internal freshwater resources characteristics show disproportion in total inflow and outflow. It means, more water is discharged than accumulated. More intensive water withdrawal for agricultural activities in consecutive years are expected - agriculture is the only one of the four sectors in which average annual water needs show a constant upward trend. Expected more extreme events related with climate change - droughts, floods, heavy rains could worsen the situation (Skorbilowicz, Skorbilowicz, 2008).

As a consequence of the dynamic expansion of the rural water supply network (in the period 1990-2017 its length increased from 57,000 km to 235,000 km) and a significant number of connections (out of 2.5 million pieces of water supply connections installed in 1995-2015 1.7 million, i.e. 68%, was installed in rural areas) the provision of running water to rural households has improved significantly. Thanks to the investments carried out, the number of people using the water supply network increased from around 30% in 1990 to over 85% in 2018. Traditionally, the population living in rural areas used water intakes from domestic wells, not normally subject to any quality control (Raczuk, Sarnowska, 2002). The factor that contributed to the increased demand for the development of the water supply system was the systematic increase in the number of rural population. This was due to the growing (especially near larger cities) population migration to rural (peri-urban) areas and general economic development (Bieganska, Szymanska, 2013). The Central Statistical Office (GUS) data shows that in 2018 the sewage network in Poland reached a length of 160.7 thousand km, while the number of connections to residential buildings was 3.4 million. Definitely greater disproportions concerned the equipment with a sewage network. Although also in this respect, in the following years there was a visible improvement in the length of the rural sewage network, in 2018 about 42% (in 1990 it was about 6%) in of the rural population used it, when in relation to cities such an indicator was more than twice as high. The development of drinking water supply infrastructure was much higher in the hierarchy of needs of the rural population than the expansion of the sewage network (Klos, 2011). This need can be partly explained by the generally low environmental awareness of society, in particular the rural population.

Significant investments in the development of the water supply and sewage network, made mainly after Poland's accession to the European Union, did not fully satisfy the demand of rural areas for devices of this infrastructure. In the near future, further expansion of the sewer network in Poland should be expected. It is highly probable, however, that its length will not be the same as the length of the water supply system. Underlying this assumption are two basic reasons: technical and economic. The natural shape of the countryside and the dispersed settlement network in the countryside significantly increase (compared to urbanized areas) the costs of investment and construction of the sewage network in rural areas (Boguniewicz Zablocka, Capodaglio, 2017). Therefore, the purpose of the research was to assess the demand of rural areas for the expansion of the water supply, sewage and sewage treatment plants. The final effect of the research was the estimation of the costs of water supply investments in 2 variants. In the case of water supply investments, Option 1 meant achieving full satisfaction of the needs in terms of water supply of 100% of households, and Option 2 - achieving the optimal level of water supply, in which the limit value was the percentage of households having access to the collective network in the highest level province availability of this infrastructure.

Methodological approach

The assessment of the demand of rural areas for the development of the water supply, sewage and sewage treatment plants covered all rural communes and rural areas of urban-rural communes in Poland. To prepare the expertise, the data of the Central Statistical Office (CSO), Local Data Bank as well as data and information obtained during the survey were used.

Surveys regarding the demand for water supply investments were carried out in 2017, and the demand for sewage investment in 2018, in the form of an electronic questionnaire posted on a website prepared for this purpose (CAWI). Before starting the study, a contact details database was prepared covering the email addresses of 2,175 rural and urban-rural communes. This database was used to send the internet address of the survey form and letters of intent of the Ministry of Agriculture and Rural Development and the Institute of Agricultural and Food Economics - National Research Institute to all the above mentioned municipalities.

Representatives of nearly 28% of municipalities answered the questions in the survey regarding the water supply network, and slightly more than 25% of municipalities in the case of the sewage network. Information confirming the representativeness of the distribution of municipalities that completed the survey, in national terms and by voivodship, was provided by the analysis of the population structure having access to the collective water supply network in the total number of rural residents in the survey and data from the Central Statistical Office of Poland (CSO) for 2015. In both studies, the distribution of these values is similar, especially in relation to their spatial relationship. This provides the basis for an attempt to generalize the obtained research results in relation to the entire country as well as in individual voivodships.

Descriptive and comparative analysis methods were used to analyse the condition of municipalities' equipment with water supply infrastructure and assess the demand for water supplies based on GUS data. Empirical material enabling this part of the study to be compiled was the data of the Central Statistical Office of the Central Statistical Office for 2,175 urban-rural and rural municipalities to which the survey was sent.

The investment costs resulting from the demand for the water supply network have been estimated in 2 variants:

- Variant I - achieving full satisfaction of water supply needs, i.e. 100% of households with access to the collective network;

- Variant II - achieving an optimal level of water supply, in which the limit value will be the percentage of households with access to the collective network in the voivodship with the highest level of its availability.

The assessment of the demand for sewage investments was also carried out in 2 variants, but with slightly different criteria:

- Variant I - achieving full satisfaction of the needs in the area of collective sewage system. This option will estimate the costs of covering all villages in the collective sewage system, which, according to local authorities, should be included due to the size or compact arrangement of buildings, which does not generate high unit costs of connections and the costs of connecting to the network of residents in villages with a collective sewage network. This estimate will include the costs of constructing and modernizing the collective sewage network and sewage treatment plant;
- Variant II - achieving the necessary level of meeting the needs of collective sewage system. This option will estimate the costs of including in the collective sewage system all villages with more than 2,000 inhabitants. This estimate will include the costs of constructing and modernizing the collective sewage network and sewage treatment plant.

Theoretical background

Water supply and sewage network are elements of technical infrastructure. Therefore, their significance for both the country's economy and the local economy results from the functions that are assigned to infrastructure in the literature on the subject. The term "infrastructure" is relatively young, as it derives from the military vocabulary of countries belonging to the North Atlantic Pact. In this approach, it meant permanent devices necessary for the needs of the army. In this sense, the analysed elements are the primary infrastructure or the basic infrastructure. Over time, however, the term began to spread in non-military spheres and displace the previously existing concepts considered synonymous with social and economic infrastructure, namely social overhead capital and economic overhead capital. In other words, the infrastructure has appropriated the meaning of the two concepts mentioned above. At the same time, many West European economists began to consider infrastructure as the basis for the development of the entire national economy. This means that it has been recognized as a very important link in the public sector and that the subject of its development policy is the state. Its importance was also recognized in the Polish literature on the subject. Evidence of this is even formulated by many authors and quite similar definitions of this concept. An example is the definition presented by Andrzejewski (1974). According to this author, infrastructure is a collection of all technical devices and the entire institutional environment that are necessary for the proper functioning of the economy and the organization of life of the population. It is also worth paying attention to the definition of Kucinski (1977), which is derived from systems theory. The author compares infrastructure to spatial systems. In his opinion, infrastructure is made up of all devices, institutions and objects without which it would not be possible to function spatial systems and meet social needs. According to this definition, it is the infrastructure that integrates all these systems into one coherent system.

However, the above infrastructure definitions are not the only ones used in the literature. Also noteworthy are the definitions:

- Dziembowski (1966) indicates that infrastructure is a necessary element for conducting all production and service activities, functioning of other, non-productive sectors of the economy and is necessary for the life of the population in a given area. The author lists tangible elements of infrastructure, such as: roads, transport, telecommunications, energy networks, water and sewage networks, gas devices and also elements classified in literature as soft and associated components, including public institutions responsible for safety, education, health protection, and compliance with legal standards, financial transfers, etc;
- Zajda (1974), according to which the infrastructure includes equipment and all installations necessary for the functioning of the productive and services sectors;
- Kopaliński (1994), presenting the definition of infrastructure, referred to the basic technical background, as well as economic entities and institutions providing services to enterprises and to the population, that are necessary for the proper functioning of the economy (he meant the whole of broadly defined economic and social infrastructure).

In principle, all infrastructure definitions emphasize its service function vis-à-vis other sectors of the national economy. This means that the proper development of each of them requires a properly shaped infrastructure. Deficiencies in basic devices and institutions referred to as infrastructure create a serious barrier to economic, social and ecological development. Cited definitions show that infrastructure is a very broad concept, and the impact of its elements covers virtually all of these development aspects. For this reason, there are essentially three sections (Sieminski, 1996), namely:

1. technical infrastructure: water and sewage management; so-called “Drainage infrastructure”; communication; telecommunications; data; energy; waste management; fire protection;
2. economic infrastructure: service crafts; collection and supply points; warehouses and warehouses; trade and gastronomy; zoo-technical and veterinary service; agro-technical service; economic administration; finance (banks);
3. social infrastructure: healthcare; culture; education and upbringing; recreation; local government; sometimes we include social and political organizations as well as „religious” infrastructure.

The complexity of the term ‘infrastructure’ also results from the complexity of its functions (Lesniak, 1985):

- transfer - includes here, among others transport, telecommunications, energy or information flow,
- service - providing services for various branches of the national economy,
- location - in other words, it is a location factor, if only because of the availability of the transport network or water availability,
- acceleration – relating to fact that a certain state and level of infrastructure can be an element accelerating the development of given areas,
- integration - this function has a strong relationship with the area served by the element.

The presence of specific infrastructure components favours the development of economic processes and the creation of new jobs. A well-developed infrastructure reduces the entrepreneur’s costs, stimulates the inflow of new investments and contributes to the location of new ventures in this area. When talking about costs, you should not only mean the road network, energy, water and modern IT supplies. Modern and well-developed infrastructure stimulates the inflow of human capital, the development of settlements, contributes to the improvement of the quality and aesthetics of the environment, and helps to protect the natural environment. All these factors influence the decisions regarding the location of non-agricultural economic enterprises, especially those of supra-local range. A slightly different situation is observed, however, in the field of agricultural production, because the infrastructure does not affect the decision on the location of farms, but it can be important when choosing activities, including alternative ones, such as agri-tourism.

In the context of this work, attention should also be paid to the connections between individual elements of infrastructure. The municipal self-government, as an institution providing services to individual branches of the national economy, is an element of infrastructure. He is also responsible for maintaining and developing a number of technical and social infrastructure components. Such a coupling creates a situation in which the efficient functioning of one element of infrastructure conditions the development of many others. In turn, barriers limiting the operation of local government have a direct impact on the infrastructure equipment of a given settlement unit. Poorly developed infrastructure cannot fully realize its location function.

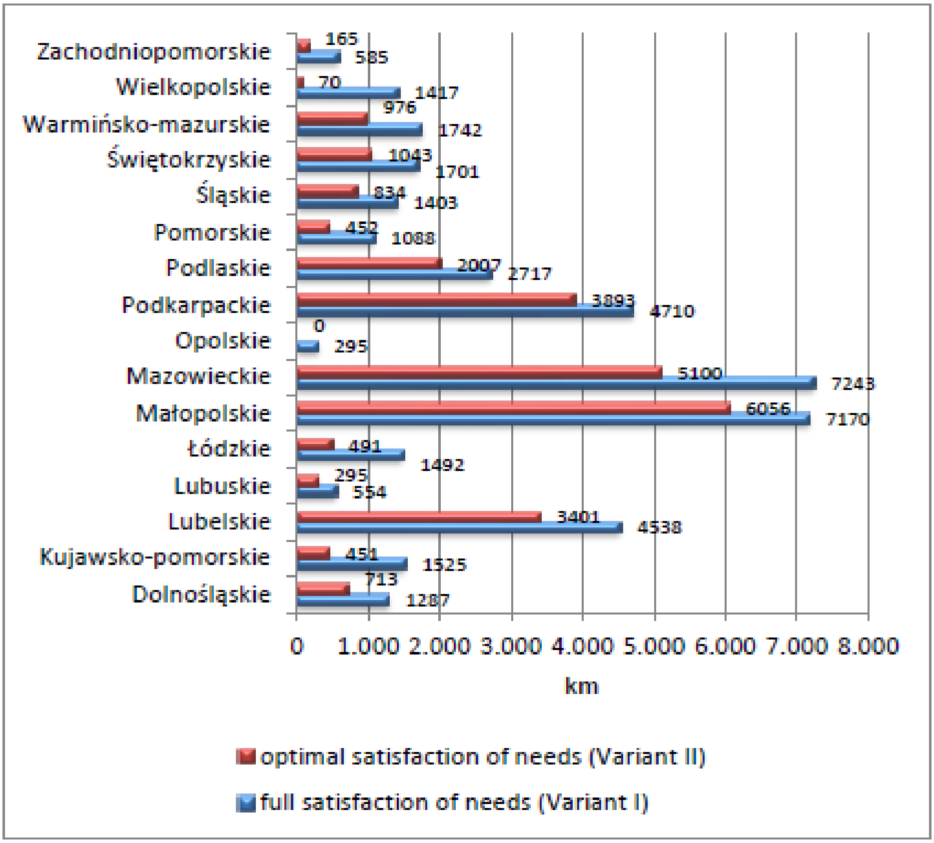
Discussion of results

In 2016, the number of inhabitants using the collective water supply network reached 12.9 million. This means that 84.8% of the rural population had access to the collective water supply system. However, considerable regional variation in water supply has been observed. The most developed water supply network had communes of Opolskie, where as much as 95% of the inhabitants used the collective water supply. A similar percentage of inhabitants using the water supply network were also observed in the province Wielkopolska. The lowest level of water supply system was characterized by rural areas of voivodeship Małopolskie, in which only 67.8% of the rural population used the collective water supply system. The low level of water supply in rural areas remained in this province despite a relatively large increase in the length of the network. Topographic conditions generating high unit costs of water supply investments were a strong barrier to the expansion of the collective water supply network in this province. A similar situation occurred in the province Podkarpackie, in which the percentage of the rural population using the water supply was at an equally low level. Analysis of population having access to the water supply network in commune system shows that inhabitants of eastern Poland are in a much more difficult situation in terms of collective water supply. Low level of water supply is also characteristic for mountainous regions of the province Podkarpackie and Małopolskie. In these communes, however, there may be difficulties with further development of the collective water supply network, and the improvement in water supply will take place through the construction and modernization of individual water intakes.

Slightly over 43% of rural residents have access to the collective sewage network. However, it should be recalled that this indicator refers to 1990 municipalities in which the collective sewage network is located. In the best situation due to the possibility of using the sewage network are residents of the province Pomorskie Voivodeship, of which more than 62% are connected to the network. A fairly high level of access to the sewage network is also ensured in rural areas of the Zachodniopomorskie, Podkarpackie, Opolskie and Śląskie voivodships, where more than half of the inhabitants use or have the opportunity to use it. A high share of population using the sewage network in the province Podkarpackie is closely related to the voivodship›s possession of the most extensive network. In turn, a high percentage of population using the network in the Zachodniopomorskie Voivodeship and the small scale of the investment constitute a premise to state that the voivodship may be approaching ensuring full satisfaction of the needs in the scope of the collective sewage network. A similar situation may occur in the province. in Opole, where a relatively large number of inhabitants use the sewage network, and investments in recent years have been at a fairly low level. Relatively fewest inhabitants of rural areas (below 30%) have the option of using the sewage network in the following voivodships: Lubelskie, Podlasie and Łódź. In these voivodships, the scale of sewage investments in recent years has not been too large either. It can be concluded from this that to some extent, the barrier to the development of the sewage network in these voivodships is scattered buildings. Relatively the most rural population has access to this element of infrastructure in the northern, western and south-eastern part of the country. In other regions, only municipalities located around large cities provide good access to the network for the rural population. Although in statistics these areas are classified as rural, in fact they are more residential than typical rural areas.

Assuming that the needs of the rural population are fully met with water, i.e. 100% of the rural population is connected to the water supply network, the length of the water supply network necessary to build can be estimated. To make this estimate, it should be assumed that the population of individual municipalities per 1 km of the network will be at the current level. Under this assumption, in rural areas in Poland approximately 39.4 thousand km of water supply network should be built. The greatest demand in this respect occurs in the province Mazowieckie and Małopolskie voivodships (Figure 1.). In each of these voivodships, more than 7,000 should be built-in. km of water supply network to achieve full collective water supply. A fairly large demand in this variant also occurs in the province Lubelskie and Podkarpackie. In this case, each province would require the construction of over 4.5 thousand km of water supply. The lowest demand is in the province Opolskie, in which the construction of less than 300 km network would lead to full water supply to rural areas. In province Lubuskie and Zachodniopomorskie would have a similar effect if they were built after about 500 km. network. Achieving full water supply would require a fairly diverse scale of investment at the level of individual municipalities. About 25% of the communes surveyed would need to build less than 3 km of water supply network. Nevertheless, about 25% of municipalities would have to implement investments involving the construction of over 30 km of water supply network. Communes requiring investments on such a large scale are located primarily in the province Podlasie and Podkarpackie.

Figure 1. Demand for the water supply network with full (Variant I) and optimal (Variant II) satisfying the needs of water supply to the village.



Source: own study based on the data of the CSO Local Data Bank.

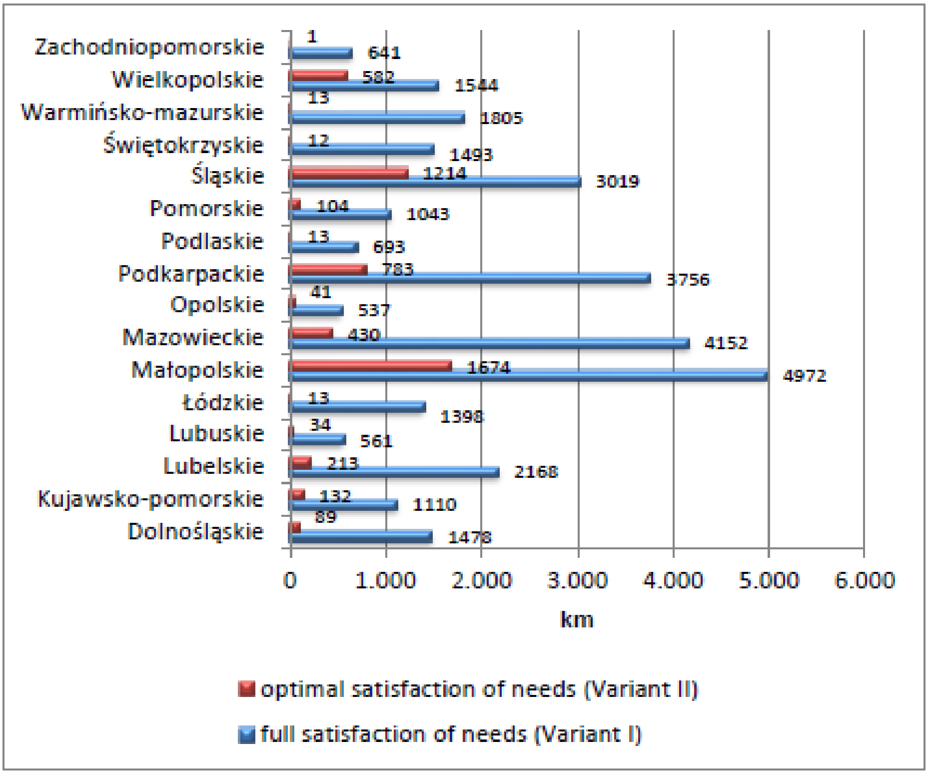
As previously emphasized, connecting all village residents to the water supply network can generate high costs due to the terrain or dispersion of buildings. It may also prove impossible for technical reasons. When preparing a support program for the development of a water supply network in rural areas, an optimal rural water supply scenario should also be considered. In this study, the level of 95% of the population connected to the water supply system was adopted as the border for optimal water supply in rural communes. It is a value specifying the percentage of inhabitants using the water supply network in the province Opolskie, which achieved the highest value of this indicator.

Using this indicator as the limit value for the level of water supply, it can be stated that water supply investments should be carried out in 1372 municipalities. In total, 25.9 thousand buildings would have to be built in rural areas in Poland a water supply network. In this scenario, the greatest demand occurs in rural areas of the province Małopolskie (Figure 1.), not as in the case of full water supply (variant 1) in the province. Mazowieckie. About 6,000 should be built in the Małopolskie voivodship km of water supply, so that at least 95% of the village inhabitants in each commune could use the water supply network. On the other hand, Mazowieckie voivodship would require construction of approx. km of water supply network. The lowest demand is in the province Opolskie and Wielkopolskie. In province for example of Wielkopolskie, it would be necessary to build only 70 km of the network to achieve optimal, collective water supply. In this variant, the vast majority of western Polish communes would not require water supply investments or require the construction of 1 to 5 km of collective network. Most municipalities from Eastern Poland would require the construction of over 15 km of water supply network.

In estimating the target length of the sewer network in rural areas in Poland allowing for full satisfaction of the needs in the field of supplying access to sanitary installations, reference was made to domestic and foreign literature in this regard. The literature on the subject indicates that one of the indicators constituting the basis for the overall size of planned networks may be the length of existing water supply networks (Mcghee, Steel, 1979). Taking as a basis the actual size of the network and the theoretical assumption that the size of the sewage network should be not less than half the length of the water supply network, some simplifying assumptions can be made regarding the desired target length of the sewage network in rural areas in Poland. It can be seen that such estimates also appear in earlier national literature. They can be a valuable supplement and reference value to which the obtained results will be compared (Swigon, 2012).

Finally, in the developed algorithm for estimating investment needs in terms of the length and costs of extending the sewer network in rural areas, explanatory/corrective variables were adopted for the characteristics of municipalities in the form of population density, area and population, and the number of villages in local government units where the number of inhabitants does not exceed 2 thousand, as well as the physical size of the commune in the form of the meridian and latitudinal extent (as an expression of the spatial extent of the commune area), and the length of the existing network, the percentage of sewage system (in relation to the population), the relationship between the length of the water and sewage network in the commune, the length of the commune legal conditions in the scope of the target desired equipment of the local government unit with sewage infrastructure (including 85% as a percentage of sewage system or 99%), as well as the potential anticipated economic profitability about the size and density of population in a given commune.

Figure 2. Demand for sewage network with full (Variant I) and optimal (Variant II) needs satisfaction.



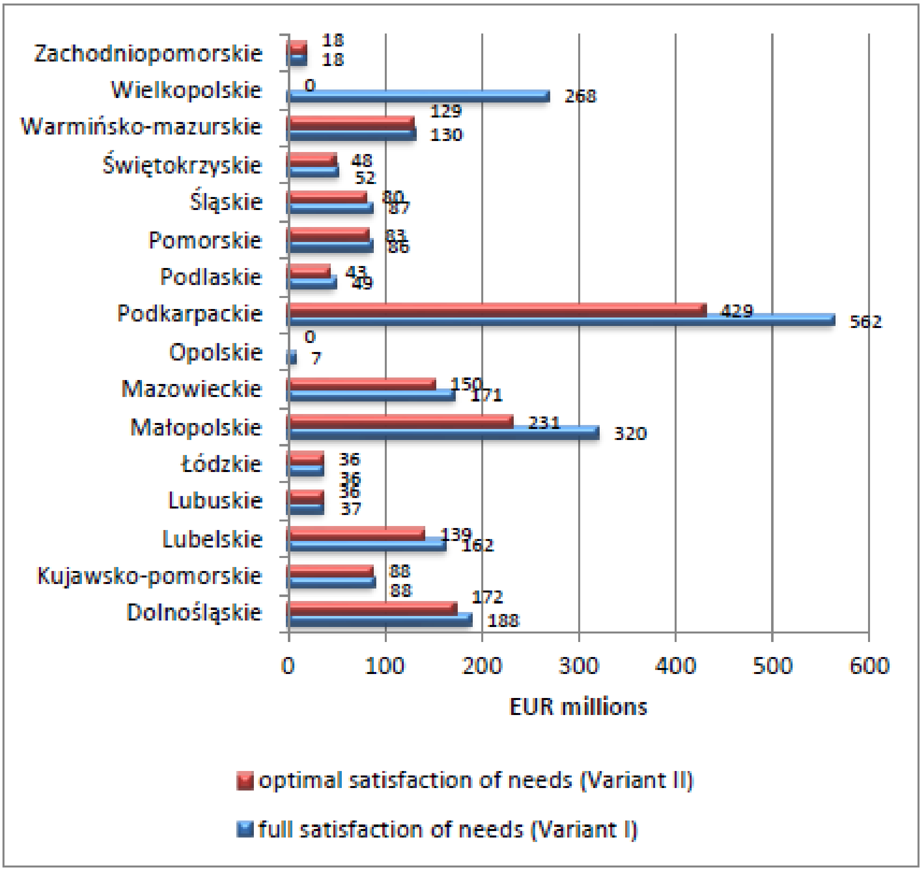
Source: own study based on the data of the CSO Local Data Bank.

Taking into account the assumptions made above, it was estimated that the total length of the sewage network that should be built to meet the needs of full access to this element of infrastructure (Variant I) is 30.4 thousand km. The highest needs in this respect were recorded in the province Mazowieckie i Małopolskie, while the lowest in the province Opolskie, Lubuskie and Zachodniopomorskie (Figure

2.). In turn, the total length of the sewage network that should be built to meet the needs of access to this element of infrastructure in villages whose population does not exceed 2 thousand. is 25.1 thousand km. However, in villages with more than 2,000 inhabitants, 5,300 should be built km of sewage network (Variant 2).

The total estimated costs of the water supply infrastructure were EUR 100 billion - EUR 2.3 billion and EUR 1.7 billion - 95%. They were the highest in the following provinces: Podkarpackie and Małopolskie (Figure 3.). Also in unit terms (per 1 commune) the estimated costs were the highest in communes in the voivodship Podkarpackie, i.e. a voivodship with unfavourable topographic conditions (mountainous areas) for the development of the water supply network.

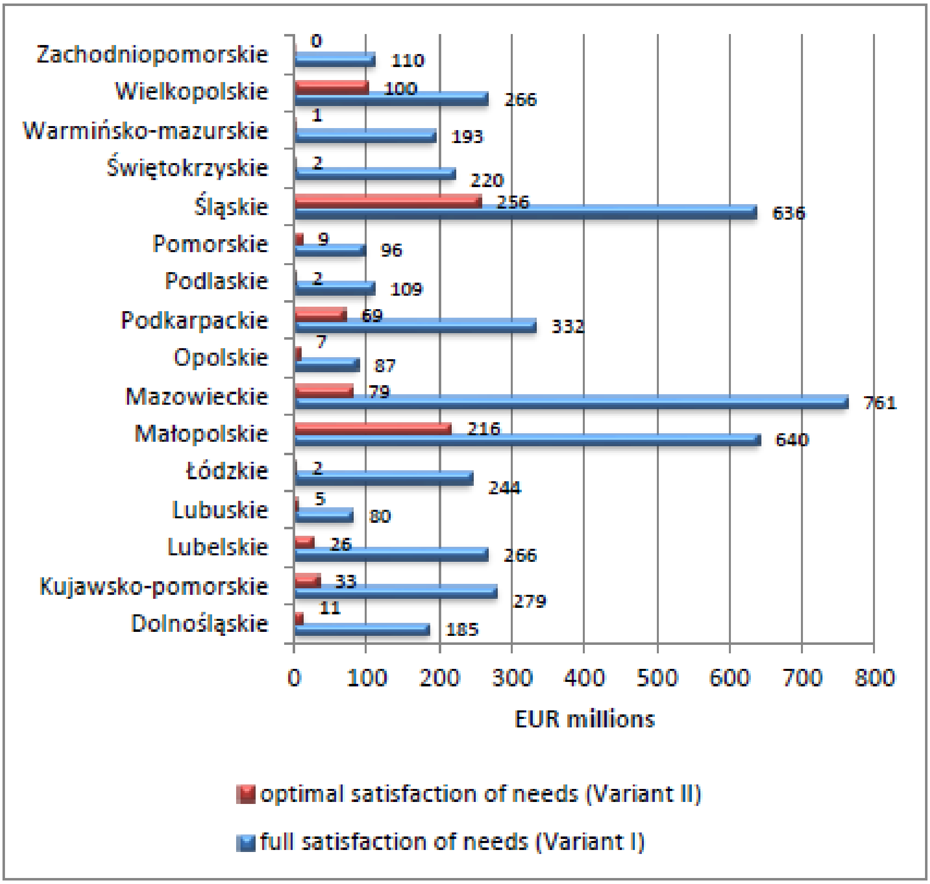
Figure 3. Expansion costs of the water supply network with full (Variant I) and optimal (Variant II) satisfying the needs of water supply to the village.



Source: own study based on the data of the CSO Local Data Bank.

The total estimated cost of investment projects in rural areas related to the full satisfaction of the population's needs regarding access to the sanitary sewage system amounted to EUR 4.5 billion. The highest costs in this respect were recorded in the province Mazowieckie and Małopolskie (Figure 4.). The estimated cost of investment projects in villages with a population of over 2,000 was around EUR 0.8 billion. The highest costs in this variant were estimated in the voivodship Małopolskie and Śląskie.

Figure 4. The costs of extending the sewerage network with full (Variant I) and optimal (Variant II) satisfying the needs of water supply to the village.



Source: own study based on the data of the CSO Local Data Bank.

Surveys show that 74.7% of municipalities are prepared to undertake investment activities in the area of water and sewage network expansion if the government launches a support program. These communes declared their own contribution in the amount of 29.2% of investment costs. In turn, municipalities interested in expanding the sewer network declared their own contribution at the level of 23.6% of the investment costs. According to representatives of municipalities interested in using a possible support program for the development of the water supply network in rural areas, the average investment implementation period should be 5 years, and in the case of sewage investments - 9 years. The duration of these investments results from the possibility of municipalities financing their own financial contribution.

Conclusions

Despite the systematic expansion of the sewage and water supply network in rural areas in Poland, the needs of the rural population in terms of access to these infrastructure elements have still not been met. The research shows that the cost of fully meeting the needs for the expansion of the water supply and sewage network would be around EUR 6.8 billion. In the optimal option, which on the one hand would provide access to this infrastructure to the most deprived persons, and on the other would contribute to the improvement of the natural environment and health of residents, the costs would reach the level of about EUR 2.5 billion.

Budget revenues achieved by local governments are too low to fully finance even the optimal investment option. However, these self-governments declare their own financial contribution at the level of over 20%. Therefore, undertaking investments in the development of these infrastructure elements requires the involvement of funds from the central budget. However, government investments in the development of technical infrastructure are justified by their positive impact on local economic and social development and by the fact that they do not destabilize market mechanisms.

Finally, it should be noted that the analyses carried out are static, i.e. they reflect the population's need for infrastructure investments over a given period of time. When preparing the government support program for the development of technical infrastructure, one should also take into account trends in the migration of rural population. Taking these trends into account could lead to some reduction in demand for these investments in rural areas. This is due to the significant scale of outflow of rural population to urban areas, especially from peripheral rural areas. However, the scale of the reduction in overall investment amounts would not be too great due to the fact that a significant proportion of this population migrates to rural areas that are located around large urban agglomerations.

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TRANSFER OF AGRI-ECONOMIC AND TECHNOLOGICAL KNOWLEDGE FOR INNOVATIVE AGRICULTURE IN BULGARIA

Albena Miteva[1]

Abstract

Sustainable management of farms involves carrying out a range of activities to improve the technologies and methods of agricultural production, on the one hand, and activities related to environmental protection, animal and plant health, animal welfare, public health, quality and food safety, on the other hand. There is a growing link between the success of a sector and the business organizations within it and the knowledge that is used. At present, the knowledge find concrete expression in various innovations - technological, organizational, human-related, etc., which help to achieve sustainable development. All this creates a serious need for knowledge transfer. The purpose of this paper is to explore the theoretical foundations of knowledge transfer, the practical options for improving the mechanisms for acquiring, storing, disseminating and absorbing agricultural and technological knowledge and to reveal their impact on the sustainable and innovative development of regional and sectoral economies.

Key words: knowledge transfer, innovation, agriculture.

Introduction

The dynamic changes in agriculture in recent years necessitate the transfer of knowledge between scientific, research, branch organizations and farmers. This allows to increase the competitiveness of the agricultural sector and to meet all legal requirements and standards related to environmental protection, animal welfare, improving public health, as well as quality and safety of produced food. On this basis, there is a serious need for knowledge transfer in support of the introduction of the necessary standards and sustainable management of agricultural holdings.

The purpose of this paper is to explore the theoretical foundations of knowledge transfer, the practical options for improving the mechanisms for acquiring, storing, disseminating and absorbing agricultural and technological knowledge and to reveal their impact on the sustainable and innovative development of regional and sectoral economies.

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In order to draw the respective assessment and conclusions the used data and information in this article are gathered from official publications of the Ministry of Agriculture, Food and Forestry and National Agriculture Advisory Service about NAAS main activities for the period 2014-2018. Agricultural Academy official publications were the basis for disclosing the historical development of this organization and its role for contemporary development of the agri-economic and technological transfer in Bulgaria.

Theoretical foundations of knowledge transfer in agriculture

Sustainable management of farms involves carrying out a range of activities to improve the technologies and methods of agricultural production, on the one hand, and activities related to environmental protection, animal and plant health, animal welfare, public health, quality and food safety, on the other hand. There is a growing link between the success of a sector and the business organizations within it and the knowledge that is used.

All this creates a serious need for knowledge transfer in support of introduction of the necessary standards and sustainable management of agricultural holdings, which is fundamental in supporting the transfer of agricultural knowledge and innovation towards farmers.

Knowledge is "individual reflection of objects, properties and attitudes of objective reality that arise by affirming the content of mental activity in the individual life path" (Qua, 1999). It is an important factor for economic development of certain sector, for enhancing life standard, etc. Currently, it finds concrete expression in various innovations: technological, organizational, human-related, etc. that help in achieving of sustainable development (Asenov et al., 2009).

A number of researchers (Alavi, Leidner, 2001; Antonova, Gourova, 2006; Varamezov, 2007) support the thesis that the knowledge management process encompasses the process to create and maintain such an environment in the company that technologically provides and organizationally encourages employees to acquire, share, disseminate, generate and effectively use of strategic important for the company knowledge. Logically some authors, (Gourova et al., 2012) define that knowledge management is a set of management activities that aim to support business processes and corporate strategy by retaining individual and organizational knowledge, delivering and using it to maximize the benefits of available knowledge and to achieve greater competitiveness. This process helps knowledge to reach it where it is needed in order to make the right decisions.

Knowledge management is related not only to technology management, but also to the management of the process of the most efficient sharing and transfer of this knowledge. A number of researchers (Alavi, Leidner, 2001; Ackerman et al., 2003; Antonova, Gourova, 2006; Asenov et al., 2009) have defined that effective knowledge transfer is very important as it facilitates the learning of organizations and the development of social capital (Kanchev, Doitchinova, 2002; Kanchev, 2002).

Knowledge transfer is seen as a two-way information process between the generators and the users of scientific knowledge. It involves the processes of acquiring, accumulating and sharing specific knowledge, skills and abilities. It is realized through commercial and non-commercial activities, such as scientific cooperation, consultations, creation of trade companies between scientific and trade and production organizations, etc.

The transfer of knowledge in agriculture covers the following activities (Kanchev, Doitchinova, 2002; Kanchev, 2002):

- Creation of new knowledge and technological skills and accelerated development and implementation of research and scientific services in the agricultural sector through research centres such as the Agricultural Academy, its scientific institutes, testing stations, etc.
- Agricultural education in Bulgaria with different forms and degrees of training, opportunities for qualification and retraining, continuing and vocational training, scientific and technical cooperation, joint research projects, international seminars, etc.
- Advisory activities are carried out through the provision of advisory services for securing economic and technological knowledge and skills, the implementation of scientific and practical developments in the field of agriculture.

Review of the development of agri-economic education and science in Bulgaria

Agricultural education has a long history and lasting traditions. It marks its beginning from the 1920s. Higher agricultural education dates back to 1921, when Sofia University "St. Kliment Ohridski "opens the Faculty of Agronomy with training in two specialties "Livestock" and "Agronomy". The Bulgarian state contributes to the development of agricultural science. In 1923 the Faculty of Veterinary Medicine was opened, and in 1925 also the Department of Forestry within the Faculty of Agronomy in Sofia. By a decision of the Council of Ministers in 1948, the Agricultural Academy of Sciences was established, encompassing four faculties from the University of Sofia - Agronomy, Zoo-technical, Forestry and Veterinary Medicine. For the period 1950-2018, it has been reorganized several times. In 1971 the Agricultural Academy "Georgi Dimitrov" was built on the basis of the closed Agricultural Academy of Sciences and its scientific units, the Higher Agricultural Institute and the Higher Veterinary Institute. It was a unified scientific-educational complex for training of students and for carrying out of scientific activity, but was closed in 1976. In 1982 Agricultural Academy was re-opened with the main task of organizing scientific activity in the field of crop production, animal husbandry and veterinary medicine, comprising 38 scientific institutes, 35 test stations, National Agricultural Museum, Centre for Scientific and Technical Information, two central laboratories. In 1999 it was reorganized into a National Centre for Agrarian Sciences, which in 2008 was renamed in Agricultural Academy. It is an autonomous budget organization under the Minister of Agriculture and Food, which carries out scientific research, applied, innovative and educational activities in the field of agriculture and food. It works within the framework of the state agricultural policy and in accordance with the CAP of the EU. It consists of 28 scientific institutes and a number of experimental stations.

It helps to strengthen and to consolidate mutual relations between education, science and business within the sector of national agriculture. To accomplish this goal Agricultural Academy has established key targets together with all stakeholders, such are industries, producers, Ministry of Agriculture, or others that use the products of science. The Agricultural Academy makes strong efforts to accomplish international projects and motivate its scientists to work in common projects with top agricultural companies or institutions. The Ministry of Agriculture and Food, the Ministry of Environment and Water, other agencies and institutions, as well as local and regional authorities use the scientific expertise of Agrarian academy and assign activities in the fields of protection and rational use of soil, water basins and fisheries resources; ecology and environmental protection; crop and animal husbandry; fisheries and aquaculture; food and food industry; agrarian economy and others.

Specialized agricultural economics courses for the first time in our country were taught at Sofia State University in the newly opened Faculty of Agriculture and Forestry. In the pre-war years (1938-1940), along with the development of the market economy in our country, agrarian science also marked significant success. Along with increasing number of studied subjects, was established a research institute for agricultural economics with the Bulgarian Academy of Sciences. During this period, a large number of agricultural scientists obtained their higher education and scientific degrees from leading European institutes, which contributed to the rapid adaptation and implementation of progressive scientific schools in the practice and training of agricultural students.

In the post-war period (1946-1949) and after the establishment of Agricultural Academy, the specialty Agrarian Economics was formed with the Sofia Agronomy Faculty, which was a branch of the Academy.

On the basis of this specialty, an independent agrarian economics faculty was opened later in 1965 with the Agricultural Institute. During this period, training in agricultural economics expanded and were prepared specialists for the agricultural production organizations and for the sectoral research institutes and experimental bases of Agricultural Academy.

The next stage in the development of agro-economic education is the period after 1975, when, by decision of the Government, the Agricultural Academy was disbanded and individual agricultural faculties were relocated to the larger settlements, centres of agricultural regions of the country. The Faculty of Agriculture, together with the experimental bases and building, became a part of the Higher Institute of Economics - Sofia, in which the Department of Economics and Management of Agriculture was organized.

In the period after 1989 the specialty Agrarian Economics was opened in other economic universities in the country, as are Varna, Svishtov and at two agricultural universities in Plovdiv and Stara Zagora.

The development of agrarian economics courses and a specialty Agrarian economics shows that in Bulgaria they have long-standing existence, traditions and developing content. In the specialty Agrarian Economics students are trained in accordance with the modern requirements of agrarian science and using the achievements of the world economic science.

When organizing the educational process in the specialty Agrarian Economics at UNWE and other universities in the country, a three-level form of training is applied, with the Bachelor‘s degree being the main and most popular one. It provides students with fundamental and specialized agricultural training. The Master‘s Degree is pursued through specialized curricula that profile the agricultural economist in a specific narrowly specialized scientific field. In the third educational and scientific degree - „Doctor“ continue their training a limited number of specialists who are preparing to occupy research and teaching positions.

The educational content of the taught courses in the specialty reflects the contemporary requirements for preparing professionals able to work efficiently in the agricultural sector organizations. This conclusion is confirmed by the comparison of our curricula with those of leading universities in France, Germany and Greece.

The acquisition of theoretical, special and practical knowledge and skills is also ensured through a system of training courses, which in the curriculum of the bachelor‘s and master‘s degrees are grouped into three blocks - fundamental, special compulsory and special elective disciplines. The basic training courses are designed to shape the theoretical and general economic training of agricultural economist. In terms of content and number of hours, these subjects are regulated by the state requirements for Bachelor‘s and Master‘s degrees.

The specialized compulsory training courses form a complex specific knowledge in the field of agricultural economics and agricultural management. They also include technological and functional economic disciplines that provide professional and applied knowledge in the field of agribusiness.

In structural terms, the share of technological disciplines is 27% of the total number of hours of specialized compulsory courses - agrarian economy and agrarian policy - 23%; agrarian marketing - 7% and management disciplines - 33%. Compared to other similar curricula in the field of Agricultural Economics, which is also studied at technological universities in the country, at the University for National and World Economy, the share of technological disciplines is lower at the expense of economics and management disciplines. This trend also reflects the curriculum of the specialty at some of the leading European universities.

The specialized elective disciplines are grouped into three blocks - applied management courses, marketing, legal and environmental.

The UNWE provides a high degree of eligibility, with students choosing 8 out of 16 subjects, compared to the curricula of the specialty Agrarian Economics, which is studied in other universities in the country where the elective courses are less than 30% of the total number of hours. This trend is in line with the direction of providing broad-based student preparation.

The bachelor‘s degree courses are spread relatively evenly throughout 8 semesters, with academic load varying between 20-30 hours per week.

In most of the courses, active teaching methods and computer techniques are applied. Some of the disciplines used specialized software packages. In the teaching process are implemented case studies and tests which are designed for specific management situations.

The preparation of the compulsory and elective courses also includes the acquisition of a wide range of practical skills. It is organized on the basis of independent work of students with literary sources and normative information. On this basis, course papers and projects are developed. For the good practical preparation of the students contribute the student practical education which have a duration of 10 days and the pre-graduation practical internship for a period of 30 days. Practices in technological disciplines are conducted in the scientific-experimental base of the specialty in most of the Universities where the specialty Agricultural Economics is taught. There are some difficulties for organizing the pre-graduate internship.

The curricula for the Master‘s Degree qualification have been developed in different variants, depending on the professional direction of the Bachelor‘s Degree for economic or non-economic specialty.

In terms of content, the master‘s degree aims to deepen the students‘ knowledge in a specific scientific field. The Master‘s Degree Program in Agrarian Economics for graduates with a Bachelor‘s Degree in this specialty, envisages specialized courses placed in two semesters.

The above mentioned give us a reason to summarize that the content of the specialty is at a good level in terms of the taught subjects, the forms and levels of training and the results of the training.

Agribusiness advisory services in Bulgaria

The need for this specific knowledge transfer in agriculture

The Common Agricultural Policy of the EU requires Bulgarian farmers to comply with and to apply Community standards, which is a prerequisite for continuation of their activity and for receiving financial support. As of 2016, all statutory management requirements in the fields of Environment, Climate Change, Good Agricultural Land Practices, Public Health, Animal and Plant Health and Animal Welfare have already been implemented in Bulgaria.

According to Council Regulation No. 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the common agricultural policy, with a view to raising farmers' awareness of the link between agricultural practices and farm management on the one hand, and environmental standards, climate change, good agricultural land practices, food safety, public health, animal and plant health, welfare of animals, on the other hand, it is necessary for the Member States to establish a comprehensive agricultural advisory system for consulting the beneficiaries under Art. 12 - Art. 15 of Council Regulation No. 1306/2013.

The farm advisory system should at least cover the requirements and standards covered by the so-called cross compliance. In this regard, it should cover the requirements to be met by farmers in respect to useful climate and environmental agricultural practices in relation to the received direct payments, and should cover requirements related to the maintenance of agricultural land, pursuant to Regulation (EU) No. 1307/2013 of the European Parliament and of the Council for laying down rules for direct payments to farmers under support schemes under the common agricultural policy. The system should also cover individual farm level measures provided in Member States' rural development programs aimed at farm modernization, building competitiveness, sectoral integration, innovation, market orientation and promoting entrepreneurship, water conservation, biodiversity as well as risk management and the introduction of appropriate preventive measures in the event of natural disasters, catastrophes, animal and plant diseases. Farmers should be included in the farm advisory system on a voluntary basis. All farmers, even those who do not receive CAP support, should be eligible to participate in the system. All this creates a strong need for advisory services to support the introduction of the necessary standards and sustainable management of farms.

Organization of consulting activities in Bulgaria

In Bulgaria, advisory services are provided by both public and private consultants and/or organizations. According to Art. 10 of the Farmers Support Act the Ministry of Agriculture, Food and Forestry establishes a System for Agricultural Advisory Services, which includes the National Agriculture Advisory Service (NAAS) under the Minister of Agriculture, Food and Forestry and the persons approved for participation under measure 2 "Consulting Services, Farm Management and Replacement Services" from the Rural Development Program 2014-2020. NAAS allowed to be helped by the Scientific Institutes form Agricultural Academy and specialized higher education institutions in Republic of Bulgaria, but not an ordinance has been issued on this issue yet.

The NAAS provides advice and information to farmers on crop, livestock, agrarian and rural development for free. The NAAS also provides information on all regulatory requirements stemming from the EU legal framework. The mission of the NAAS is to support the implementation of the state policy in the agricultural sector and the achievement of the priorities and goals set by the Ministry of Agriculture and Food for the implementation of efficient and competitive agriculture in the Republic of Bulgaria, assisting the development of the national system of agricultural councils and offering the farmers quality consulting services, up-to-date and useful information, training and technical assistance.

The NAAS is structured in a specialized Directorate "Agriculture Councils and Analytical Laboratory" and a Directorate "Administrative and Financial Activity", which provides administrative support, financial accounting and internal control, maintenance of the material base and information system, management of transport and human resources. At the end of 2018, the specialized administration was organized into 27 regional offices and 3 central level departments dealing with information-training activities, innovation and international cooperation, advisory services on national and European programs, and testing and assessment of the suitability and quality of soils.

The provision of advice from the NAAS is financed from the national budget, under the schemes and measures of the CAP and from other financial sources. It supports the implementation of state policy in the agricultural sector.

In a more limited territorial scope, advisory services are also provided by universities such as the Agricultural University in Plovdiv, the Agricultural Academy, Thracian University in Stara Zagora, Rousse University "Angel Kantchev", Forestry University in Sofia, and the Department of Economics of Natural Resources at the University of National and World economy.

The agro-ecological centre of the Agricultural University in Plovdiv, in addition to research and educational activity for the development of organic agriculture in Bulgaria, also provides advice in this area to farmers, municipalities and entrepreneurs in the preparation of technical and business plans for the transition to organic production.

The Advisory Service for Biological Resources of the University of Forestry in Sofia provides consulting services for project preparation, sampling and soil analysis and assists farmers in maintaining land in good ecological condition.

The Thracian University of Stara Zagora through its National Centre for Vocational Training and Competence "America for Bulgaria" also offers consulting services mainly as specialized advice and consultations in the field of dairy farming.

The Agricultural Academy also provides advice to farmers, through its 26 Institutes located all over the territory of the country and provides mainly specialized technology advice to farmers.

The Bioselena Foundation for organic farming also provides advice and counselling, but they are mainly related to organic and sustainable agriculture. Bioselena Foundation prepares the farms for application by providing complete consultancy assistance in the preparation of the Agro-ecological plan of the farm.

Private consultants and non-governmental organizations also provide advice to farmers and prepare application projects under Rural Development Program measures. The main part of them is united in the Bulgarian Association of Consultants on European Programs (BAKEP). In addition to these companies, there are private individuals who also provide advice to farmers and prepare Rural Development Program application projects. Many of these individuals are agronomists who provide technical advice to farmers.

Unfortunately, other than the NAAS, no other organization or private consultants provide official data on the number of consulted persons and no analysis of the units and scale of their advisory activities can be made.

Agrochemical analyses and the preparation of recommendations based on their results are also an important part of advisory work. In addition to the Agrochemical Laboratory of the NAAS, the laboratories of the Nikola Pushkarov Institute of Soil Science, Agro-technology and Plant Protection in Sofia, part of the Agricultural Academy, the laboratories of the University of Forestry in Sofia, the laboratories of the Thracian University in Stara Zagora and the Agrarian University in |Plovdiv also provide a variety of agrochemical analyses. Other important organizations for carrying out agrochemical analyses are NIK Agro Service Ltd., Eurotest-Control EAD, Laborex Bulgaria and IC GLOBALTEST.

Results of the National Agriculture Advisory Service's main activities for the period 2014-2018

Advisory activities under the Rural Development Program

The NAAS provides advice and information on support options for measures and sub-measures of the Rural Development Program 2014-2020 (II pillar of the CAP), as measure 1 "Knowledge transfer and actions for information"; measure 9 "Establishment of producer groups and organizations"; measure 10 "Agroecology and climate"; Measure 11 Organic Farming; measure 12 "Natura 2000 payments and the Water Framework Directive"; measure 13 "Payments for areas facing natural or other specific constraints".

Another major part of consultations provided by the NAAS is focused on the sub-issues of the Thematic Sub-Program for the Development of Small Farms.

The NAAS is the only advisory organization at this stage. For the implementation of the sub-measure 2.1.2. "Advisory Services for Small Farms" and Sub-measure 2.1.1. "Advisory services for farmers and foresters" under measure 2 "Advisory services, farm management and farm replacement services" of the Rural Development Program for the period 2014-2020 and approved by the EC to give extension services to small agricultural holdings. Under sub-measure 2.1.2. the NAAS provides 6 basic advisory packages to small farms, without payment, strengthening the economic development of small farms via their modernization and technological renewal and converting them in sustainable and viable units which contribute to the environmental protection and climate change combat.

The NAAS offers a comprehensive package of consulting services, as is shown in Table 1.

During the analysed period 87,981 persons received 453,994 consultations from the NAAS experts, in average, about 17,600 persons were consulted annually. Fact that consulted persons visited the office in average 2 times shows good degree of farmers trust towards NAAS experts (Doitchinova et al., 2018).

Table 1. Number of consulted persons, number of contacts and number of consultations for the period 2014-2018.

Year	Consulted persons	Number of meetings	Number of consultations			
			Total	In the office	At the farm	In the reception room
2014.	17,287	30,278	80,267	70,630	9,637	No separate data
2015.	23,127	38,687	109,252	99,092	10,160	No separate data
2016.	19,306	35,300	98,825	84,410	11,814	2,601
2017.	16,067	27,375	92,785	68,907	12,006	11,872
2018.	12,194	21,123	72,865	62,448	8,516	10,413

Source: NAAS, 2019.

Reason for the sharp increase in the number of consulted persons in 2015 and 2016 stems from the interest of farmers in connection with the launch of Rural Development Program measures for the 2014-2020 programming period.

The NAAS works with all categories of farms. The largest share is of consulted persons with an economic size of their farms up to 8,000 EUR, i.e. about 20% of all small farmers and about 10% of all young farmers are provided with advice.

The only opportunity to receive support for their development for small business farms is through the provision of free advice and professional advice provided by the NAAS.

Although farms are declining in number, farmers continue to visit the NAAS, which suggests that they will innovate and modernize their farms. In this regard, farmers need adequate advice on increasing the area and/or animals, advice on compulsory preservation of cross compliance, as well as examples of good farming practices and training.

The NAAS also works with over 10,500 farmers, with holdings between 16,000 EUR and 50,000 EUR in economic size and that can be classified as medium-sized holdings.

Table 2 provides information on the number of persons consulted by type of farming activity by years.

From the data in table, it could be noticed that in 2018 there were over 3,700 consulted persons who are potential farmers and intend to set up a holding, i.e. this includes persons who do not currently cultivate land or raise animals.

From the data in following table, it could be noticed that in 2018 there were over 3,700 consulted persons who are potential farmers and who intend to set up a holding, i.e. this includes persons who do not currently cultivate land or raise animals.

Table 2. Number of consulted persons by type of agricultural activity per year

Executed agricultural activity	**Number of persons consulted by years**				
Specialization of holdings	**2014.**	**2015.**	**2016.**	**2017.**	**2018.**
No farm is established - it does not cultivate land or raise animals	5,728	10,306	7,055	5,857	3,713
Growing of cereals, legumes and oilseeds; Growing other arable crops and crop production	3,934	4,025	3,357	2,639	1,858
Growing vegetables and flowers	1,574	1,547	1,604	1,376	1,117
Fruit production (including fruits, berry and nuts), vines and other permanent crops	2,335	2,513	2,523	2,274	2,224
Livestock farming	1,094	1,716	1,543	1,351	938
Mixed crop and livestock (including bees)	1,522	1,804	1,960	1,519	1,664
Other holdings	1,100	1,216	1,264	1,051	680
Total for each year	17,287	23,127	19,306	16,067	12,194

Source: NAAS, 2019.

Advisory activities for the provision of specialized consultations

The specialized consultations on crop production, animal husbandry, agrarian economy are also part of the advice that National Agricultural Advisory Service (NAAS) provides to farmers in the period 2014-2020. Another type of advice that NAAS provides is related to agrochemical soil analysis; safe working conditions; registrations and/or categorizations of animal holdings incl. bees; registration with the Executive Agency for Vine and Wine and issuing of documents; registration with the Executive Agency for Variety Testing, Testing and Seed Control and issuing of documents; registration with the Bulgarian Food Safety Agency, keeping diaries and issuing documents; registration of farmers under Ordinance 3 of 1999; other registrations, authorization and licensing regimes related to agriculture.

Another part of the advice provided by the NAAS is directed to direct payments, in particular the Single Area Payment Scheme, which is of the greatest interest to farmers; coupled support schemes for fruit and vegetables; the payment scheme for climate and environmentally friendly agricultural practices, the so-called Green direct payments; as well as providing advice on the National Apiculture Program.

In its consultative work, the NAAS also pays special attention to the consultations related to the third National Climate Change Action Plan (NCCAP) for the period 2013-2020 and the river basin management plans prepared under the Water Framework Directive and the Water Act. The NAAS provides these consultations since 2015. In general, the NCCAP consultations are divided into measures with indirect and direct effects on the reduction of greenhouse gas emissions, which are the following: humus conservation activities (fertilization - precision and green fertilization, liming, soil tillage, no stubble burning, anti-erosion practices); water-saving and energy-saving irrigation technologies; extensive grazing of animals; opportunities for use of plant residues; improving the storage and application of manure; low carbon manure processing practices (composting, anaerobic biogas processing). For the period from 2015 to 2018, the NAAS experts provided 31,305 consultations to 19,554 persons on the NCCAP (Miteva, Kanchev, 2017).

Other advisory activities

In its activity, the NAAS provides training to farmers through the Vocational Training Centre, which was licensed in 2007. The centre provides vocational training in agriculture, courses, seminars, information activities and training in key competences. In addition to enhancing farmers ‘knowledge and skills, the successful completion of some of the training is a prerequisite for fulfilling farmers’ commitments under the Rural Development Program measures.

The trainings conducted so far are free of charge to farmers and by the end of 2018, 2,999 farmers were trained by NAAS staff and external experts.

In 2015, the NAAS's activities expanded with the launching of the organization of exported reception facilities with the aim of expanding and facilitating the access of farmers to the NAAS consulting services, with the total number of exported reception facilities for the period from 2014 to 2018 being 4,359. In 2015, the NAAS also launched another new activity related to the dissemination of information to farmers through the creation of the so-called. 'Farmer circles' by sending information to the members of the circle about important issues affecting farmers by e-mail and/or calling participants by telephone. For the period 2015 - 2018, 27 farmer circles were created with around 315 participants.

Another step is the establishment of informal advisory councils which include active farmers, representatives of local industry organizations, representatives of scientific institutes, representatives of local public organizations and state structures. 27 informal advisory councils have been set up for the period from 2015 to 2018, covering the 27 regional centres. The number of participants each year is about 300. The NAAS Analytical Laboratory performs sample analyses and prepares fertilization recommendations for the respective crops, which grow each year (Doitchinova et al., 2017).

Based on the information provided, it can be summarized that the NAAS performs a variety of advisory activities not only for the Rural Development Program but also other activities related to raising the awareness of farmers and enhancing the effects and efficiency of their business.

Conclusions

The place and role of knowledge transfer in the new programming period 2021-2027 are linked to the widespread use of knowledge and innovation, which guarantees the achievement of the new CAP objectives. Knowledge and innovation are essential to achieving an intelligent, innovative, stable and sustainable agricultural sector. Knowledge transfer should maximize its contribution to promoting and facilitating the widespread use of modern technology and innovation in agricultural holdings.

To maximize the expectations of farmers and the objectives of the CAP during the new 2021-2027 programming period, knowledge transfer must offer adequate ways of improving the quality of education, increasing competitiveness, by providing targeted advice to activities related to the introduction of innovation in agricultural holdings. In order to protect and care for the environment, scientific solutions and advice need to be provided that are purely environmentally friendly and aim at nature conservation and biodiversity. National Agricultural Advisory Service (NAAS) must actively participate in the process of assisting with the change of generations by encouraging young people to join agriculture by providing viable rural areas.

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REGIONAL DIFFERENCES IN THE PROFITABILITY LEVEL OF DAIRY PRODUCTION IN REPUBLIC OF SERBIA[1]

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Abstract

In this paper the most important aspects of business profitability of agricultural holdings which are involved in dairy production in Republic of Serbia (RS) are being considered. The aim of the paper is to determine the profitability level by regions in RS. In the focus of the analysis is quantification of basic profitability factors, with special accent on impact of region wherefrom observed agricultural holdings are. Return on assets rate (ROA) is used as basic profitability indicator. Agricultural holdings which are involved in dairy production makes 18.6% of total number of holdings which enters in FADN sample in RS. Research results shows that there is statistically significant difference in the profitability level between agricultural holdings which are involved in dairy production in Southern and Eastern Serbia and Autonomous Province of Vojvodina in comparison with holdings from Šumadija and Western Serbia region. Further analysis established that asset turnover ratio is a factor which has statistically significant impact on differences in profitability between agricultural holdings by regions in RS. Profit margin, as the second examined factor, doesn't have statistically significant influence on existence of differences in profitability between agricultural holdings.

Key words: comparative analysis, profitability, dairy production, ROA, FADN.

Introduction

Livestock breeding has great importance, not just because of the main products which are obtained in this production, but also because of the manure which is important in rising agricultural land quality. Livestock products contain higher added value, given that crop production is integrated in livestock production. Share of

1 Paper represents a part of research on the project "Analysis of production and economic results of business entities in the field of agriculture and food industry of AP Vojvodina", financed by the Provincial Secretariat for higher education and scientific research APV.

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livestock production in total agricultural production value represents significant indicator of agricultural production development level.

Livestock production is not on adequate level in Republic of Serbia (RS) if natural and other resources which agriculture disposes are considered. In the structure of the production value in 2017, dairy production was on the second place with 25.35% share, behind pig farming with 49.39%, and in front of beef production with 8.53% (Miljatović, Vukoje, 2019).

Dairy production in the European Union (EU) countries is in expansion, which shows increase in the number of agricultural holdings (AH) which are involved in this type of production. Agricultural holdings which are involved in dairy production makes about 12% of total number of agricultural holdings in EU (FADN Europe, 2019).

Agricultural holdings which are involved in dairy production in RS are on the third place by share in total number of AH which enters in FADN[4] sample and, according to Agriculture Census from 2012, there were 200,800 holdings (total number of registered farms is 628,552), (Munćan, Božić, 2017). Namely, these agricultural holdings makes 18.6% of total number of AH in FADN sample and they are behind holdings which are involved in various crops and livestock combined production with share of 39.1%, i.e. field crops AH with 23.6% (author's calculation based on the data of the SORS, 2019).

Subject of the research in this paper is business profitability of agricultural holdings which are involved in dairy production on the Republic of Serbia territory. The main aim of the research is determination of differences in profitability of AH which are involved in dairy production through the identification of impact of region wherefrom holdings are located on their profitability. In order to give more reliable ratings, influence of individual factors on the existence of differences in profitability of agricultural holdings is being considered. Profitability of agricultural holdings is analysed by return on assets rate (ROA - Return on Assets) as a relative indicator.

Objective and high quality analysis of profitability has great importance for both, internal (head of holdings) and external users (state). About that, this paper point to differences in profitability of agricultural holdings which are involved in dairy production by regions in RS. On this way, internal users can get information about

4 FADN (Farm Accountancy Data Network) is a system for collecting and proccesing data which bases represents yearly collection of production, economic and financial data from agricultural holdings (FADN Serbia, 2019).

profitability level of this production which can be useful in decisions making process. Analysis is, also, significant to the state authorities in creation appropriately measures, as well as reionization of agricultural production.

Material and Method

Agricultural holdings, in FADN sample, are classified according to three criteria: regional, production type and economic size. According to regional criterion, holdings are separated into Serbia North (Belgrade region (B) and Autonomous Province of Vojvodina (APV) region) and Serbia South (Šumadija and Western Serbia (SWS) region and Southern and Eastern Serbia (SES) region), (Vukoje et al., 2019). Towards production type, AH are divided into 10 groups, but only agricultural holdings which are involved in dairy production are significant for this paper (Stojanović et al., 2016). Agricultural holdings, according to economic size, are divided into 14 classes, but it is possible to reduce these 14 classes into 9 or 8 classes for the research purpose (Đorić et al., 2018).

Economic size is expressed as a sum of individual standard output values. Standard output is the result of multiplication of standard output coefficients with livestock number for each product separately, if it is about livestock production as it is in this work (Novaković et al., 2019).

Total number of agricultural holdings which are involved in dairy production, according to Agricultural Census 2012, was 37,314 (Cvijanović et al., 2014). Most of them (80.9%) are located on Serbia South territory, i.e. Šumadija and Western Serbia and Southern and Eastern Serbia. Initial sample for this research was 279 agricultural holdings which are involved in dairy production, based on the FADN data. Considering that individual extreme values of profitability could affect the quality and reliability of conclusions, eight AH which have standard output value more than 100,000 EUR are excluded from the sample.

The profitability of agricultural holdings is calculated from net profit and total assets value ratio (Jakšić et al., 2016). Profitability indicator, which is used in this paper, is often called return on assets rate (ROA - Return on Assets) in literature.

ROA shows profitability of the business entity compared to the assets which it owns. Fairfield and Lombardi Yohn (2001), Walsh (2003) and Zekić et al. (2016) point out that the highest impact on profitability has the profit margin (PM) and asset turnover ratio (AT). Considering this, ROA indicator is calculated as follows:

$$\textbf{\textit{ROA}} = \textit{Profit margin} \times \textit{Asset turnover ratio}$$

$$= \frac{\textit{Net profit x 100}}{\textit{Total revenues}} \times \frac{\textit{Total revenues}}{\textit{Total asset value}}$$

FADN methodology (Farm Return) is unique and it is applied in all EU countries which enables comparison of achieved results on agricultural holdings between EU countries. Net profit label, according to official FADN methodology, is SE 420, until label for total asset value of AH is SE 436. Total revenues are composed of total production and services value on the AH (SE 131) enlarged for subsidies and taxes in the current production in one accounting year (SE 600), (Martinovska Stojčeska et al., 2008; Bojčevski et al., 2019).

Indicators of profitability of agricultural holdings are primarily processed with standard instruments of descriptive statistics: mean, extreme values (min and max), coefficient of variation (CV).

For the testing of hypothesis about (not)existence statistically significant differences between individual regions, the analysis of variance single factor method (one-way ANOVA test) was used. Analysis of variance method implies examination of mean variability based on random selected samples, whereby total variability is separated on components, i.e. variability within the group and variability between groups (Hadživuković, 1991; Petz, 2007).

For the post-hoc analysis of statistically significant differences in profitability between agricultural holdings by regions in Serbia, following treatment pairs are applied:

1) LSD test (Least Significant Difference) - shows between which treatment pairs exists significant difference. LSD test is easy to operate and it is mostly used in practice. However, its deficiency is that it shows more significant differences than it actually exist in comparing means for greater number of treatments, or it shows higher level of significance than there really are.
2) Tukey test is consists of calculating of differences between two by two means, then they are compared with appropriately limit or theirs theoretical values “D“. It is stricter compared to LSD test (Maletić, 2005).

Statistical data processing is done by statistical software - STATISTICA 13.3.

Research results

Performed analysis of impact of regions, wherefrom observed agricultural holdings are, on their profitability is extremely important for determination favourable regions for dairy production in one country, i.e. reionization of agricultural production. Also, internal users (head of holdings) could get important information about regions which have advantages in dairy production, i.e. in which region could be achieved better economic results in this type of agricultural production.

Analysis of profitability of agricultural holdings

The highest average profitability of agricultural holdings of 19.27% is recorded at AH from AP Vojvodina, until the smallest average profitability of 12.91% is noted at holdings from Šumadija and Western Serbia (Table 1.). The highest data variability, with coefficient of variation 80.39%, is visible on holdings from Belgrade region.

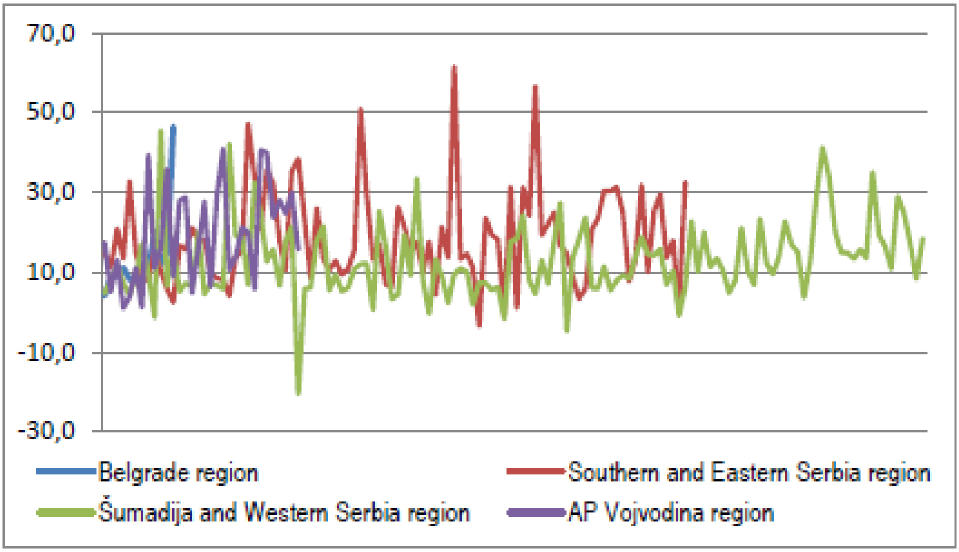
Table 1. Descriptive statistics profitability indicator (ROA) on agricultural holdings which are involved in dairy production in RS

Region / Variable	Mean	Interval of variation		Coefficient of variation (CV) in %
		Minimum	Maximum	
Belgrade region	13.75	4.08	46.45	80.39
Southern and Eastern Serbia region	18.55	-3.45	61.48	64.32
Šumadija and Western Serbia region	12.91	-20.52	45.40	73.06
AP Vojvodina region	19.27	1.05	40.89	63.32

Source: Author's calculation.

The highest profitability of 61.48% is recorded on AH from SES, until smallest value of this indicator (-20.52%) is noted on the holding from SWS (Graph 1.).

Graph 1. Variability of profitability indicator (ROA) on agricultural holdings which are involved in dairy production in Republic of Serbia



Source: Author's calculation.

Testing statistically significant difference in profitability on agricultural holdings which are involved in dairy production is done by using analysis of variance single factor, i.e. "one way ANOVA test". Agricultural holdings in sample are divided into four regions which represent treatments (Belgrade, Southern and Eastern Serbia, Šumadija and Western Serbia, AP Vojvodina). In Table 2 are presented the results of conducted test.

Table 2. Statistical significance of differences in the level of ROA between agricultural holdings which are involved in dairy production in RS

Effect	Univariate Tests of Significance for ROA Sigma-restricted parameterization Effective hypothesis decomposition				
		Degree of Freedom	MS	F	p
Intercept	31537.35	1	31537.35	272.3114	0,000000
Region	2258.96	3	752.99	6.5017	0.000292**
Error	30922.21	267	115.81		

Source: Author's calculation.

Note: *Statistically significant ($p < 0.05$), **Highly statistically significant ($p < 0.01$)

Based on results showed in previous table it could be concluded that there is statistically significant difference in profitability between agricultural holdings which are involved in dairy production by regions in Republic of Serbia ($p = 0.000292$; $p < 0.01$).

Considering that analysis of variance confirmed existence of differences in profitability between AH by regions in RS, post-hoc analysis is done in order to determine between which regions exist statistically significant difference. For that purpose, least significant difference test (LSD test) was done (Table 3.).

LSD test results point to existence of highly statistically significant difference in profitability on agricultural holdings which are involved in dairy production in SES and SWS ($p = 0.000129$; $p < 0.01$). Also, between Šumadija and Western Serbia region and AP Vojvodina region exist highly statistically significant difference in profitability on agricultural holdings which are involved in dairy production ($p < 0.01$).

Table 3. Results of LSD test

No.	LSD test; variable ROA Probabilities for Post Hoc Tests Error: Between MS = 115.81, df = 267.00				
	Region	**1 13.755**	**2 18.553**	**3 12.909**	**4 19.268**
1	Belgrade region		0.146993	0.794508	0.129744
2	Southern and Eastern Serbia region	0.146993		0.000129**	0.742808
3	Šumadija and Western Serbia region	0.794508	0.000129**		0.002632**
4	AP Vojvodina region	0.129744	0.742808	0.002632**	

Source: Author's calculation.

Considering LSD test deficiency that in certain cases shows more significant differences than it actually exist, in further analysis Tukey test was done in order to unequivocally determine difference between individual regions. Tukey test, in this situation, presents a little bit different results in comparison with LSD test (Table 4.).

Table 4. Results of Tukey test

No.	Tukey HSD test; variable ROA Approximate Probabilities for Post Hoc Tests Error: Between MS = 115,81, df = 267,00				
	Region	**1** **13.755**	**2** **18.553**	**3** **12.909**	**4** **19.268**
1	Belgrade region		0.465318	0.993797	0.425524
2	Southern and Eastern Serbia region	0.465318		0.000610**	0.987776
3	Šumadija and Western Serbia region	0.993797	0.000610**		0.012809*
4	AP Vojvodina region	0.425524	0.987776	0.012809*	

Source: Author's calculation.

Tukey test results' confirms existence highly statistically significant difference in profitability on agricultural holdings which are involved in dairy production in SES and SWS ($p < 0.01$). On the other side, difference in profitability between agricultural holdings which are involved in dairy production in Šumadija and Western Serbia region and AP Vojvodina region is statistically significant, but not highly statistically significant ($0.01 < p < 0.05$).

Analysis of individual factors impact on profitability

Previous analysis confirmed existence of statistically significant difference in profitability of agricultural holdings which are involved in dairy production by regions in RS. Considering this, it is necessary to point at factors which have the highest influence on existence of this difference. According to Fairfield and Lombardi Yohn (2001), Walsh (2003) and Zekić et al. (2016), profit margin (PM) and asset turnover ratio (AT) represent factors which have the highest impact on profitability, in this case, expressed with ROA indicator.

Return on assets ratio is in the function of revenues profitability and efficiency in management of total assets. It is important to emphasize that asset turnover ratio multiplies effect of increase of revenues profitability on profitability of total investments in agricultural holding assets. This means that if profit margin increases, asset turnover growth will additionally multiple increase effect of revenues profitability on total assets profitability growth. If profit margin decreases, asset turnover growth will mitigate reduction effect revenues profitability on profitability of total investments in assets of AH (Malinić et al., 2018).

Profit margin is calculated as net profit and total revenues ratio. Total revenue of agricultural holding makes achieved production value in current accounting year enlarged for subsidies. On the other hand, asset turnover is calculated as total revenue and total asset value ratio.

The highest average profit margin (43.16%) has agricultural holdings from Southern and Eastern Serbia region (Table 5. and Graph 2.). On the other side, the least average profit margin (28.71%) is recorded on AH from Belgrade region. The highest data variability, with coefficient of variation of 53.35%, is noted on agricultural holdings form Šumadija and Western Serbia region.

Table 5. Descriptive statistics of profit margin and asset turnover ratio on AH which are involved in dairy production in Republic of Serbia

Region / Variable	**Mean**	**Interval of variation**		**Coefficient of variation (CV) in %**
		Minimum	**Maximum**	
Profit margin (PM)				
Belgrade region	28.71	13.95	51.24	35.15
Southern and Eastern Serbia region	43.16	-9.80	74.02	41.02
Šumadija and Western Serbia region	39.49	-91.42	72.19	53.35
AP Vojvodina region	42.85	8.23	87.72	45.06
Asset turnover ratio (AT)				
Belgrade region	0.475	0.115	0.907	48.00
Southern and Eastern Serbia region	0.426	0.092	1.393	52.00
Šumadija and Western Serbia region	0.327	0.015	1.219	56.01
AP Vojvodina region	0.432	0.126	0.838	48.33

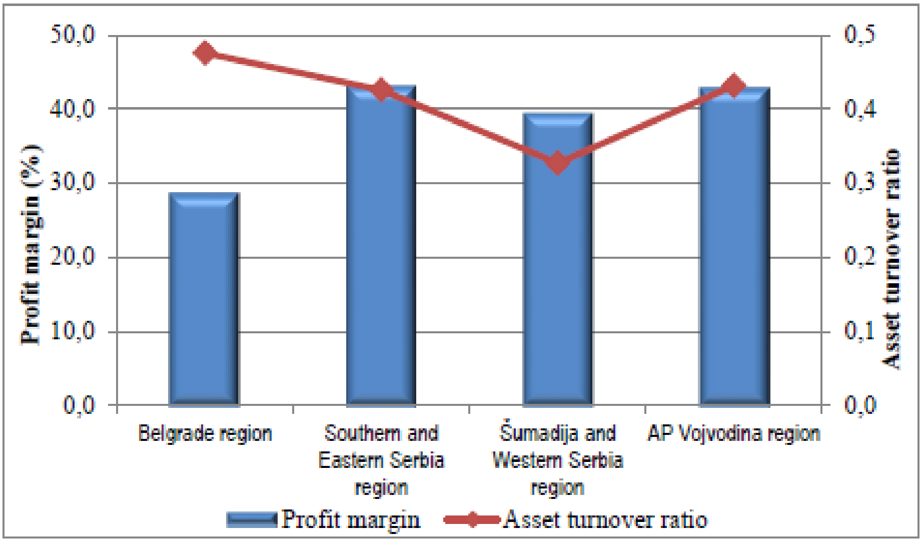
Source: Author's calculation.

The highest profit margin single value of 87.72% is recorded on agricultural holding from AP Vojvodina, until the smallest profit margin single value of minus 91.42% has an AH from Šumadija and Western Serbia region.

Asset turnover ratio is the highest, in average, on agricultural holdings from Belgrade region (0.475), and the smallest on agricultural holdings from Šumadija and Western Serbia region (0.327). The highest data variability (CV = 56.01%) is recorded on agricultural holdings from Šumadija and Western Serbia region (Table 5. and Graph 2.).

The highest asset turnover single value (1.393) has an agricultural holding from Southern and Eastern Serbia region. On the other side, the smallest asset turnover single value (0.015) has an AH from Šumadija and Western Serbia region.

Graph 2. Average profit margin and asset turnover ratio on AH which are involved in dairy production in Republic of Serbia



Source: Author's calculation.

Identifying impact of before mentioned factors on difference in profitability is analysed by application of "one-way ANOVA test". Significance in differences of profit margin between agricultural holdings by regions, as indicator which has influence on profitability, is primarily tested (Table 6.).

Table 6. Statistical significance of differences in the level of PM between agricultural holdings which are involved in dairy production in RS

Effect	Univariate Tests of Significance for PM Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degree of Freedom	MS	F	p
Intercept	179094.6	1	179094.6	476.4058	0.000000
Region	2635.4	3	878.5	2.3368	0.074079
Error	99997.0	266	375.9		

Source: Author's calculation.

Results of applied analysis of variance show that there is no statistically significant difference in profit margin between agricultural holdings which are involved in dairy production by regions in Republic of Serbia ($p > 0.05$). Namely, analysis confirmed that profit margin doesn't have statistically significant influence on existence of differences in profitability between agricultural holdings which are involved in dairy production in Belgrade region, Southern and Eastern Serbia region, Šumadija and Western Serbia region and AP Vojvodina region.

After profit margin, impact of asset turnover ratio is tested, as second factor which has influence on profitability (Table 7.).

Table 7. Statistical significance of differences in the level of AT between agricultural holdings which are involved in dairy production in RS

Effect	Univariate Tests of Significance for AT Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degree of Freedom	MS	F	p
Intercept	20.74633	1	20.74633	507.5342	0.000000
Region	0.76026	3	0.25342	6.1996	0.000438**
Error	10.87321	266	0.04088		

Source: Author's calculation.

Based on previous table results, existence of highly statistically significant difference in asset turnover ratio between agricultural holdings which are involved in dairy production by regions in Republic of Serbia is confirmed ($p < 0.01$). Otherwise stated, asset turnover ratio has statistically significant influence on existence of differences in profitability between agricultural holdings which are involved in dairy production in Belgrade region, Southern and Eastern Serbia region, Šumadija and Western Serbia region and AP Vojvodina region.

Research has confirmed that, of two before mentioned factors, only asset turnover ratio is a factor which has influence on existence of differences in profitability between agricultural holdings which are involved in dairy production by regions in RS.

Conclusion

Dairy production is significantly more intensive production line than crop production which predominates in Republic of Serbia. Milk production (cow milk) was, in the structure of livestock production value in 2017, on the second place with participation of 25.35%, behind pig farming with 49.39%. Agricultural holdings which are involved in dairy production in RS makes 18.6% of total number of AH and they are on the third place by representation in total number of agricultural holdings which enters in FADN sample.

Agricultural holdings which are involved in dairy production in AP Vojvodina region have the highest average profitability (19.27%), followed by Southern and Eastern Serbia region (18.55%), Belgrade region (13.75%) and Šumadija and Western Serbia region (12.91%).

Analysis of variance has confirmed existence of statistically significant differences in profitability between agricultural holdings which are involved in dairy production by regions in RS. Post-hoc tests results (LSD and Tukey test) show that there is highly statistically significant difference in profitability between agricultural holdings which are involved in dairy production in Šumadija and Western Serbia region and Southern and Eastern Serbia region ($p < 0.01$). Also, statistically significant difference in profitability between AH from Šumadija and Western Serbia region and AP Vojvodina region is proven ($0.01 < p < 0.05$).

Considering existence of differences in profitability, further analysis of identification of factors which have impact on that difference is executed. Profit margin and asset turnover ratio are recognized as factors which have influence on profitability indicator (ROA). Research has shown that only asset turnover ratio, of two mentioned factors, significantly influences on differences in profitability between agricultural holdings by regions in RS ($p < 0.01$). On the other side, profit margin impact on existence of differences in profitability between AH by regions is not statistically significant.

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POSSIBILITIES AND EFFECTS OF PROTECTION OF GEOGRAPHICAL ORIGIN OF AGRICULTURAL PRODUCTS - CASE STUDY OF "GLAMOC POTATO"

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Abstract

One form of product differentiation, especially agricultural products and foodstuffs, is their geographical protection. Bosnia and Herzegovina (BiH), through adoption of the Rulebook on Quality Systems for Food Products, become fully compliant with the EU Regulation 1151/2012. However, geographical protection of agri-food products in BiH is still in its early stage. The aim of the paper is to present the possibilities of protection of geographical indications in accordance with the existing regulations, as well as the effects that would be achieved in case of protection of geographical origin on the example of Glamoc potato. Production of Glamoc potato has been traditionally produced and has a reputable place in domestic market, for which consumers are willing to pay a higher price especially in case of guaranteed geographical origin. The paper presents the procedure and the order of the steeps for the protection of the geographical origin of Glamoc potato (local and national phase), SWOT analysis of the position of producers and simulated effects of production and sales cost, revenue and gross profit without and with the protection of geographical origin applying partial budget analysis method. Research results and analysis confirmed that the potato producers and the local and wider community would benefit from the geographical protection of Glamoc potato through direct and indirect financial and non-financial benefits.

Key words: potato, Glamoc, geographical indications, effects of protection.

Introduction

Today, the demands and expectations of consumers regarding the specificity of the quality of the product, its characteristics and the characteristics of products bearing the label of a certain quality are increasing, and special importance is given to the branding of agri-food products. Consumers are interested

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in products that reflect the identity, culture, and characteristics of a particular area. Creating and surviving a brand aims to gain and maintain its position in the market, as well as to gain recognition and easier identification. Glamoc is a municipality in the western part of BiH and, among other things, is known for the Glamocko polje, a plateau on 920 meters of altitude suitable for agricultural production. Traditionally, potatoes have been grown in this field due to favourable climate condition.

Literature review

Glamoc potatoes are a geographical brand that is indisputably recognized in the territory of Bosnia and Herzegovina (BiH) and the former Yugoslavia, and on the other hand, there are almost no scientific results that would materialize this advantage, especially with regard to the procedure provided for by regulations regarding geographical protection of agricultural and food products. It could be said that Glamoc potatoes belong to the group of "recognized but not adequately protected products" as defined by Giovannucci et al. (2009). A number of authors have dealt generally with potato production technology in the BiH territory. The research mainly went towards comparing the yield of potatoes depending on the variety, the amount of artificial fertilizer and variations of other production factors, and the area of Glamoc was taken as one of the experimental sites. As a result of these studies, soil characteristics and climate conditions for the Glamoc site were identified. In experimental studies at several localities in BiH, because of climate conditions and soil suitability, the site of Glamoc has been confirmed its comparative advantages for potato production, as the highest yields and quality of potatoes are achieved here (Ćota et al., 2011; Ćota, Silj, 2012; Ćota, Hadžić, 2013). According to Beljo et al. (2006), over the past 25-30 years, more productive varieties introduced into BiH have been gradually squeezing out old indigenous varieties that are disappearing, not only from commercial production, but are forever lost as potential genetic sources. Surfaces sown by potatoes in the area of Glamoc municipality are declining. In 2018, 256 ha were planted with potatoes. The annual production of potatoes is between 5,000 and 7,000 tons, depending on the average yield achieved. The five-year average is 19.7 t/ha with a coefficient of variation of 15.5%.

Table 1. Planted area and realized volume of production and yields of potatoes (2014-2018)

Indicator	Mean	Variation interval		Cv (%)	Rate of Change (%)
		Max.	Min.		
Area (ha)	301.6	378	256	16.12	-9.28
Volume of production (t)	5,838	6,953	4,993	12.34	-1.08
Yield (t)	19.7	24.0	15.8	15.05	8.01

Source: Authors calculation based on data from FBS (2015-2019).

Around 388 tonnes of potatoes were produced on 19 million of ha in the World in 2017 (FAOSTAT, 2019). As in case of other agricultural products, the opportunity to sell potato and the sale price that can be achieved are issues that most producers are concerned with. One way to make it easier for farmers and to sell potato at higher price is to differentiate their own offer from the offer of other producers by protecting the geographical origin of the product, and thus influencing consumer preferences.

On the global level, 111 countries, including 27 EU members, protect designation of geographical origin by the *sui generis* system. The *sui generis* system has the meaning "unique in features" and in the context of protection of geographical origin it is a term used to identify a legal category that exists on its own, independent of other legal categories, because it was created for a specific purpose, in this case the protection of geographical indications. The *sui generis* system belongs to a formal group in the territory of origin of the product and as a public good cannot be dislocated, sold or controlled by one individual or one corporation as opposed to a trademark (Samardžić et al., 2013). The system of protection of geographical indications as a sui generis industrial property rights is not universally accepted. Such a system was created and developed in the countries of the EU (Rački Marinković, 2013). In order to increase the competitiveness of their products, many developed and developing countries are trying to protect agricultural products through protection of their special designation or as part of the protection of industrial property, in order to differentiate them from other products and increase the competitiveness of their producers. According to Leko Šimić (2002), brand products are by definition those products which, by their guaranteed quality and specific label, bounce off the same or similar competing products and are accepted by the market as such. Branding of agricultural products can theoretically be done by branding an independent brand, a collective brand, and statutory forms of identification. Branding of primary agricultural products, as homogeneous products, through an independent brand is very complicated, and consequently protection at the EU level is carried out by means of the labels prescribed in the legislation. EU Regulation 1151/2012 defines three forms of protection: Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Specialty Guaranteed (GTS), (EC, 2012). According to the aforementioned Regulation 1151/2012, it is pointed out that an increasing number of consumers in their diet give more importance to the quality of food products than to their quantity. The protection of the geographical origin of a product is most often linked to agricultural food products, wine and spirits.

Figure 1. Products' labels for protected geographical origin in the EU and BiH

Looking for specific products generate the demand for agricultural and food products with a definite geographical origin. In order to enable producers to maximize their revenue from their products and to inform consumers in detail about the characteristics of the foods they consume, the EU in 1992 set up and adopted a system aimed at promoting and protecting agricultural and food products with label of the designation of original, geographical indication and guaranteed traditional specialty (Jug Dujaković et al., 2008). According to Profeta et al. (2010), yet 10 years ago in only 4 EU countries (Germany, Italy, France and Spain), about 14 billion EUR of PDI and PGO-labelled products were sold annually. Unlike a product brand that is beneficial to only one producer, its owner, or the association that has protected it, geographical indication benefits all its users (Kovačić, 2005). Regulation on the protection of geographical origin protects, at the same time, both, the producer and the consumer, the producer from the misuse of his hard-earned reputation, and the consumer from the misuse of the marking origin of the product (Nation, 2011).

Bosnia and Herzegovina, through the Rulebook on Quality Systems for Food Products (Official Gazette of Bosnia and Herzegovina 90/2018), aligned the legislation with the provisions of the mentioned EU regulation.

However, despite the legal regulations, the process of protection is at the very beginning. The situation in BiH is further complicated by the dual designation registration system by the Intellectual Property Institute of BiH and the Food Safety Agency of Bosnia and Herzegovina. The confusion came from two laws: the Law on Geographical Indications of BiH (Official Gazette of BiH 53/10) and its by-laws, which authorized the Institute and the Law on Food (Official Gazette of BiH 50/04) and its by-laws, which for registration and implementation of the protection procedure authorized the Agency.

Material and method

Aim of this paper is to present the possibilities of protection of geographical indications through the application of the Rulebook on Quality Systems for Food Products, as well as the effects that would be achieved in the case of protection of geographical origin of Glamoc potato. Geographical indications represent an important opportunity in many regions to achieve added value in the economy and society, not only in terms of trade and revenue, but also in terms of cultural and environmental benefits (SWG, GiZ, 2019).The existing bibliography on the subject matter was the main research material, which was reviewed by desk research method. Historical method was also used for surveying the history of geographical protection in the EU and the world.

The compilation method was used to retrieve the results and views of other researchers, and a summary based on the data collected and own expert opinion was formulated through a SWOT analysis. Descriptive statistics methods were used to process the data on the areas sown and the volume of production achieved. The impact of the protection of geographical indications on the financial result of the potato producers was calculated by applying a combination of analytical calculation method and partial budget analysis method, calculating the revenue and costs difference over an area of 1 ha, using the following scheme (Vaško, 2019), (Scheme 1.).

Scheme 1. Calculation of basic and additional revenue and cost in potato production

+	Volume of production	x	Basic price	=	Basic value	Total revenue
+	Volume of production	x	Increase in price	=	**Added value**	
-	Quantitative expenditures	x	Purchase prices	=	Regular cost of production	Total costs
-	Cost of certification			=	**Added costs**	
=						Profit

Source: Vaško, 2019.

Results and discussion

Situation analysis

Origin-linked products are those that can be differentiated as a result of their local identity or typicality. Their identification as GI products is justified by the particular local context in which they originate and that gives them a specific nature, quality or reputation in consumers' eyes (Vandecandelaere et al., 2013).

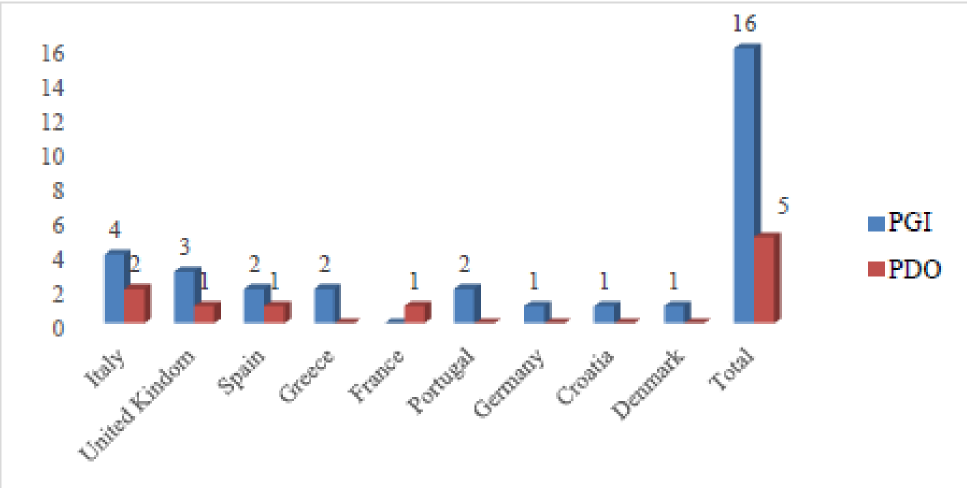
The situation regarding the protection of geographical indications can be monitored through the official database (Database of Origin & Registration), so-called DOOR databases (EC, 2019). According to aforementioned database, in total, 1,455 names of agricultural and food products were protected at EU level until November 5th 2019. The structure of protected names is 640 PDOs (43.98%), 753 PGIs (51.75%) and 62 TSGs (4.26%). If these data are compared with the data presentation in the paper of Mesić et al. (2011), an increase in the protection of all designations is observed, and thus, importance of them is increasing for producers. The increase in protection over the past eight years has been by 365 product designations.

Potatoes as a product falling into category 1.6. Fruits, vegetables and cereals, raw or processed nomenclature from Annex I and Rulebook on Quality Systems for Food Products (BiH CM, 2018). At the level of this class (1.6), a total of 390 product designations are protected in the EU, of which 156 with PDOs and 234 with PGIs (EC, 2019). The share of this class in the total protection with PDO and PGI designations is 27.99%, i.e. it could be said that every forth protected name from this product group.

The distribution of the protected name of raw or processed potatoes by type of designation is shown in the following chart (Chart 1.).

A total of 21 raw or processed potatoes are protected, of which 16 have PGI and 5 have PDO designation. The largest number of protected designations of potato is in Italy, and 9 out of 28 EU member countries protected this product. Looking at the data, it is noted that, as with other products, protection of this group is dominant in the Mediterranean countries, i.e.in the southern parts of the EU. Vanhonacker et al. (2010) argues that traditional products are more common in the Southern than in Northern Europe because of the large number of small businesses that favour the production of food and because of greater diversity in the ways of production and numbers of final products. The result is greater recognition and economic value of such products in Southern Europe. From the republics of the former Yugoslavia, independent states today, only Croatia has protected Lika potato. Bosnia and Herzegovina has no significant experience in the protection of agricultural products origin, nor a significant number of protected products. According to the WIPO Database (WIPO, 2019), only 3 products are protected at the BiH level by the Institute for Intellectual Property of BiH, namely: Cazin chestnut honey (2010), Herzegovinian honey (2014), and Romania skorup – cream (2017). These products are protected on the international level, under the Lisbon Agreement about protection of geographical indications. One of the reasons for the small number of protected products is confusion of the producers and their associations with the conditions where and how to start the procedure.

Chart 1. Distribution of protected designations of potatoes in EU-28



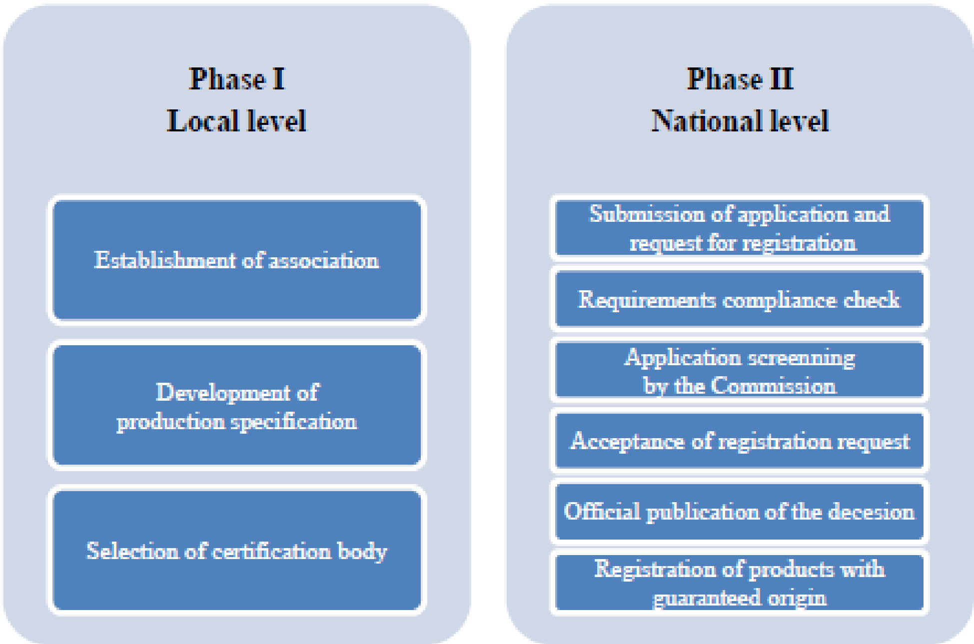
Source: EC, 2019.

Brenjo and Hajric (2019) state that Food Safety Agency of BiH, during the first four months of 2019 officially received four applications for protection of geographical indications: 1) "Visoko's pečenica (smoked meat)", request for protection of geographical indication (PGI), 2) "Nevesinje potato", request for protection of geographical indication (PGI), 3) "Livno original cheese", request for a protected designation of origin (PDO) and 4) "Livno cheese", request for protection of geographical indication (PGI).

The procedure of protection of geographical origin

In the conditions of strong competition in sale of agricultural and food products on the domestic market, as well as uncertainty regarding the product origin, the quality or production technology, consumers are paying more and more attention to these elements but also to the area which the products come from. Glamoc potato is a product which has a quality reputation and recognition in the domestic market, which is valued by consumers. However, it is not legally protected in the market, and consumers are not even able to properly identify it correctly through the label and to be sure that they are buying the actual product. In order to legally protect this Glamoc product from imitation and to raise consumer's confidence to actually buy potatoes from Glamoc, it is necessary to carry out the process of protection of geographical origin in accordance with the provisions of the Rulebook on Quality Systems for Food Products (Official Gazette BiH, 90/18). The protection process could be divided into two phases: local and national (Figure 2.).

Figure 2. Main steeps in PGI protection process



Source: Own interpretation of legal act.

The first and basic steep in the local phase of protection of Glamoc potato is the establishment of a producer's association, as the protection process is basically initiated by the association of its producers. It is desirable that all members of the association are from the producers' group of producers of the same type of product. The establishment of association at the local level should be supported by the local community. In principle, it is the most critical steep, confronts the various interests, expectations and concerns of the.

Within the local phase, a product specification should be made, which is the most demanding steep after establishing an association. Writing a production specification is defined in article 7 of the Regulation on the quality system for food products. The production specifications include the definition of the following elements: product name; product description; delimitation of the geographical area of production; proof of origin of the product, i.e. proof that it originates from the area in terms of historical facts and tradition; the production procedure or production standards; connection with the geographical area, where the direct link of the food product to the defined geographical area is demonstrated; the selection of certification body and specific rules for product labelling.

This is followed by the second phase, which basically entails submitting a request to the Agency in accordance with Article 11, and checks compliance with the provisions of the specification. The registration procedure shall be carried out by the Commission (in accordance with Article 9), which shall consider the application for registration of the designation of origin or geographical indication. By harmonizing the national Rulebook with EU Regulation 1151/2012, the possibility of extending protection to the EU level has been opened, but the products having to be protected at national level first and then entering into protection process at European level upon request.

SWOT analysis

Based on the analysis of the state of protection of geographical indications in BiH, as well as needs and conditions in case of protection of Glamoc potato, a SWOT analysis of internal factors, from the point of view of Glamoc potato producer group, as well as external factors characterizing the conditions of protection in BiH were made (Table 2.).

Table 2. SWOT analysis from the point of view of the potato producer group

Strengths:	Weakness:
✓ Favourable agro-climate conditions for potato production; ✓ Tradition in potato production; ✓ Recognized name; ✓ Possibilities of product differentiation trough protection of geographical origin; ✓ Producers interested for PGI protection; ✓ Sales at higher prices; ✓ Joint appearance on the market.	✓ Disorganized producers; ✓ Insufficient number of actors involved in the protection process; ✓ Lack of understanding of the whole process of protection; ✓ lack of financial resources for the implementation of the process of protection; ✓ Lack of interest of producers for protection; ✓ Potato yields variation; ✓ Absence of consensus on the rules and conditions of protection.
Opportunities:	Threats:
✓ The existence of demand for Glamoc potatoes; ✓ The existence of regulation and its compliance with EU regulation; ✓ Consumers positive attitude towards Glamoc potato; ✓ Added value remains in the region; ✓ The wiliness of the local community to support the protection process; ✓ Revitalization of the entire area through the valorisation of the potato protection; ✓ Activation of local resources.	✓ Complex protection procedure; ✓ Misuse of geographical area name in the market; ✓ Status of marginal area; ✓ Obstruction of other actors in the process; ✓ Unfavourable demographic trends.

Source: Author's interpretation based of research results.

Financial analysis of the effects of protection

By protection of geographical indications producers gain added value in order to achieve a more favourable (higher) sales price. Raustiala and Munzer (2007) state that rising wealth and falling food prices have increased the share of household income available for niche food products, which are often marketed through GIs.

In addition to single producers, the geographical region from which protected product originate is also of added value. The procedure and registration for the protection of geographical origin have additional costs, so that all manufacturers have increased certification costs. The higher the number of producers using the right to a single geographical indication, the lower the average cost of protection.

Assuming that the yield of potatoes and production costs are the same, in case of geographical origin protection only additional costs are the initial costs of establishing an association and development of a producer specification (expert study), as well as the cost of subsequent controls to retain the certificate. These costs are paid through joint association and they are shared between all members in proportion to the production achieved, that is, the sown area.

Although the yield of potato is a constant, additional revenue is generated by a higher price. The realistic assumption is that such branding would enable the sale of Glamoc potato at a price higher by at least 20%, or 0.30 EUR/kg instead of the previous 0.25 EUR/kg.

The estimated costs of the initial study and registration of the origin are EUR 25,000 and divided by the current production area under potato of 250 ha, it is EUR 100/ha. When these costs are deferred to 10 years it is only 10 EUR/ha per year. Additional costs of controls to keep the certificate, are calculated with additional 100 EUR/ha each year.

Without protection of geographical origin, a gross profit of 1,005 EUR/ha is achieved, and the difference between the sale price and the cost price is 0.050 EUR/kg. With protection of geographical origin, a gross profit is 1,895 EUR/ha, and the price difference is 0.095 EUR/kg. Gross margin increased from 20.10% to 31.58%. Additional costs are 110 EUR/ha, i.e. 5.5 EUR/t.

A more detailed overview of production and sales costs, revenue and gross profit in two varieties of potato production (with and without PGI) is attached in Appendix 1.

In addition to the individual benefits that any Glamoc potato grower would have, the local and wider community would benefit further from its geographical protection:

- increased production of potatoes and increased cultivated areas;
- increased GVA due to increased value of potatoes produced;
- redistribution of producer's revenue in favour of tax and budget revenues;
- increased employment and decreased depopulation of rural areas;
- improved competitive position of domestic potato producers;
- decreased potato imports and reduced outflow of foreign exchange;
- improved tourist offers based on distinctive product.

Through the aforementioned benefits, the protection of geographical origin of Glamoc potato would be a contribution to integrating multiple aspects of rural development in the Glamoc municipality into a sustainable concept out of which the whole municipality population would benefit in both financial and nonfinancial terms.

Conclusions

Geographical protection of the origin of agricultural products is a way of differentiating such products from the same products of other producers and a way of increasing their competitiveness, while gaining consumer loyalty. This protection system involves pre-defining the legal basis and authority for registration and monitoring. Although there are legal and institutional preconditions, only 3 products with geographical origin are protected in BiH so far, and 4 more procedures are ongoing.

One of the products that historically have a recognized geographical origin by BiH consumers is Glamoc potato, for which the protection procedure has not yet been initiated. The initiative should come from potato producers who have an understanding of the process, but have not yet reached consensus on launching a procedure of protection. Support in these activities should be provided by the local and scientific community. The analysis showed that in case of protection of geographical origin of Glamoc potato, producers would incur additional costs for elaboration and registration of protection, as well as additional revenue due to possibility of selling branded potatoes in this way at higher prices, which, compared to their current situation, would increase their gross profit by 88%.

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Appendix 1

Table 3. Partial budget analysis of revenue and costs in potato production without and with geographical origin protection

		Product:	Potato	Without protection		With protection		Difference
Production costs	Direct costs	Inputs	Seed	1,000	1,750	1,000	1,750	0
			Fertilizer	600		600		0
			Chemicals	150		150		0
		Workforce	Labour cost	600	1,600	600	1,600	0
		Services	Machinery cost	1,000		1,000		0
	Indirect costs	Overhead farm cost		250	425	250	425	0
		Cost of financing		175		175		0
Costs of certification	Direct	Cost of re-certification services		0	0	100	200	100
	Indirect	Cost of initial study		0		100		100
Sales costs	Direct costs	PVC bags		120	220	120	220	0
		Transportation cost		100		100		0
			Total cost (EUR):	**3,995**	**3,995**	**4,105**	**4,105**	**110**
			Volume of production (tons):	**20**		**20**		**0**
			Price cost (EUR/t):	**199.75**		**205.25**		**5.50**
Potato mercantile		Volume of production	t/ha	20,000	5,000	20,000	6,000	0
		Sale price	EUR/kg	0.25		0.30		0.05
			Total revenue (EUR):	**5,000**	**5,000**	**6,000**	**6,000**	**1,000**
			Gross profit (EUR):	**1,005**	**20.10%**	**1,895**	**31.58%**	**890**
Potato mercantile		**Sale price**	**EUR/kg**	**0.250**		**0.300**		**0.050**
		Cost price	**EUR/kg**	**0.200**		**0.205**		**0.005**
		Price difference	**EUR/kg**	**0.050**		**0.095**		**0.045**

FOOD SAFETY ASSESSMENT AND THE CONTAMINANT CHEMICAL RESIDUES

Alina Stancu[1], *Radu Antohe*[2]

Abstract

In recent decades, there has been an increase in the public interest for the possible connection between contamination with chemical residues which represents a danger to both food safety and the global economy, having a devastating impact on producers and processors .The standard procedure for assessing the safety of chemical contaminants in the human consumption of processed foods is regulated by the European Agency for the Evaluation of Medical Products and the Committee for Veterinary Products and involves the identification of chemical residues such as mycotoxins, polychlorinated biphenols, dioxin and the various chemicals used in agriculture or for veterinary use. These foods are susceptible to contamination with molds and toxic metabolites, representing a high pathogenic risk. The present paper aims to define and identify through a comparative analysis the impact of chemical residues in processed foods on human health and to propose some effective solutions to reduce these chemical risks that threaten food safety.

Key words: food safety, chemical residues, mycotoxins.

Introduction

It is widely recognized that all chemical substances present in finished products intended for human consumption or in the raw materials to be processed, whether they are additives or chemical residues arising from unintentional contamination, pose some risks to public health and this is precisely why food contamination has become a problem of major importance in the last decade due to the high level of concentration of chemicals present in all bakery products and all types of meat. Pathogenic or not, chemical residues affect the immune system and have a major contribution to the installation of biochemical imbalances in human metabolic processes. Lately, protecting public health and reducing chemical risks to the level accepted by the critical control limits set out in the quality and safety standards is becoming an increasingly difficult task. The first step in the study of the harmful

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effects that the chemical residues have on the population is represented by identification of the causes throughout the production chain, concept that is called farm to fork as well as the identification of the types of contaminating agents and the implications that they determine.

Lately, on the domestic market, several phenomena determined largely by the process of globalization have begun to manifest, among which the extreme diversification of the categories of food products. In order to increase its competitiveness, the producers focus on the packaging and the way the product looks and less on the complex but poor composition in nutrients that cannot provide the daily necessary of phytochemicals, vitamins and minerals to the human body. Public opinion about human nutrition must therefore be revised so that the nutritional value of the food is considered as a prime factor in the quality analysis and the concept of food safety becomes even more important in the context of an extremely dynamic and complex trade. This concept outlined around traceability on the agri-food chain implies a current approach in which not only the intermediate stages as traditionally done but the whole production chain is analysed. Many diseases have been discovered whose cause is irrelevant in the first stages of the chain, especially in the livestock sector. This fact proves the importance of strict verification of all steps within the transfer of a product into its final form (Cabado et al., 2008).

Therefore, food safety is becoming an increasingly difficult task and because its realization is affecting public health, food safety issues need to be addressed in the context of creating synergies between all economic agents in the agri-food chain. Ensuring food safety and security rests with all farmers and governments involved and contribute to the smooth functioning of the agri-food supply chain upstream and downstream through the legislative regulation of responsible use of plant protection products (PPPs) and beyond. The residues are defined by law being regulated accordingly as any trace of chemical substance that may remain on the crops at the time of harvest. In order to be able to delimit the amount of residues harmful to human health, the legislative framework defines maximum residue limits (MRLs) which are marketing standards and summed the maximum level of chemical residue from PPP tolerated on the surface of food or feed only when pesticides are used. This maximum limit is well below the safety margin to ensure over 98% that the respective foods are safe for human consumption and at the same time provide consumers with confidence or a guarantee of quality. Thanks to this standard that prevents the ingestion of contaminated foods, a possible residual quantity is harmless. In addition to the quality standard mentioned above, the European Food Safety Authority monitors the chemical risks after their identification, comparing them with the maximum permitted limits and taking measures accordingly, thus publishing an annual residue monitoring report that shows that in the last decades of May more than half of the samples considered in the laboratory analyses do not contain traces of detectable residues. In the last 5 years the results of these reports show that only 2% of the tested samples exceeded the maximum allowed limits, but without any risk to human health due to the very large safety margins and the very small quantities. The rest of the tested samples are below the maximum allowed limit.

In addition to legislative regulations, farmers also play an important role in ensuring food safety by adhering to the guidelines of good agricultural practices that control the quantities of food residues even though PPPs are applied at all stages of the production process to protect plants from diseases and pests. It is essential that producers meet these standards to ensure their competitiveness with foreign farmers and to be able to sell their goods both locally and abroad. The responsible use of PPP has a dual role in supporting the reduction of waste as a holistic approach to the concept of sustainability in agriculture materialized through the comprehensive control of diseases and pests. The annual reports published by the European Food Safety Authority include various tests for detecting chemical residues in food, thus establishing maximum permitted limits and verifying whether farmers use pesticides responsibly and correctly, to demonstrate food safety in front of consumers but also in the face of economic agents, which plays the role of traders and importers who can trust that the finished product or the raw material they order meet the safety and quality criteria. If the producers exceed the MRL, they are obliged by law to proceed with the destruction of the contaminated products. The standards regulated by Codex Alimentarius are outlined around the different systems of setting the MRL that are established before a product receives authorization, and in each internal market this happens automatically, except for the import markets where the manufacturer requests to the export market a maximum export tolerance regulated by local authorities. In the last decades, the quantity of exported food products has increased exponentially with the intensification of international trade, which until a century ago involved the production, sale and consumption of food or raw materials locally. The legislative framework imposes a ban on the marketing of a crop or foodstuff whose chemical residues exceed the MRLs and because they are not harmonized at the global level, farmers have a difficult task to comply with both the maximum limits allowed by the country in which they produce and those provided in the quality and safety standards of the country in which it exports. Farmers must also be well informed about the requirements of all internal or external markets in which they operate, being informed by the organizations of producers, traders and PPP producers that continuously and closely monitor the MRLs.

For the efficiency of the analysis on the presence of chemical residues in foods and their effects on human consumption, it was used as a research method the analysis of the data provided by the National Institute of Statistics and the results of the laboratory analyses elaborated by EFSA. The research method used in the present work is an observational method.

The objectives of the present research consist in determining the causes of food contamination with chemical residues arising from the use of chemical substances as treatments in the first stage of agri-food sector, namely in vegetable farms or in the zoo-technical sector, identification of the main chemical risks and elaboration of preventive and corrective measures to ensure food safety throughout the production chain.

The main sources of food contamination with chemical residues

Ensuring the confidence of consumers who consume plant or animal products is quite easy to reach because the maximum permissible limits make a big difference between perception and reality, they have a very large margin between the amount of chemical residues that would be harmful for human consumption and the quantity of substances, chemically inoffensive, so a person should consume about 28,000 strawberries in a single day to reach the maximum level of chemical residues allowed for these fruits. Another index that ensures food safety is given by the large number of samples that are analysed annually for the correct evaluation of the residues and the continuous monitoring throughout the production processes. Consumers should be well aware that most of the residue is on the surface of foods of vegetable origin - fruits and vegetables, so that they can be easily eliminated by the process of peeling or as in the case of salad, removal of outer leaves and taking of precautionary measures by the consumer who will wash under the jet of water before ingestion.

The main sources of contamination of food with chemical residues are:

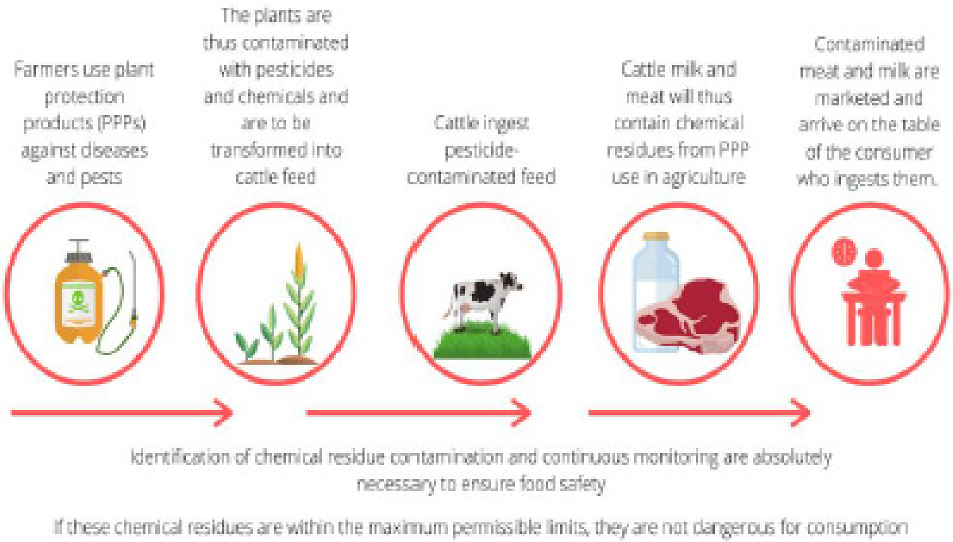
1. Irresponsible use of plant protection products (PPP) care can materialize in pesticide, insecticide, fungicidal) residues or a chemical fertilizer or a treatment applied to the soil.
2. The application of the medicinal treatment in the zoo-technical sector determines the appearance in the finished product of the residues of the antibiotic type, soothing or anabolic.

3. The non-conforming condition of the food determines the appearance and it can take care of the microorganisms in turn they can contaminate the food by their metabolic products (toxins, amines, bio-gens, and aldehydes-acids).
4. Food submission somewhat industrial processes of conditioning and preservation care most often or involves the application on the outer surface of the fruit some care substance to increase its life in care at the same time while maintaining its colour and odour.
5. Packages of different types: 2 isopropyl thioxanthone and 4 methyl benzo phenone, mineral oils or other agents used in different types of packaging.

Pesticides

Pesticides are chemical treatments used to protect plant crops against diseases and pests and include several classes of chemicals such as: insecticides, fungicides, herbicides and other high toxicity compounds that act on viruses, weeds, infectious agents, insects, rodents and of mushrooms. Responsible use of pesticides involves the use of quantities that are not harmful to human consumption and which comply with the standards in force provided by international bodies towards food safety and security (Bajwa, Sandhu, 2011).

Figure 1. Monitoring of the beef and dairy production chain - Contamination of final products with chemical residues from pesticides



Source: Authors opinion based on Stancu, 2018.

The maximum level of chemical residues from the use of pesticides should not exceed 0.01 mg/kg but this value may vary depending on the processes through which food, natural factors, type and quantity of the substance used as a pesticide, conditions of storage, etc. (Androutsopoulos et al., 2013).

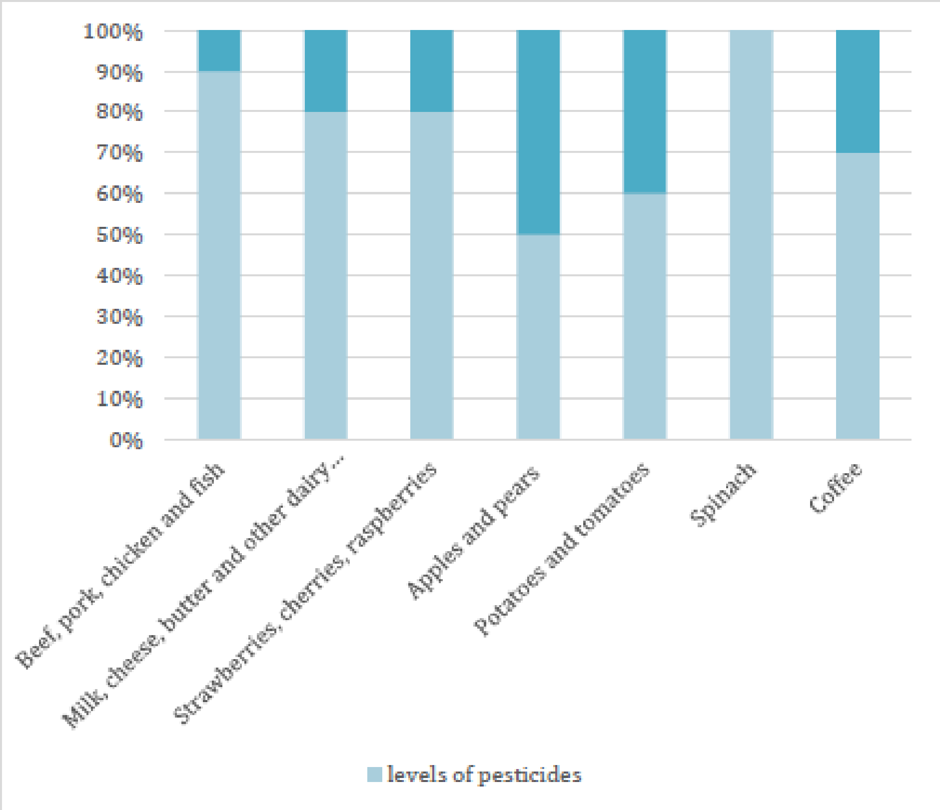
Continuous and close monitoring of each link in the production chain is essential to identify the causes of possible contamination with chemical residues. The first stage of the agri-food chain is the production within the farm, whether it is vegetable or animal, it must be regulated by the standards in force for food safety and security (Bassil et al., 2007).

The process of production of vegetable crops involves several processes, including chemical treatments applied to plants to avoid the development of diseases and pests. Products for plant protection (PPP), a category of which they belong and pesticides should be used responsibly. The quantities of PPP must not exceed the maximum limits allowed and regulated by law. Following the first stage of the production chain, on the surface of the plants remain chemicals with high toxicity that then enter their structure, being ingested by animals during feeding. Once reached the digestive system of animals, the dry substances from the pesticides are absorbed together with water in the blood vessels located in the intestinal villi of the colon and are transported through the blood in all the cells of the body, thus adding in the milk given by cattle, bovines, goats but and in the meat produced after slaughtering the animal. The next stage of the agri-food chain involves packing and packaging the products. In the case of milk, it is subjected to the pasteurization process, which significantly reduces the level of chemical and biological contamination risks. In the case of meat, it is subjected to processes of conservation by smoke or by salting, cold conditioning or freezing, which also reduce the level of residues (Abhilash, Singh, 2009). Thus, before the products reach the final consumer they are subjected to tests and meet the criteria of quality and food safety falling within the MRLs.

There are also pesticides that have been banned globally, such as dichlorodiphenyltrichloroethane (DDT) due to persistence in the environment and exaggerated ability to accumulate body fat.

In 2018, according to the data provided by the National Institute of Statistics, the highest weight is held by herbicides between plant protection products (PPP), both in solid form (52.5%) and in liquid form (52.7 %).Of the amount of plant protection products used in solid form, fungicides have the highest share of total plant protection products used (71.1%), followed by insecticides (13.9%) and herbicides (10.7%).

Figure 2. Food that is most easily contaminated with high level of pesticides



Source: Authors calculation according to NIS, 2019.

Of the amount of plant protection products used in liquid form, herbicides have the highest share in total plant protection products used (62.6%), followed by fungicides (24.5%) and insecticides (11.1%).

In order to protect themselves from the harmful effects of the chemicals found in the diet, more and more people are opting for organic foods or growing their own vegetables and fruits. Other effective ways to reduce exposure to pesticides and chemical residues used in agriculture are:

- Washes fruits and vegetables well and peels,
- Elimination of fat from meat as much as possible, because most pesticides are fat soluble,
- Cooking and exposing at high temperatures food and especially meat properly,

- Consumption of various foods - eggs, tofu, nuts - to reduce the risk of exposure to bacteria resistant to pesticides, antibiotics, hormones and other chemicals used in agriculture.

Table 1. The maximum permitted limits regulated by law for plant protection products (PPP)

Crop	Pesticides				MRLs
	Fungicide	Herbicide	Insecticide	Complex (fertilizers)	
Potatoes				◆	0,3 L/ha
Cereals				◆	0,75 L/ha
Vine				◆	2-3 Kg/ha
Corn		◆			1,0-1,5 L/ha
Wheat		◆			0,6 L/ha
Barley, Triticale		◆			0,4 L/ha
Vine	◆				4 Kg/ha
Tomatoes	◆				4 Kg/ha
Trees	◆				7,5 Kg/ha
Sugar Beet	◆				1,9 Kg/ha
Strawberries	◆				0,6 L/ha
Onion/Garlic	◆				0, 4 L/ha
Aubergines			◆		15 Kg/ha
Bell Pepper			◆		10-15 Kg/ha
Soybean			◆		0,6-1 Kg/ha
Rice			◆		0,75-1 K/ha
Carrots			◆		0,75 L/ha

Source: Authors opinion according to EFSA, 2019.

Antibiotics

Antibiotics are chemicals produced by microorganisms or obtained by synthesis which, applied at very low doses, can inhibit the development of pathogens in food. Antibiotics are simple molecules produced by bacteria or molds and have the ability to slow down the development of competing species, having action on bacterial proliferation (bacteriostatic), elimination of bacteria (bactericidal) and bacterial membrane lysis (bacteria-lytic). These substances are used in animal husbandry in relatively small quantities and guarantee a 10% increase in animal weight. Having a role in the prophylaxis of bacteria, antibiotics will be used as a supplement within the limits allowed by law and will not exceed 20 ppm. Responsible use guarantees the absence of any danger to human germs, but excessive use presents risks with a high incidence.

Once reached by the feed in the animal body which will be later slaughtered, antibiotics cause contamination of the finished product with chemical residues whose quantity varies depending on the species (in beef and pork, mention is made of the presence of tetracycline in the organs) and the way of administration (oral administration - residues present in meat 16 hours after use) and of the type of antibiotic (streptomycin is present in tissues 24 hours after intramuscular administration), (Wang, Leung, 2007).

In the case of poultry, the residues produced by the use of antibiotics in animal feed are in larger quantities in tissues so they were detected 14 days after administration and in eggs were detected at 4-5 days and in bones at 16 days.

Regarding milk, the presence of antibiotics has technological, industrial and hygienic consequences that can lead to technological defects of the products and economic losses because the prior pasteurization of the milk does not influence the content of antibiotics and the specific strains of these derivatives can no longer act, so the products are compromised. About 30-80% of the antibiotics used are eliminated through milk. In larger quantities, tetracycline and chloramphenicol, less penicillin and streptomycin, are eliminated (Bulthaus, 2004).

Important factor for reducing the harmful effects of the antibiotics in the zoo-technical sector is the break time between treatments that also differs from the species to the type of antibiotic administered, so that for the slaughter of the animals it takes 14 days to pause before starting the process according to the legal norms, for milk are also required 14 days of break regardless of the administration method for the purpose of antibiotic, tolerance to these substances being 0 and for eggs the break time can be reduced to 7 days also with tolerance 0. As for muscle and fat test of slaughtered animals, tolerance is all 0. However, there are exceptional cases in which a very small amount of antibiotics is allowed in tissues after slaughter but its presence is attributed to inhibitors of another nature (Diaz Bao et al., 2015).

All chemical substances and treatments given to animals prior to slaughter, whether they are chemotherapeutic, anti-parasitic, tranquilizing or antibiotic, determine the presence of chemical residues that have a harmful effect on human health, which is why US legislation has banned all antibiotics for nutritional purposes, based on the fact that some microorganisms are naturally resistant to antibiotics, others develop resistance through genetic mutations or through the transfer of genetic material which causes diseases that are very difficult to treat. This resistance of the bacteria is determined by the residues of antibiotics in animal foods and by the abuse of the medicinal treatment in the human diet. In 2017, the European Food Safety Authority (EFSA) analyses 360,293 samples of food fragments from slaughtered animals that have been given veterinary treatments of a medicinal nature. The results of the analyses underline the presence of some pharmacologically active substances where 0.42% non-compliant samples were found for anti-thyroid agents and anabolic steroids were found 0.28% in cattle, 0.11% in pigs and 5.77 in sheep and goats. Regarding the samples taken from milk, 0.17% does not comply with zearalanone and derivatives and the prohibited substances were found in 0.03% of the samples. The substances identified were chloramphenicol, nitroimidazoles and nitrofurans.

Table 2. Identification of chemical risks and monitoring of the stages of the agri-food chain

<table>
<tr><th>Parameter</th><th>Chemical Risk</th><th>Critical Limit</th><th colspan="2">Preventive measures and Corrective measures</th></tr>
<tr><td>Production (Farm)</td><td>Pesticides, Anabolic medicines, toxins, amines, biogens, aldehydes-acids, environmental pollutants</td><td>0,01 mg/kg (crops)
3mg-kg (tomatoes)</td><td rowspan="6">1. Compliance with hygiene rules
2. compliance with the legal norms regarding food safety and environmental protection
3. Compliance with the principles of management systems (Hazard analysis and critical control points - HACCP)
4. Continuous monitoring of each stage of the agri-food chain
5. Establishing and observing critical control limits for each stage of the production chain</td><td rowspan="6">1. Personal re-training
2. Rejuvenation of the machines
3. Applying a more advanced heat treatment in case the defrosting operation did not proceed correctly
4. Isolation of potentially contaminated lots, marking them
5. Stopping the use of the lot and carrying out laboratory analyzes</td></tr>
<tr><td>Transport</td><td>detergents, cleaning substances for cooling tanks, disinfected for surfaces, environmental pollutants</td><td>0,02 mg/kg</td></tr>
<tr><td>Processing</td><td>detergents, cleaning substances for cooling tanks, disinfected for surfaces, environmental pollutants</td><td>0,01 mg/kg</td></tr>
<tr><td>Conditioning</td><td>surface cleaning substances, detergents, pollutants from the previous conditioning</td><td>0,01 mg/kg</td></tr>
<tr><td>Packing</td><td>Chemical substances used for gluing packaging, volatile chemicals from the packaging component</td><td>0,01 mg/kg</td></tr>
<tr><td>Marketing</td><td>different pollutants from the air or the marketing unit if the packaging has not been hermetically sealed</td><td>0,01 mg/kg</td></tr>
</table>

Source: Authors opinion according to EFSA, 2019.

The highest frequency of antibacterial non-compliant samples was found in honey (0.83%). In the group of samples analysed to detect non-steroidal anti-inflammatory drugs, non-compliant samples were reported 0.05% for cattle, 0.06% for sheep and goats, 0.66% for horses, 0.06% for pigs and 0.96% for milk.

Mycotoxins

Mycotoxins are by-products of fungi as well as antibiotics only because they are toxic to animals and humans. Their toxicity is quite high and thus very small quantities can affect the health of the body. Almost all mycotoxins are cytotoxic and can cause cell membranes to break down and prevent or influence the synthesis of DNA, RNA and proteins.

Mycotoxins are natural substances that appear as by-products of the development of parasitic fungi (Fusarium, Aspergillus, Penicillium, Alternaria and Claviceps) in plants and in products stored and used later in human and animal feed (Pitt et al., 2012). They exhibit high toxicity either ingested and in very small quantities and are usually difficult to detect because the contamination of raw materials or finished products with these biochemical compounds is not necessarily determined by the presence of the elaborating fungus, nor by the organoleptic modifications that are not mandatory at the moment. For this reason, food and feed should be carefully monitored and controlled to avoid the occurrence or presence of mycotoxin groups that currently reach 300-400 types. These compounds inhibit protein synthesis in cell ribosomes, consequently, cell division. The high toxicity of mycotoxins is a threat to food safety, which is based on epidemiological studies whose results show a close link between mycotoxin intoxication and liver cancer. The target organ that suffers serious injury in case of aflatoxin poisoning is the liver (Abnet, 2007).

In general, mycotoxins have high chemical stability which prevents the detoxification of contaminated products by physical methods (irradiation, refrigeration, dehydration, sterilization by high temperatures, drying, lyophilization,) or even by methods based on chemical phenomena (molecular structure modification), oxidation, solvent extraction or hydroxylation.

Mycotoxins can reach the human body both by ingesting contaminated foods and by exposure to polluted air especially in countries with a warmer climate and humidity as they are conditions that are conducive to the development of mycotoxin-producing fungi. Food safety threatened by the high incidence of poisoning with these biochemical compounds receives another blow in the sense that the exposure of the human body is difficult to avoid because the development of fungi on the surface of the food is not visible, does not cause changes in taste, smell or colour. Although in the developed countries the marketing of foods heavily contaminated with mycotoxins is not allowed their harmful effects are still felt because there is no need for exposure to a large amount of aflatoxins but continuous exposure in small quantities that can be just as dangerous.

Table 3. Foods where the incidence of mycotoxins is high

Contaminated Products	The main mycotoxins found in foods			
	Ochratoxin	Fumonisin	Zearalenone	Deoxynivalenol
Beans		◆		
Wheat			◆	◆
Corn	◆	◆	◆	◆
Barley			◆	◆
Rye				◆
Oat				◆
Rice		◆	◆	◆
Rye				◆
Sorghum		◆		
Products derived from previous foods	◆	◆	◆	◆
Beer	◆	◆	◆	◆
Wine	◆			
Coffee	◆			
Cocoa	◆			
Dehydrated fruits	◆		◆	
Meat			◆	
Milk			◆	
Eggs			◆	

Source: Authors opinion according to SN, 2019.

Regardless of the stage of the agri-food supply chain or the storage conditions, the parameters must be respected precisely because monitoring mycotoxin prophylaxis is very difficult, these being able to develop throughout the production chain even during cultivation or storage (especially in grain silos if the system ventilation is not efficient) or at other times when the parameters are inadvertently exceeded. The corrective measures involve the isolation of the contaminated lot and the hygiene of the machines (Westphal, 2008). Analyses conducted to identify the effects of different chemicals and their impact on the human body and public health emphasize an unfavourable result for the presence of mycotoxins that are at higher risk than pesticides, additives or synthetic contaminants from ingested foods. Besides the harmful effects they have, molds have a great adaptability to any climatic condition and can develop on several nutritional layers.

In the agricultural sector, during the production stage, the crop contamination is relatively simple but varies from year to year depending on the environmental conditions so that in the drought years a higher incidence is affected by aflatoxin because the plants are not so vigorous and are vulnerable in against diseases and pests. Nearly a quarter of the crops at the world level are contaminated with mycotoxins, according to analyses carried out annually by the international bodies on food safety.

Mycotoxin contamination does not cause devastating effects only for public health or yield per hectare but for the economy as a whole. The economic consequences materialize in huge losses worldwide when entire crops are destroyed or if used as feed in the livestock sector cause animal disease or even death. Contaminated feed is transformed into chemical residues in milk and slaughtered meat which cause serious risks to public health.

Conclusions

From professionals to consumers, all economic agents have the responsibility to ensure food safety by increasing the quality of agricultural products and by promoting a current and efficient management system that can increase the competitiveness of the domestic producers over the foreign ones. For safe food to be delivered consistently, each production and processing unit must implement efficient control mechanisms and step-by-step procedures whereby the risks to which food is exposed are reduced to close to 0. A few solutions that out of necessity the diminution of the factors that have determined the food crisis is shaped around the improvement of the food risk management, the sustained increases through subsidies of the availability of the finished products on the internal market and the obtaining of an extended international consensus regarding the use of biofuels to avoid harmful practices.

In all the stages of the agro-food supply chain within the production units, the eradication of diseases and pests is done by physical methods or by treatments with chemical agents, approved (insecticides, contact or respiration applied as such or on auxiliary substances) within pest control programs well regulated by HACCP management systems. The methods must be efficient and rhythmically applied and evaluated through regular inspections and continuous monitoring.

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AGRICULTURE POLICY AND THE RESULTS OF SERBIA'S AGRICULTURE SECTOR

Jugoslav Aničić[1], *Dušan Aničić*[2]

Abstract

Serbia's agriculture sector has great potentials which are used to a small extent because of inherited condition from pre-transitional period and economic policy which was conducted at the expense of agricultural products' prices. Large agricultural combines and cooperatives, which were carriers of production and trade, disappeared during privatization period. In recent years, companies that are emerging and developing themselves, take over the role of carrier of agriculture development, thanks to the application of modern knowledge and the latest technology from their domain. Alongside with them, agriculture cooperatives, entrepreneurs and small households develop themselves through horizontal and vertical connecting and take their place in production and trade chain of agricultural products. Assets and capital structure of companies from this sector, as well as their results realized in recent years, present a reliable basis for further development of the whole sector, as well as a contribution to export increase and overall growth of GDP. The aim of this paper is to, on the basis of realized results of enterprises from agriculture sector, point to economic policy creators their big importance for both development of agriculture, and overall contribution to economic growth and reduction of country's foreign trade deficit.

Key words: agriculture, companies, business results, competitiveness.

Introduction

Inherited state of Serbia's agriculture from after-war period was unfavourable, and an unsuccessful policy of agriculture development was added to that after 2000. During the after-war period, dominant structure of agriculture was made of agricultural combines and cooperatives, based on state's and public's ownership. The development of industry had a priority in economic policy, and other branches of economy had an advantage over agriculture. This whole period is characterized by the so-called price disparity at the expense of agricultural products. Privatization

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and restructuring of agriculture went unduly slow in relation to industry and other economy branches.

Agriculture's impact on the development of processing industry and other industries has not been recognized enough by the creators of economic policy. Agriculture is particularly important for developing countries because through food supply it reduces poverty, affects overall economic growth, contributes to preservation of environment, keeps younger population in smaller and rural areas and other. Along with appropriate institutional support and application of modern knowledge and innovations, agriculture sector will be capable of entering an international market. Precondition for that is that all participants in the chain of agriculture production and turnover strengthen their competitive ability.

Serbia's agriculture has, so far, based its competitiveness on the low price of work force and other resources, such as land and other. However, permanent sources of competitive advantage should be found in other fields, primarily in knowledge and innovation application, facilitating the EU accession process, with a lot of benefits for the sector of agriculture. The companies in this sector should be the makers of the new development policy, making it possible for cooperatives and small family households to become necessary participants in the agricultural products production and marketing chain through their knowledge usage and breakthrough into the markets of the world.

Agriculture has a strategic importance in future development, and therefore the economic policy should create a favourable environment for growth and development of all the participants in the production and marketing chain, their horizontal and vertical relations resulting in GDP growth, export and living standards increase, as well as negative migrations reduction.

For a successful formulation of the set subject and objective of the research, an application of basic analytical and synthetic methods, particularly deduction and induction, was necessary. In theoretical-methodological procedure of research for the needs of this paper, methods of descriptive and comparative analysis, history analysis method, dialectical method and analytical method were used. Primary and secondary data, found in official publications of state's institutions - Serbian Business Registers Agency, the National Bank of Serbia, the Republican Institute for Statistics and other relevant institutions, were also used. The second part of data sources was scientific material from this area published in scientific journals and conferences which were held on the subject of agriculture development.

Macroeconomic environment

Since 2000, Serbia initiated necessary reforms which meant complete transition to market model of economy and inclusion in world's trade. Socialist system is abandoned and the country completely turned to capitalist principles of economy management. Fundamental postulates of new economic policy were privatization, deregulation and liberalization of all economic transactions. In accordance with new demands, reduction of state's role, restructuring of economy and adaption of institutions to new rules of functioning occurred (Sachs, 1994).

New business model neglected development of real sector, primarily of industry and agriculture, while, on the other hand, a lot was expected from service sector development and an increase of personal consumption. Such policy basically meant neglect of domestic production and a faster growth of import in relation to export, which caused foreign trade deficit and country's borrowing for its coverage. Accompanying phenomena of such policy were high unemployment, low gross domestic product per capita and a low living standard. The departure of young, educated people to big city centres or abroad, particularly left long-term negative consequences on emptying of rural and small areas and an overall development of such environments.

Serbia's inadequate economic policy, big financial crisis from 2008, which additionally reduced economic activity, slowed down economic growth, lead to unemployment increase and smaller salaries and similar, was added on. Help was asked for from financial institutions, primarily IMF, in order to preserve macroeconomic stability of the country. However, globally, institutions from financial sector, did not respond properly to developmental issues of undeveloped, so it has to find adequate alternatives relying on own forces, along with appreciation of market's demands, and including the state's participation in economic transaction (Stiglic, 2004).

Serbia has a very unfavourable structure of economic system in the whole period of transition. Economic policy was based on the development of services' sector, primarily trade, banking and financial sector, while real sector of economy was in the background. Particular stagnation followed movement of industrial production, and adverse consequences of such economic policy suffered agriculture, too. In certain number of branches, modern enterprises that can follow world's trends, are formed, while a large number of enterprises still lags behind when it comes to all parameters of successful functioning. Because of such situation, salaries that employed earn are among the lowest in Europe, and the rate and number of poor people is also increasing. What characteristic are unfavourable migration movements from smaller to large centres, as well as departure to foreign countries, especially of younger, educated people (Aničić, Aničić, 2019).

Compared to other central and south-eastern Europe countries, Serbia has entered into necessary economic reforms with big delay. Although numerous institutions which were characteristic for previous economic system are abandoned, establishment of modern market institutions is unfolding very slowly which has its price in a low level of development. Without development of stable institutions, a high rate of economic growth cannot be realized, as well as vice versa, without high growth rate, stable institutions cannot be established (Jakopin, 2018). Jurisdiction of central authorities in relation to local ones, on the issues of economic development, has not been defined yet. Local authorities need a higher level of independence in making strategic plans and projects in every area.

In line to World Economic Forum Report for 2018 (WEF, 2018), Serbia was positioned as 65th country towards the value of Global Competitiveness Index. It is important to emphasize that Serbia had, in transition period, significantly slower growth than Central and Eastern Europe (CEE) countries which much earlier reached its pre-transition level of development (Arsić, 2016). This group of countries was in 2015 for 85% more developed than Serbia, although Serbia was in 1989 on the average of development of these countries. This fact alone shows how harmful negative impacts from surrounding and slow implementation of necessary reforms in economic policy are.

Revenues realized in privatization process were, instead of production renewal, mostly directed into an increase of personal consumption, increase of import along with borrowing of both state and population. Investments into new production capacities, which are the main development driver, were omitted (Pejanović, 2017).

In 2018, the national economy achieved the highest growth in the post-crisis period in increasing global economic activity conditions. It is the result of the creation of more favourable business and investment environment, due to the structural and fiscal reforms implemented, as well as lower growth during the previous period. Positive macroeconomic tendencies are indicated by GDP growth, strong foreign direct investments growth, foreign market exchange, increased loan activity, relatively stable exchange rate and low inflation, favourable for positive developments in the labour market.

The achieved 4.3% GDP as the main indicator of the entire economy development was mainly the result of the agriculture recovery, and therefore sector A - Agriculture, forestry and fishing - showed the most dynamic growth. Intensive growth was also shown in sector F - construction, and the activity was increased within other non-tradable sectors, mostly in sectors G - wholesale and retail trade, H - traffic and storage, and J - accommodation and nutrition services (BRA, 2019).

The entire economic activity focus remained on the non-tradable sectors, while the tradable ones showed slower growth. The entire industrial production increased for 1.3% per year, slower than 2017. growth (3.9%), as well as the entire economy growth. Foreign trade exchange growth added significantly to the entire economic activity increase, whereas export was 8.1% higher, while import was 13.0% higher, resulting in 30.0% annual foreign trade deficit increase.

Favourable macroeconomic trends were also influenced by low inflation pressure as well as relatively stable exchange rate, thus the value of RSD against EUR was slightly increased (0.2%), while the exchange rate against dollar was 4.3% lower. These positive tendencies reflected on the positive developments in the labour market, therefore the number of employed people was 3.8% higher than in the previous year, and the average earnings were also slightly increased. According to the Labour Force Survey, unemployment was 10.3% at the end of the second quarter in 2019, the lowest rate since 2008 crisis (SORS, 2019).

Table 1. Basic economic indicators

Description	Year	
	2018	2017
GDP (in million RSD - current prices)	5.069.680	4.754.368
GDP growth rate	4,3	2,0
Annual inflation rate (consumer price index)	2,0	3,0
Export (million EUR)	16.271,4	15.050,8
Import (million EUR)	21.918,4	19.396,0
Gross earnings (RSD)	68.629	64.727
Number of employed (thousands)	2.053	1.977

Source: SBRA, 2019.

Economy's competitiveness improvement in world's relations is a strategic assignment of Serbia's economic policy in next period. This assignment is very difficult having in mind starting position of Serbian economy, globalization process and accelerated technology changes, especially in information technology domain. It is necessary to define products and services with which enterprises have comparative and competitive advantages on which long-term sustainable growth of economy can be based.

According to Kuznecov (2005), competitiveness of one country depends on quality of state's institutions to contribute to stimulating conditions of functioning, on one hand, and on the capabilities of enterprises and industries to use those conditions as its competitive advantage. Although globalization's impact is indisputable, many specific local conditions determine national competitiveness (Porter, 2008). State's impact on certain institutions, measures that they take and policies of economic development they lead, is big.

Agriculture producers in Serbia have more and more open possibilities for entering an international market, and competition in domestic market is increasing due to import and development of domestic enterprises. Opportunities that arise by opening new markets can be utilized only with production efficiency increase which must not be based on low price of work force and other inputs, but on application of innovations and successful practise from developed countries. The participants in agriculture production and turnover chain must use synergetic effects of positive competitiveness factors, by which to a large degree, can replace existing weaknesses and limitations in this area.

Agriculture policy in transition period

In historical context, agriculture of Yugoslavia (Serbia), since the end of World War 2, had second-class significance in overall policy of economic development. Country turned itself towards industrialization and opening of numerous factories from different areas with an objective of faster growth and employment of large number of unemployed population. Prices of agricultural products were limited which had an impact on then organizations that were in that area - they did not have a possibility for a significant accumulation and faster growth. It was the time when an opportunity to utilize numerous comparative advantages of Serbia's agriculture - fertile land, rich water flows with great irrigation possibilities, qualified work force and other.

Low level of development of Serbia's agriculture sector is a product of two key factors that caused it: economic policy after 2000 and the state of agriculture which is inherited from pre-transition period. The base of development in pre-transition period was made of agriculture combines, cooperatives and individual farms. State's and public's sector were prevailing to a large degree, while private sector was completely neglected in economic policy. On the level of agriculture sector, there was no appropriate strategy of development, and agriculture was additionally collapsed through privatization, thanks to delay of regulations which were supposed to regulate this area, especially privatization of agriculture cooperatives. Despite all that, agriculture has, in transition period, significantly contributed to country's foreign trade balance and employment of population (Aničić, 2016).

Although the significance of agricultural production in transition period was very often emphasized by the economic policy creators, this area in reality was not adequately supported in order to improve its competitiveness in regional and world market. Because of that, Serbia today has much smaller agricultural production in relation to many countries, although it has better natural conditions for its development. There are some stances, Pejanović et al. (2006), that transition period in the first decade of XXI century unfolded in two phases: first, which was characterized by privatization and restructuring, and second - creating of stimulating macroeconomic, primarily investment, environment. What should be emphasized is that global financial crisis from 2008 largely slowed down realization of these objectives.

Increase of food production and its rational and efficient distribution to consumers in international framework is a condition of development and competitiveness of agriculture sector (Stefanović, Broćić, 2012). Although economic theory a larger participation of agricultural production in GDP and export link with a low development of a country, practise of many countries shows that through successful development of agriculture they, to a large degree, improved their foreign trade balances and overall development (Denmark, Canada, Holland, France and others).

In agriculture, individual family households are particularly endangered. They are affected by low levels of revenues that they realize, small local demand and by the lack of capital for investments which would bring development. On the other hand, aging structure of population is getting worse as younger people are moving towards larger cities and abroad. Also, overall infrastructure in villages is undeveloped which makes it difficult to transfer products towards larger, developed areas. The problem of developing countries is that all these deficiencies mostly arise together and have a cumulative effect on survival and development of agriculture.

New economic policy should, to a larger degree, recognize and appreciate multiple functions of agriculture which range from food supply, reduction of poverty and difference in development of certain areas and regions, ecological moments, all the way to contribution to overall economic growth. Neglect of these functions leads to a smaller growth and low level of efficiency of agricultural sector (Byerlee et al. 2009).

Countries which are EU members dedicate very big attention to agricultural policy and development of economic subjects that are in this area – from big corporations to small family farms. Estimates show that 15 million people work in agriculture in EU, but that number may vary depending on the development of a country. In

15 most developed (industry-wise) countries, that number is around 4%, while in the rest of EU that percentage is around 12% (Vapa Tankosić, Stojsavljević, 2014).

The share of agriculture in Gross Domestic Product (GDP) in the most developed countries of EU is between 2 and 3%, while in certain new members of EU it is more than 10%. In total, during 2008 the gained value of agricultural production in EU was estimated at 635 billion EUR.

Agrarian sector should be the carrier of economic development, the backbone of the economic stability and it should increase GDP. Direct participation of agricultural production of Serbia in GDP is 15%, while indirect is around 40%. Participation of agricultural production in overall export of the country is particularly important since it is around 23%. That is the reason to invest additional efforts into increase of usage of this branch's capacities because estimates present that existing capacities of Serbia's agriculture are used only to one third of its maximum (Gulan, 2016).

According to Devetaković et al. (2009), agriculture was neglected during the whole period after World War II. Problem is that such relation is present nowadays, too. Agriculture was particularly stagnating during 1970s when development of industry and other branches of economy was forced by economic policy. Economic policy of that time did not recognize the significance of agriculture sector so the development was based on big systems in states' and public's ownership.

What is characteristic for Serbia's economic policy is that privatization of enterprises from agriculture sector was late after the privatization of the rest of the economy. Regulations from this area was often changed and enacted with delay, which caused decays of agricultural cooperatives and combines which were main carriers of production in pre-transition period.

Contemporary agricultural production, just as others, demands application of latest knowledge and innovations in the fields of technology, organization and politics (Asenso Okyere, Davis, 2009). Fast progress of science and information technology enables that latest scientific knowledge and innovations are found out and applied. Competitiveness of agricultural producers and their market success on international level depend on their ability to apply the latest knowledge and innovations (Vasiljević, Savić, 2014).

Serbia's agricultural production factors are significantly cheaper than the ones in developed countries, which contributes to the fact that prices of certain agricultural products are competitive in international market. However, competitiveness must be based on application of innovations and scientific knowledge, on production of products that contain larger new-added value, and should not rely on products with a low level of procession and low prices.

Regulations and standards in agricultural production in EU are very complex and demanding. Since Serbia is in the process of accessing to EU, it inevitably has to obey the rules that are present in that large market, which is a big foreign trade partner when it comes to agricultural products, too. Domestic regulations and practise have to comply with the EU Common Agricultural Policy (CAP), and by that create presumptions for an increase of cooperation with this organization. It is especially necessary to take care of CAP's priorities which are: products' quality assurance, preservation of life environment, increase of competitiveness of agriculturalist and preservation of rural communities and their self-sustainability.

During 2010-2016 period, agrarian budget's participation in annual budget is around 4%, which is insufficient for a more ambitious development of this sector. Relation between participation of plant (66.6%) and livestock's production (33.4%) is unfavourable, which confirms a low participation of products with high added value. This relation points to large possibilities of change of agricultural products' structure towards those with a higher processing degree. Progress is possible to achieve in both agricultural enterprises, and family households and other participants in production and processing chain of agricultural products.

The Republic of Serbia signed Stabilization and Association Agreement (SAA), which was put into effect on 1st September 2013, with EU. The objective of this agreement is support to the Serbia's advancement on the path to reach full-fledge membership in the EU. This agreement should, among other things, establish much better cooperation related to issues of trade, regional cooperation, capital movement, harmonization of legal processes, political and financial cooperation and other. Complete application of this agreement should enable harmonization of Serbia's legislation with positive regulations and standards of the EU. All that should, from its side, contribute to the development of Serbian economy through bigger attraction of foreign investments and all positive features they bring along.

Economic effects of SAA will reflect, among other things, in an improvement of products quality, increase of supply and drop of prices. This agreement implies unique rules of conduct in all sectors, including state. SAA raises standard of doing business for Serbian enterprises which will make them capable of competing with EU companies in an open market. All that will contribute to rising of competitiveness of Serbian enterprises in the long-term.

SAA's application has significant repercussions on movements in agricultural production and turnover of its products. Agricultural producers from EU countries have big offer of its products at low prices. Reasons for that are: high subsidising of agricultural production and the reduction of costs due to application of latest technological achievements in doing business. Consequences of import of products with lower prices will mostly experience family farms and small enterprises from agricultural sector, because they cannot provide competitive prices and quality of its products in comparison to competition from abroad.

In such conditions, small producers have to perform together (jointly) in procurement and sale market, and they should adapt its production to market demands. From its side, state should have a transparent and stable policy of subsidizing in order to enable agricultural producers to, in the long-run, plan their functioning.

Agriculture sector enterprises' business results

Food industry, by the nature of its business, to a large extent, relies on agricultural production. Capacities of food industry in Serbia are also used to a small percentage, so a larger development of agriculture will lead to an improvement of results in processing industry (OGRS, 2014). In food sector, number of modern, big enterprises which are efficient in functioning is small, while most of the enterprises are small with an outdated technology and with modest amounts of own capital which would be invested in purchase of modern technique and technology. Thus their productivity is a lot smaller in relation to big systems.

SME sector is, during whole transition period, facing with aggravated financing conditions of its businesses: on one hand, the support of state's institutions (Fund for Development, different agencies for development of agriculture) is insufficient, and on the other, bank credits, with repayment periods which are not adjusted to the character of business in agriculture, are too expensive. Because of that, there is a necessity to work on other financing sources such as credit associations, microfinancial organizations, leasing and other. That would significantly contribute to both SME sector as well as to development of family farms (Bogavac Cvetković et al, 2010).

Entrepreneurship is considered to be a big development opportunity for the whole economy of Serbia, so the same applies to agriculture domain. Many institutional strategies and plans are dedicated to the development of entrepreneurship, but it is still in its infancy. Entrepreneurs are the ones who start new ventures, launch new ideas, technologies and process in order to realize profit (Kalođera, 1990). In agriculture sector there are big and versatile possibilities for the development of entrepreneurship and SME sector, too. Tail wind should be given to its advancement by state's economic policy, primarily through creation of favourable macroeconomic environment for its development.

Enterprises that are in agriculture business are classified according to the Regulation on activity classification (OGRS, 2010) into sector A. Value of assets and business results are presented in next paragraphs.

Table 2. Business property structure in sector A - Agriculture, forestry and fishing (in million RSD)

Description	Amount	Index
A. Subscribed but unpaid capital	591	62,5
B. Fixed assets	614.408	107,7
V. Deferred tax assets	1.638	72,3
G. Current assets	251.861	104,3
D. Total assets=Business assets	868.499	106,6

Source: SBRA, 2019.

According to the data from Tables 2. and 3., it is clear that the companies in this sector have a low capital share (518,931) in comparison to permanent assets (614,408). It indicates that a part of permanent assets is funded from borrowed financing sources, but a positive circumstance is the long-term financing sources total (capital plus long-term provisions and liabilities) being higher than the permanent assets in the sector.

However, according to SBRA report, sector A - Agriculture, forestry and fishing had the total negative financial result in 2018 - the loss in the amount of 1,027 million RSD, while in the previous year the result was positive in the amount of 7,024 million RSD. Besides, a positive circumstance is that business result was positive in the amount of 8,790 million RSD, while the total result - the loss, was affected by financing results, the results in 'other activities' and the losses in suspended business.

Table 3. The structure of financing sources in sector A - Agriculture, forestry and fishing (million RSD)

DESCRIPTION	Amount	Index
A. Capital	518.931	102,1
B. Long-term provisions and liabilities	135.861	142,8
V. Deferred tax liabilities	9.417	108,5
G. Short-term liabilities	252.019	101,5
D. Loss above capital value	47.729	105,1
D. Total liabilities	868.499	106,6

Source: SBRA, 2019.

According to the data in Table 3., it is obvious that capital share in total financing sources is 59.75%, meaning that the companies in this sector rely considerably on their own financing sources. If we consider the policies and conditions of bank loans, as well as the interest rates in the previous period, it is certain that the companies were cautious in borrowed financing sources usage. The adverse circumstance in financing sources is that short-term liabilities (252,019) were much higher than long-term liabilities (135,861), with negative effects on this sector liquidity. Large amount of losses above capital value indicates a large number of companies in the sector with negative business results, i.e., incomplete privatisation process and sector restructuring.

The above mentioned data on assets structure and financing sources indicate that the companies in this sector could be the support for small family holdings, entrepreneurs and cooperatives as necessary participants in market production and marketing, with better mutual horizontal and vertical connections.

Successful development of agriculture, in existing circumstances, can be best achieved through its connection with other economy sectors on local and wider, regional level. Those are, primarily, processing industry, trade and tourism, forestry and other. Offices for local economic development, agricultural professional services and other local authorities can, with its joint work, advance agrarian sector and raise its strength and competitiveness. That will improve conditions and living standard of local people which will contribute to staying of young, educated staff and their advancement of this area.

Introduction of entrepreneurship into school system would significantly contribute to the efficiency of work of young and educated people, their training for business plans making and assessment of capital investments. That would give both short-term and long-term positive effects for society (Arasti et al, 2011). High education of young would create conditions for starting a business, not only out of economic necessity, but because of elaboration of business ideas and wish for an independent business (Grbović et al, 2013). Results of the conducted research towards the employment and migrations in Serbia (Vladisavljević, et al., 2010) show that determination for entrepreneurial business is more a result of a necessity to find a job and exist, and less as a possibility to develop business abilities and utilize market opportunities in business.

In some developed countries in Europe could be found a good example of successful agricultural development that represents a backbone of overall economic development. There are indisputably great possibilities for Serbia's agriculture development and its becoming a serious competitive advantage for competing in international markets (Aničić et al., 2016).

Changes that follow the end of previous and beginning of current century show that there is a demand to develop a new approach to new situation. Revitalization of cooperatives and other ways of connecting of agricultural entrepreneurs, by the model from developed EU countries, is a necessity which has to be considered by the new economic policy (Aničić et al., 2019).

Previously stated unequivocally points to a necessity of formulating new agriculture strategy with consideration of previous positive practise, both our and from surrounding and developed countries. Changes in existing organizational forms of enterprises, along with encouragement of forming clusters, cooperatives and other ways of horizontal and vertical connecting, are necessary. From its side, state's role is to create a frame for institutional changes that will induce agriculture sector efficiency, based on sustainable development, preservation of natural resources and environment.

Conclusion

The sector of agriculture in Serbia shows some signs of recovery and opportunity to become even more involved in the developed world markets in perspective, despite numerous problems and long-term lag behind the developed countries. It could be achieved through the sector competitiveness increase, on the basis of knowledge and innovation application. New agricultural policy has to start from existing comparative advantages which Serbia has, and by application of latest achievements from its area, enterprises from this sector should become competitive in a demanding international market.

Serbia has a strategic interest in further agriculture sector development, from physical increase in production volume, changed market demands adjustments, competitiveness increase provision for all participants in the production, processing and marketing chain. Agriculture development strategy can be implemented through numerous incentives from the economic policy creators. The key role in agriculture sustainable development should be played by the companies in the sector, enabling both horizontal and vertical links among all the participants in agriculture production and marketing. The results achieved in business, property and capital structure in the companies indicate rapid development of the sector as well as the recovery of lost positions in the international markets.

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IMPORTANCE OF INTEREST LINKAGE FOR DEVELOPMENT OF VEGETABLE PRODUCTION IN THE REPUBLIC OF SERBIA: POSSIBILITIES FOR INCREASING COMPETITIVENESS[1]

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Abstract

The aim of research is overview of importance of interest linkage for development of vegetable production in Republic of Serbia and possibilities for increasing collaboration of participants in this sector of agriculture. In paper are analysed individual concepts which define relations of interest linkage, which can be implemented depending from economic conditions in specific surrounding. Problems that occur in possible interaction of interested participants is a consequence of distrust in long-term of good relations with other participants, unknowing of benefits which can be made by linkage, as well cultural pattern which do not allow insight in all advantages and development possibilities that linkage brings. In paper are analysed examples of good practice which indicate on possibilities of overcoming listed problems which follow and influence on the quality of relations of participants and importance which interest linkage have on vegetable production as one of the most intense plant production. Especially is emphasizing the importance of interest linkage for increasing of competitiveness of this sector, as on domestic market, as well on international market.

Key words: linkage, vegetable production, competitiveness, Serbia.

Introduction

Vegetable production represents highly intensive and propulsive branch of agriculture. Final vegetable products are being marketed directly on markets or as raw materials to other branches of food industry. With other branches of agriculture (field farming, fruit farming, viticulture) and group of extractive

1 The paper represents a part of the research at the project III 46006 ″Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals' realization within the Danube region″, funded by the Ministry of Education, Science and Technical Development of Republic of Serbia.

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food industry (industry for production of sugar, flour, vegetable oils, vegetable fat, etc.), vegetable industry belongs to the basic branches of food industry and has the status of inevitable segment of the overall food economy. Production of vegetables requires full attention, first and foremost, from institution of a highest level of state systems.

In a first place, state help is necessary primarily for procure fixed assets for labour. First of all, it is intended to subsidize the procurement of facilities for the production of vegetables in a protected area (greenhouses, greenhouses), equipment (watering and air-conditioning systems), as well as the purchase of machinery for processing and harvesting vegetables. In addition, agricultural producers are expected from state providing vegetable growers with easier access to development funds and provide more favourable conditions for securing products during production and production facilities against natural disasters.

The production unit, average performance, within the registered farm cannot be expected to support the country in all aspects of manufacturing problems and problems of product placement. An exception are cases where the production capacities of the production unit are quantitatively at an enviable level and fully justify the status of a legal entity, which is enabled by positive legislation. In all other cases, the assistance of the state can reasonably be expected by the associated vegetable producers, whether it is the production or marketing of vegetable products. Accordingly, interest linkage represents interest of producers with goal of development of vegetable production, as well from the point of individual as well from the point of total production on certain territory. No matter which modality of linkage is applied (cooperatives, specialized cooperatives, complex cooperatives, clusters and similar forms of association), the benefits for participants can be expected.

Association, in addition of satisfying the basic criteria of responsibility of society to individual (care for business security), is in possibility to provide existence to individual with different profiles, professions and level of education in the way of providing employment for those people. Their engagement represents social resource, which, with the use of natural resources, is able to contribute to satisfying the other criteria of a responsible society, which is, above all, economic stability, sustainability of the tendency for the development of vegetable production in the long run and strengthening the standards of producers.

Main goal of this research is making the overview of linkage between participants in sector of agriculture, with special emphasize on vegetable production. This paper analysed examples of good practice which indicate on possibilities of overcoming listed problems which follow and influence on the quality of relations of participants. Research relies on using the data from Official sources, Laws and data collected on field in Republic of Serbia.

Interest linkage and possibility of exploitation of process concentration of capital on certain market

Trend of multination companies to make concentration of capital on international market is possibility for development of small and medium enterprises (Anghel et al., 2007), as well and agricultural producers in countries in which such companies invest. Function of small and medium enterprises, with involvement of agricultural producers is support to large production systems. This kind of attitude is based on fact that these enterprises, with their elasticity are in possibility that their innovative solutions which are reflected in flexible production programs, supply to large production systems. Practice shows that corporate systems precisely define the parameters of process operations in full respect and strictly adhere to the projected program in the realization of the set production goals. For this reason, customized SME production programs are in dire need of them.

In order for multinational companies and SMEs to cooperate at all, it is necessary to develop cooperative relationships with the aim of satisfying common interests. The interest of multinational companies, as investors, is a positive calculation of the production costs that encourages faster capital accumulation as well as the ability to export from the country where the production takes place. The interest of small and medium-sized enterprises is satisfaction of production capacities intended for the production system of large companies and the security in the placement of their products with adequate profit effects (Lazarević Moravčević et al., 2014).

It should have in mind that corporate entities direct their flow of capital, flow of goods and services and on that way make control markets. They also concentrate their financial resources and marketing solutions in organizational, technical and technological terms solely in the countries where they come from and from where they operate. One contract is bound to be a number of years to maintain its production in the country in which they have invested their capital and then decide for themselves about their future business. For this reason, SMEs are in a position to bear the risk itself is the incorporation of innovative solutions in adapting its production to the needs of these companies. There are various reasons why a foreign company decides to part of its generation capacity installed in a particular country. Stable political situation, legal certainty, favourable ambient and business climate, the possibility of targeting markets of other countries and unions of countries with which the investing country has attractive bilateral and multilateral agreements on foreign trade cooperation, etc. can be cited as the reason.

However, if cheap labour and government subsidies are the sole motivation of foreign companies to invest in a country without intending to stay there, improve production and thus influence the development of domestic production capacities, such practices should be minimized and should only be implemented at any given time. An alternative to such a practice is strategic partnership, subsidizing domestic production and investing in the development of centres for technical, technological and marketing training.

The sector of production and processing of vegetable can initiate interest of foreign investors only in case that there are satisfied following criteria:

- Political stability of state in which vegetable production is happening.
- Legal security of potential investors.
- Economic environment of the production destination - accessibility of the destination, i.e. existence of an acceptable road infrastructure.
- Technical and technological environment - besides access to modern means of communication, it also implies adequate space in which the basic means of work will be housed as well as storage space for finished products.
- Organizational and technical capacity.
- Financial accounting skills, as well as a culture of relationship with the target environment and the public.

Business environment and business culture determine the level and performance of the production destination in general, which directly contributes to the positive customer experience and influences the perception of potential investors. The interest of potential investors is directly dependent on the results of their analysis regarding the fulfilment of elementary criteria at the micromarketing level.

Interest linkage in vegetable production and agriculture in general

Interest is factor that profiling norms of social behaviour in the way of creating values of ethics and moral, spiritual and business, as well and emotional designation of personality in frame of their own social and natural environment.

Social and sociological aspect of interest, no matter if is individual, group, public, population or in synergy, they are subject of constant review by institutions. Defined legislative is one of the mechanisms of protection of interests or contestation of the right to satisfaction of interests.

According to research of Zarić et al. (2008) commercial farmers which have perspective of existence in in business, they have a positive attitude to interest association, often cite examples from abroad; they are aware of the benefits of association and believe that farmers' association in the Republic of Serbia can work. The same study states that despite the positive attitude of the connections established there is no will for associating with other farmers. For the most part, farmers believe that future contracts would not be respected and that there would be no mechanism for real compensation for damages, and one of the reasons why they did not want to associate would be that good farmers would be tricked by negligent ones. Zarić et al. (2005) conclude that the memories of former state cooperatives and the way they functioned have a negative impact on the interest connection.

Fragmented social entirety, in side of segments of business activity made rules and obligations of all interests connected and related parts by intern legislative. When is about agriculture in general, which is by definition common expression for terms which include relations, reforms and laws related to land and agriculture, as an industry branch from national importance by question of satisfying needs for food, it is institutionally pressured by a range of diverse and often conflicting interests.

Activities and initiatives focused on agriculture are linked almost exclusively to rural areas and peripheral zone of suburban areas. The stability of relations in agriculture is highly dependent on economic stability and overall economic development of the country (Papić et al., 2015). Interest connect in agriculture cannot be viewed in its entirety if it is the basis of the elaboration of production only in the context of primary production of agricultural and food products ready for consumption or production of raw materials for the food industry (Malagie et al., 1998), but in addition the connection needs to be viewed from the standpoint of complete industrial finalization of foodstuffs and placements finished products to the final consumer.

It should also be borne in mind that, unlike land that is not a renewable resource, agriculture is a renewable resource, not only for food production, but also for the pharmaceutical and chemical industries, construction, energy, etc. For agriculture, and hence the rural areas, of interest and binds to a number of service activities in the field of craftsmanship of all types and the mode of operation, the field of tourism, medicine and similar activities.

However, the analysis of interest integration in the agricultural sector, irrespective of the context of the analysis, makes sense only if the environmental factors, in economic and political terms, on the development of the agricultural sector in the Republic of Serbia are considered first.

City of agriculture in the strategy of economic development, demographic characteristics of agriculture and rural areas, quality of personnel-related issues of agriculture and rural areas, cooperation between research institutions, opportunities for development and incorporation of new technologies in agriculture and its compatible storage, transport and processing capacities, are just part of the fragmented field of solutions for your problem of trying to find in agricultural policy. The problems of these areas, as well as the situation in the sphere of interests and interests of institutionally defined priorities in the agricultural sector, presupposes the synergy of interests awaiting systemic solutions.

Science in function of interest linkage in vegetable production and agriculture in general

The economy of food which is not based on the values demanded by open markets don't have a developmental perspective. The elementary criteria of value which is necessary to satisfy are ecological and health safety standards in production. Bearing in mind certain technological limitations in the production of agricultural and food products, as a result of, among other things, the lack of cooperation research institutions and institutes with agricultural producers, manufacturers in Serbia rely increasingly on the traditional values, and their use in agricultural production and processing of product. The need for cooperation and an interesting link between farmers and science, in the minds of agricultural actors, has not yet emerged as a necessity at full capacity.

Profession needs to interact with the practice, whether it supports or corrects the operation. The essence of progress is to respect the elementary principled attitude to science and to the theoretically grounded postulates and established criteria of existing, traditionally accepted practice. However, the traditional experience should be viewed from the aspect of predispositions of success only in entrepreneurial activities which are judged by the profession to be credible. In any case, the compatibility of these two parameters, profession and tradition, determine business success. Performance criteria correlate with market conditions and alignment of intentions and capabilities.

Improvement and rationalization of agricultural production is possible if scientific institutes are allowed to finance projects aimed at developing biotechnical innovative solutions aimed at the modern development of agricultural production, which will contribute to increasing international competitiveness. The solution of environmental problems must be the subject of strategically regulated systemic knowledge-based solutions, because these problems are not only about preserving the ecological balance of biotopes and biodiversity, but reflect the culture of living and business activities, which directly affects the quality of the business environment and its willingness to accept investment.

Interest as category of prerogative (category of primary) in vegetable production and agriculture in general

Correct relation and compatibility of attitude between primary agricultural producers, buyers, storekeepers and processors contribute to the coherence (coherence) of their interests and promote cooperation in business.

According to this statement, it is necessary to insist that all stakeholders in the process of interest integration accept the principle of transparency when it comes to business. The implementation of a transparency policy presupposes the conditions that allow the verification of the capacity of potential business partners. An open access policy on data related to purchase prices, warehousing prices, logistics support costs, product sales prices, and the like is of paramount importance for deciding on a partnership and business collaboration. The practice of the so-called "Open Ticket" will contribute to greater mutual trust which improves the quality of business. Cooperation in terms of trust contributes to quality, stability and business expansion.

In cases where different interests are involved and boil down to the same expected benefit, a culture of compromise is very important. Business culture has its own form of action and methods of influence. The causal effects are directly reflected in the security and effects of the business.

Situation in agriculture with special emphasis on vegetable production

Rural environment is a fragmentary whole in geographical sense only. In economic terms, the rural environment is a cornerstone of overall economic development. Development of the entire economic system is not possible without the involvement of rural resources, and only certain segments of economic activities are not interactively dependent on rural potentials.

The agricultural situation cannot be assessed as satisfactory. Despite the efforts, the potential in the agricultural sector is underutilized. Crisis is evident in almost all regional units, which frame rural areas and the agro-industrial complex. The agrarian crisis is of a systemic, agro-political nature. It is known that most of the land (60%) and a small percentage of agricultural production capacity are in the hands of registered agricultural holdings and rural households. The second, smaller part, when it comes to land and an incomparably larger part of production capacity, is in the hands of a small number of persons who, during the transition period, privatized large agro-industrial systems within agro-complexes.

The transition by ad hoc model, without the implementation of a long-term strategy, could not have produced better results than those present in the agrarian sector today. Inaccurate legislation, discretionary powers of local authorities in individual cases and inability to review transitional procedures, with markedly bad effects, in a reasonable time, destroys agro-industrial plants and devastates agro-systems, as well as the entire agro-economy of the Republic of Serbia. Transition, privatization, the prematurely signed Stabilization and Association Agreement with the European Union, and a number of other inter and proactive turbulent political and economic developments (the world economic crisis of 2008) have put agriculture and the agrarian Republic of Serbia in a very difficult position.

Agrarian policy defines strategies that could be assumed to have no favourable conditions for implementation. The agrarian policy strategist's vision defines the possibilities of interest interconnection and elaborates the necessity of forming cooperatives and even clusters. However, strategies that do not contribute to the development of agriculture and farmers' business activities and are not in favour of favouring the principle of equal opportunity for all, cannot meet the expectations, nor the assumption that they will come to fruition in practice.

Main problems related to development strategy presents the absence of assumed competition of their contents and reduced possibilities of implementation of established principals in sense of maintaining the development process, as well their control. In other words, the strategies do not provide mechanisms that can govern the processes it regulates. There is simply no clear correlation or coherence between the strategic outline and the implementation in practice. There is no responsibility for not meeting the strategic goals, and even in the legislation this kind of responsibility is not defined.

In the period to 2008 cooperatives are often established by individuals, usually advanced agricultural producers, and nine fictitious cooperative memorandums with symbolic role. The business of such cooperatives was reminiscent of manufacturer's cooperatives operating at the end of the twentieth century, which certainly had a negative connotation. The only difference between them was that these newly formed cooperatives had a strictly defined ownership structure.

In such a situation, vegetable growers were forced to rely on their own strengths and resources. They adjusted their production to the needs of only those markets that were available to them, most often local markets and possibly small sawmills. Only farms with, conditionally, higher production were able to market their products in the quantum markets of major city centres. There were very few buying centres, but even where there were, there were build-ups between manufacturers and purchasers, which significantly influenced the development of the "grey" economy.

After 2008 there was a slight improvement of business conditions and some improvement in the interaction between institutions systematically farmers. However, the results that would satisfy both sides were missing. It is increasingly recognized that radical reforms are needed at all levels of decision-making structures.

In the structural reform cycle, which began in 2014, the process of fiscal consolidation has led to changes in fiscal and monetary policy, but also to the definition of a new Strategy for Agriculture and Rural Development. The next cycle must have two priorities. One is the good dynamics of economic growth and development. The second priority is institutional development that will guarantee a more reliable rule of law. Bearing in mind that structural reforms have not yet been fully implemented, the emphasis in the reform process should be on institutional development, i.e. opening up space for the development, strengthening and affirmation of the authority of institutions. It is important to emphasize that developed institutions are the foundation of democracy in society, as well as the basis of political and economic stability.

The influence of the "grey" economy and corruption on situation in vegetable production and agriculture in general

It is necessary to analyse the causes that lead to the emergence of the grey economy and corruption, and not just the manifestations of the same. Manifestations of the "grey" economy and corruption are equally represented at the level of local government, territorial autonomy and Republic, regardless of the fact that the different levels of decentralized government.

The "grey" economy, as a matter of fact, should be brought under the legal norm. This means that efforts should be made to such operations translated into legal channels. If the determination and understanding for the needs, above all of the primary manufacturers, is shown, such an option has a chance of success. It is important to note that farmers themselves are in some way encouraged by the "grey" economy. These are cases where they are forced to look for customers for their products, which have a limited shelf life, because they do not have the ability to secure the placement on their own in the short term. Then they are forced to turn to the buyers, who usually operate in the "grey" zone.

In solving this problem can significantly help interest connection or association of producers, and then the timely formation of a joint offer on the market.

It should have in sight that problem of grey economy or corruption is not solved in general not even in developed countries. Results, worth of respect is to reduce these manifestations of action to a reasonable extent.

Measurement for improvement of concurrency

Bearing in mind that the final vegetable products assume a basic deal on the market is one of the priorities that the range of the range of products grown in greenhouses plans to complete a new, more attractive, more specific taste and aroma, assortment of products that today, with the more demanding customers seek and to mostly out of season basic vegetable offerings. That way, the full capacity vegetable grower and processing business would not only be seasonal in nature. Likewise, an improved assortment of vegetables would improve the competitiveness of vegetable converters. The occupancy of the installed production and processing facilities, in this case, would not depend on the weather and the season. Likewise, energy sources and labour would be used rationally. Cost-effectiveness at the disposal of both social and material resources significantly contributes to the profitability of the business and the competitiveness of the product.

Many existing processing capacities require a thorough reconstruction and modernization, while applying the above steps would be able to improve competitiveness and achieve a significantly better profit effect than the one that is quite modest today.

It is necessary to intensify research into the justification of investment activities and the work of the institutions of the system, not only on restructuring in the revitalization of existing processing capacities, but also in the analysis of project documentation for the construction of new vegetable processing capacities. New processing capacities are scarce and existing ones are spatially inadequate.

The aim of the research should be the analysis of the spatial distribution of production, storage, and purchase and production capacity in relation to the processing capacity. The optimal concentration of these capacities contributes to the rationalization of costs in a series of process operations, from production to processing, and thus improves competitiveness.

Perspective and modality of interest linkage and examples of good practice

Does it all production and export chances of vegetable production used in total? Perspective is large. Great climatic conditions, justified and high fertile varieties of exceptional qualitative and organoleptic characteristics; specific taste, attractive colours and smell, with possibility to be product of organic producing are qualitative and high respectable characteristics of vegetable product which did not bring high export or high profit effect (Subić et al., 2010). From the marketing point of view is not find way that emphasized characteristics of vegetable from Serbia made competitive advantage and arouse curiosity with customers in the international market (Jović, 2002).

Base of perspective are human and material resources. With them it goes technological, science and educational structure and trained staff.

In developed countries difference between perspective and time realization is usually small, and if there are conditions, there is practically no possibility that the predicted situation will not be fulfilled. In Republic of Serbia, the perspective and realization of opportunities are often on opposite sides.

Is it justified to invest a large amount of budgetary resources in companies, which regardless of ownership structure, do not guarantee the rehabilitation of their production capacities, nor do they seek to meet at least their elemental profit from their obligations arising out of business. There is a prospect for them, but how much money is needed to make a successful business happen at all and whether it is sufficient to invest without taking concrete strategic steps.

Linkage: Examples of good practice

As a good example of interest in the field of vegetable production, it is important to mention the AC “Begec Vegetables” located in the village Begeč. The cooperative has 28 cooperatives and is best known for producing carrots. In addition to these vegetables, the cooperative also produces young potatoes, cabbage and onions. The annual production of the AC “Begečki vegetable garden” carrot is at the level of 30 thousand tons and the average yield is 50 t/ha.

Significant producer of vegetables with a strong influence of interest for connecting to the success of the production and placement of an association

“Futoški cabbage”. In the structure of cabbage production, which takes place on more than 500 ha of varieties with the protected designation of geographical origin “Futoški cabbage” has a share of 30% in the total production.

In addition, a good example is the AC “Green Garden”, which is located in the village Saraorci near Smederevo city. It is important to note that the cooperative has implemented the GlobalGAP standard, which is necessary for the placement of products in retail chains. Production takes place only in a protected area, i.e. greenhouses on about 10-12 ha. The production period is from March to November and the production structure is dominated by peppers, tomatoes and cucumbers.

Organizational, technical - technological and personnel - structured associations, regardless of the organizational modalities, are able to realize the assumed perspective. The modality of organization is not crucial. It is necessary that the organizational status of the business entity is formally and legally regulated, that property-legal relations have been resolved and that a realistic project has been conceived to define the development strategy.

Commercial agricultural holdings

There are commercial and non-commercial farms. The difference is obvious and it is not surprising that a producer with a commercial status, that is, with a developmental perspective, has no interest in partnering with small farmers. Also, if there is a significant difference in profit effects between the two commercial farms, under the same conditions of economic activity on relatively equal areas, there will be no clear motivation for the association of higher income farm holders.

Give a chance to everyone is quite atypical for the mentality of agricultural producers in the Republic of Serbia (Bodiroga et al., 2018). The prevailing view is that assistance should be given to those who have already proven to be successful producers and who generate significant revenue per unit area, while there is some scepticism towards those producers who lack such resources in the absence of resources.

Whether such an attitude reflects a mentality, distrust in the long term of good relationships, or merely a desire to acquire or maintain a leadership position has not been sufficiently explored. This attitude of existing local leaders can only be changed through education and external incentives. Farmers should be made aware of the benefits that can be gained from connectivity and the development opportunities that connectivity brings. With regard to external incentives, a good example is the possibility of procuring complete lines for planting and/or harvesting different vegetables, with performance in operation that goes beyond the needs of the individual producer. The interest in the association would be instantly up-to-date because the individual, and having the means to buy such a line, does not have the surface to satisfy its performance in the work. However, if there are funds available for the purchase of said production lines and areas in the vegetable production system to utilize the working capacities of the lines, the producer must liaise with the economic operator to whom or through whom he will market his products.

Cooperatives

Agricultural cooperative, according to Law of cooperatives (OGRS, 2015) produce, take over, buy, process and sell agricultural, food and other products of the cooperative and cooperatives, supply cooperatives with reproductive material, energy products, by material for production, parts for agricultural machinery and other goods, trade in goods and services of the cooperative, cooperatives and cooperatives, and provide services to farmers' households in the organization and development of rural tourism and perform all other activities of interest to the cooperative's business.

Previous problems, misunderstandings, and even conflicts between cooperatives and holders of administrative functions in cooperatives have arisen from superficially defined and freely interpreted rules in communication and coordination in performing process actions. Formally, it is provided that the management of priority cooperative links with other cooperatives and other organizational units such as clusters, associations of producers and processors. Likewise, their association with representatives who have processing capacities should result in the secure placement of primary products from the vegetable production of current cooperatives at a predetermined price, which is rarely implemented.

The price of the final product need not be nominally fixed but should be contractually proportionate to the input prices. To assume this type of contractual obligation of cooperatives towards registered agricultural holdings, on the one hand, and organizations from the processing complex to cooperatives and associations, on the other, it is necessary to involve system institutions that have mechanisms through instruments defined by the indicative planning model (national planning). In order to carry out such an interactive connection between producers, purchasers and processors, it is necessary to make a lot of efforts, harmonization and compromise among the entities that are, as a rule, in one way or another competing with each other.

One of the reasons for farmers' distrust of cooperatives is that they, viewed from previous experience, view cooperatives not as a place where they can turn for help in organizing production, crop protection and the like, but solely as a place where inputs for production are procured and where products are sold. Zaric et al. (2008) state in their research that commercial, advanced farmers see the role of former cooperatives primarily as a buyer.

Controversial attitudes were also significantly contributed by the behaviour of the leaderships of former cooperatives that privileged individuals and thus created an atmosphere of mistrust, and often of conflict.

Babovic et al. (2005) point out that cooperatives should be modern business organizations of cooperatives trained in entrepreneurship. The same authors state that it is necessary for the associated manufacturers to define the production for the known buyer with management, which is the reason that the cooperatives must, in addition to adequate staffing and know what the market is looking for most, or what should be produced. According to Law of cooperatives (OGRS, 2015) cooperatives can be specialized and complex. Specialized agricultural cooperatives organize the production of only certain products, their processing and marketing. Mentioned Law in Art. 67 states that a complex cooperative is a legal entity, which is a special form of organizing cooperatives, which, by operating on cooperative principles, realizes economic, social and cultural interests and performs the tasks conveyed to it by the founders by the founding agreement and cooperative rules. A complex cooperative can be founded by at least two cooperatives.

Complex cooperatives may own or co-own storage and production facilities. Specialized cooperatives are also not denied this right, but they often do not have sufficient resources to buy into existing ones or build new storage and production facilities. Cooperatives should be the nucleus of a general gathering of all those interested in the subject matter, and the incentives and development of cooperatives require the assistance of system institutions at all levels.

Clusters

When the institutions of the system devise programs that seek to promote growth and development, as well as the competitiveness of a branch of agriculture or one of its sectors, it can be said that it is a branch approach to the problem in question. Branch access to an area is essentially a cluster form.

A cluster represents the geographical concentration of interconnected entities and institutions in a particular area of activity in the common interest or activity, that is, the critical mass of enterprises and institutions in one place, of unusual competitive success in certain fields of activity (Porter, 1998). Clusters can also be defined as groups of connected customers, suppliers, competitors and other support institutions, such as universities, schools, research institutions, financial institutions and services, standardization agencies, etc. (Russel et al., 2003). Also, according to Porter (2008), clusters can take different forms depending on the size of the development, but mostly include manufacturers of final products or services, suppliers of special inputs, components, machines and services, financial institutions and related businesses.

In the Republic of Serbia, a specific form of organization and interest association, such as vegetable clusters, has not come to life. No interest was recognized or any potential benefits would be realized if the implementation of the business development program, increased productivity in production and improvement of competitiveness were inter-proactive coordination of resources of combined production capacities, knowledge and experience, both vertically and horizontally, of all interest. Related within and around a production branch such as vegetable gardening.

Examples of benefits from cooperative of vegetable producers, vegetable processors and sales centres

Large production systems and large retail chains, since they do not usually have a raw material base capable of meeting their production and sales capacities, have been referred to farmers' associations, most often cooperatives, but also small and medium-sized enterprises. They enter into cooperative relations with them, which are regulated by a joint cooperation agreement. These are strategic, legally binding agreements, and it is in the mutual interest that everything works in the spirit of good business practice. Practice has shown that large systems have a positive effect on the organization of production of their subcontractors. They help them to eliminate subjective weaknesses of a technical and organizational nature, point out possibilities of how to operationalize the principle of economy and expediency, improve productivity in carrying out process actions, and point out factors that may limit them. On both sides, the utility effect is coming to the fore, that is, large systems have a secure raw material base and subcontractors have a secure placement of their products at a price that values their business efforts.

Conclusion

The Republic of Serbia has the material and social resources, both for conventional and organic vegetable production. In accordance with traditional principles, vegetable production has advanced, in line with its resource potential, and is delivering significant results. Today, when business results are both qualitatively and quantitatively subordinated to improving the quality of life and standards of citizens, vegetable production does not live up to expectations. The highly competitive environment and increasingly demanding markets make a big contribution to this. In order for vegetable production to achieve higher yields and reach a level of satisfactory competitiveness, convention-intensive, and especially organic production, must be based on modern technological solutions in all process operations.

If the coordinate schedules production and processing capacities, introduce modern processing equipment, implement control application of rational technical solutions from the aspect of health security, energy efficiency and environmental friendliness of the manufacturing process, it is possible to raise the level of competitiveness of the food industry and improve the economics of food in general and not for profit effects they would not stand out.

Manufacturers must accept the fact that their business status and profit effects are directly dependent on the conceptualization of the organizational, technical and technological characteristics of production and the acceptance of binding criteria in the association. Before establishing guidelines and elaborating their production program, it is necessary to carry out a proper analysis of the cost calculation of the overall business. The irrational use of labour, raw materials and technical means of labour is directly reflected in production efficiency and, consequently, in competitiveness.

Through the processes of actualization and re-contextualization of the original qualities of a cooperative, it is possible to establish new and contemporary connotations and references to modern cooperatives that associate farmers would trust. It is important to emphasize that the correct relationship is the only relevant connotation of successful business.

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EFFICIENCY OF SUNFLOWER PRODUCTION AS PART OF SUSTAINABLE AGRICULTURAL PRODUCTION IN HUNGARY

Beata Bittner[1], *Adrian Nagy*[2]

Abstract

Sunflower production has a growing trend worldwide due to its diverse uses. In addition to food and energy utilization, it is the raw material of many industrial products. Between 2007 and 2016, global demand for vegetable oils grew more than 4% annually, so it was difficult for the production to keep up with it. As a result, the future of sunflower production is predictable and demand is guaranteed.

Incorporating sunflower cultivation into the crop structure has many benefits that contribute to the sustainable operation of farms. From these, it can be pointed out that in areas with relatively poor productivity and low asset supply, farms are capable of efficient production. In addition, it does not require special machinery, the lines for grain and corn are suitable, so its cultivation improves machine utilization without causing peak work.

In this study the efficiency of sunflower production will be presented through Hungarian examples.

Key words: sunflower production, efficiency, sustainable farming.

Sunflower production worldwide

Sunflowers are classified as oil crops. Between 2007 and 2016, global demand for vegetable oils increased at a rate of more than 4% per annum, which was difficult to satisfy by production primarily due to climatic reasons (El Nino). As a result of increasing market demand and production lagging behind, prices are constantly rising. The cultivation of sunflowers is a growing trend globally, not only due to the growth of the world's population, but also by the rise in consumer incomes and measures to encourage the production and use of biodiesel. The use of sunflower seed in the plant oil industry has increased globally by more than 80% since 2004 (Potori, 2018). Its popularity is further enhanced by its multifaceted use. It is also used in the manufacture of a wide range of raw materials for pesticides, detergents

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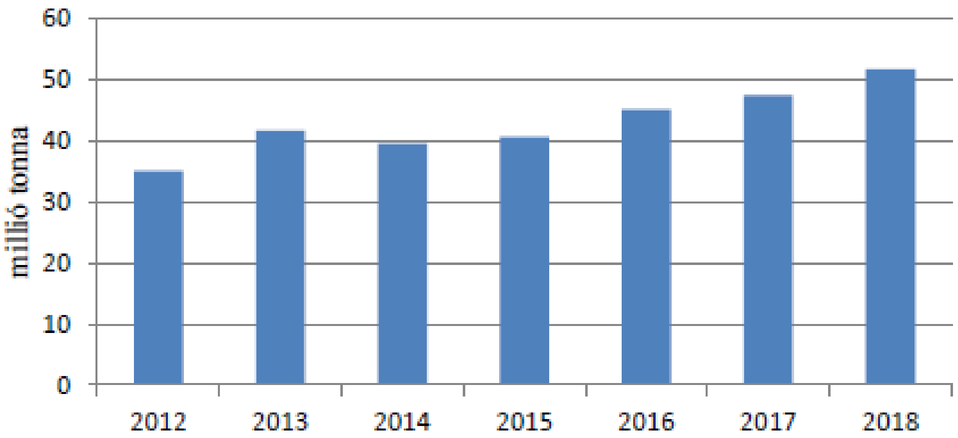
and cosmetics, fine art paints. The cascade is suitable for the production of feed yeast, furfurol production, and ethyl alcohol can be obtained from it after fermentation and distillation. It is an important raw material for margarine production. It provides valuable protein-rich feed through its industrial by-product.

Sunflower production in the world for the period between 2012 and 2018 can be seen in Figure 1. The world's oil seed production has risen to around 500-550 million t in the past period, with sunflower shares of 8-10%. In 2017, sunflower production was carried out on 27 million ha, resulting in a crop yield of approximately 51 million t (equalling to 1.8 t/ha specific yield).

Figure 1. Sunflower production of the world between 2012 and 2018



Source: Oil World, 2019.

The production in Table 1. shows a continuous increase for sunflower.

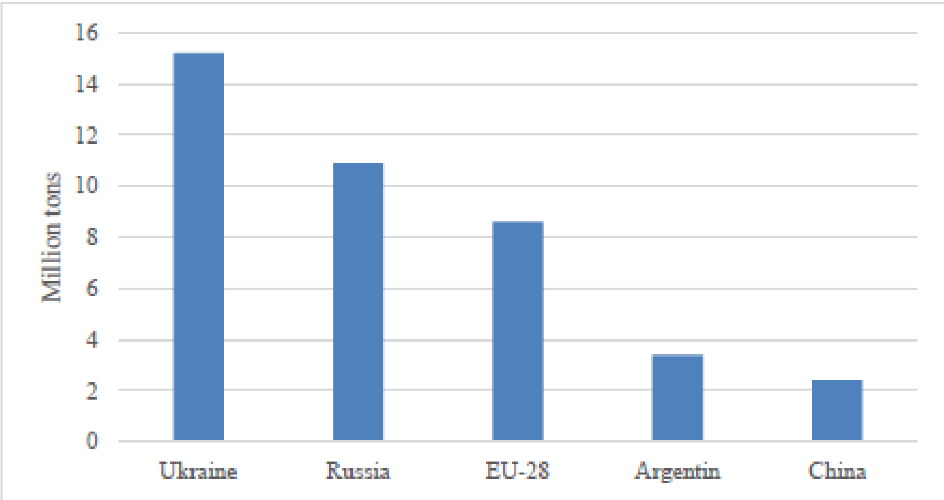
Table 1. Oil crop production of the world between 2012 and 2017 with special regard to sunflower

Year	Sunflower (million tonnes)	Total (million tonnes)	Share of sunflower in oil crop (%)
2012/2013	34.99	474.5	7.4%
2013/2014	41.61	504.19	8.3%
2014/2015	39.4	535.65	7.4%
2015/2016	40.57	526.88	7.7%
2016/2017	45.04	558.03	8.1%
2017/2018	47.3	573.67	8.2%

Source: Oil World, 2019.

The Top 5 sunflower producing countries in 2017 are shown in Figure 2. First ranked is Ukraine followed by Russia, then the EU, Argentina and China. According to the predictions, the same five countries would prevail in the sunflower production sector in 2018 as well with an expected yield of almost 50 million t (USDA, 2018).

Figure 2. Top sunflower producing counties, 2016



Source: USDA, 2018.

It has to be noted that typically extensive and semi-intensive production is going on in the top producing countries (Ukraine, Russia) therefore crop yield average rates are much smaller than in Hungary. In 2016, 1.6 t and 2.2 t/ha were harvested in Russia and Ukraine respectively. As a result of increasing demand, the above countries increase their production significantly.

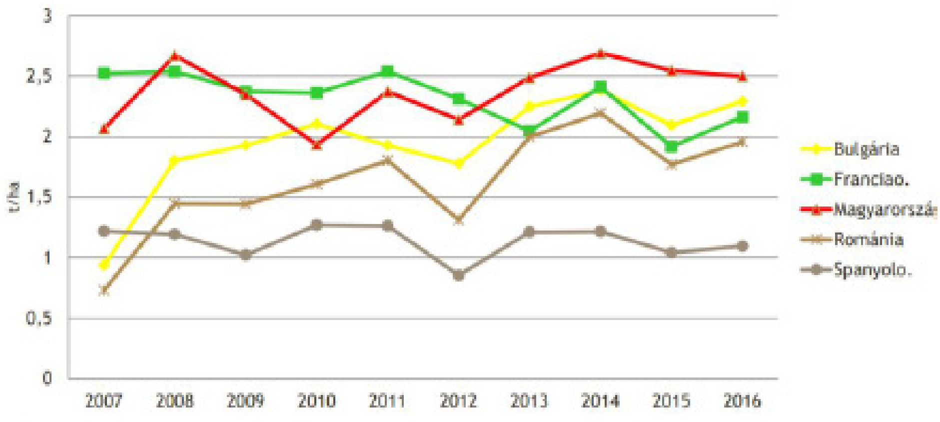
Sunflower production in the European Union

The production area of sunflower is the third largest among plants in the European Union, only the acreage of wheat and corn is greater (EUROSTAT, 2017). In 2017 a yield of 9.2 million t was harvested over 4.3 million ha (equalling to 2.1 t/ha specific yield.)

By 2018 the acreage of sunflower did not change compared to the average for 2011-2015 but crop yield increased thanks to technological advancement. Plant oil industry in the in the EU produces 40% more sunflower seed nowadays than 10 years ago.

The TOP-5 sunflower producer in EU-28 is Romania, Bulgaria, Hungary, France and Spain. Regarding production area, the rank is the following: Romania, Bulgaria, Spain, Hungary and France. Crop yield for 1 hectare is 3 t/ha in Kosovo and Slovenia, 2.73 t/ha in Croatia and 2.63 t/ha in Serbia. Based on these values, Balkan countries are leading sunflower production but the quantity of sunflower produced in this region is insignificant. Greater specific crop yield in the above areas can be explained by the greater number of sown seeds (70-75 thousand/ha). Another major producing country is Turkey in non-EU Europe (EUROSTAT, 2017).

Figure 3. Average yield of sunflower (2007-2016)



Source: EUROSTAT, 2017.

Hungary was at the top regarding average yield among the major producing countries with 2.5 tonnes per hectare (Figure 3.). Yield in Hungary was over 2 t/ha in every year apart from a relapse in 2010. Bulgaria achieved an increase of 2.4 times in average yield in a period of 9 years. In contrast yield in France decreased by 22%. Production in Romania also increased significantly as average yield was almost tripled in the studied period. While yield in Spain remained continuous around 1 and 1.5 t/ha.

Apart from yield, oil content is also a very important measure of value. For food (bird food) varieties or hybrids lower (30-40%) oil content is typical. Oil hybrids generally have an oil content of between 45% and 55%, most often 48-53% of the dry matter. The “real” high oleic (HO) quality is represented by hybrids the oil content of which in the F2 (commodities) generation is at least 80% without plate isolation. Unfortunately, the yield potential of varieties with a high oleic acid content is about 10-20% lower than conventional hybrids, so their cultivation is mainly economical when their goods can be sold at a higher price than normal varieties.

Important tendency is the shift of production from traditional sunflower types with high linoleic acid ratio (above 60%) to hybrids with high oleic acid ratio (80-90%). This can be explained firstly as their processing requires no hydrogenation providing plant oil free of trans fatty acids, and on the other hand, it is beneficial for health like olive oil compared to traditional varieties that have a negative effect on blood cholesterol level similarly to saturated fatty acids. Hybrids also have high heat stability which is ideal for frying.

Production in Eastern-Europe

In 2018 the high increase of production in Eastern Europe leads to grow of the global sunflower production up to the 50 million t (Crook, 2018). “That is 27% increase in output over the last 5 years, representing it globally as the one of the fastest growing crop lines. In near future (up to the 2030) EU expects further expansion, in line to 200 thousand ha increase in surfaces under sunflower, where the major growth would took place within the Eastern part of the EU” (DG AGRI, 2018).

Sunflower prices have dropped alongside the large global crop in 2018. The decrease in price may limit the growth in areas under sunflower planned for future harvest. Currently, crop has value and its find a place within the crop rotation used by many farmers worldwide.

As FAOSTAT data show, growth of yields and total production is larger in Eastern Europe than in the US. In US the planting area was decreased for a 30% in previous 10 years, as well as total volume of production decreased for 25%. European yields in same time reached impressive growth. Advancement in Eastern Europe sunflower performances’ has been driven global production up for 80% during the previous decade, with yields growth of around 46%. In observed period yields have been tripled in Romania, doubled in Moldova, or raised for 150% in Bulgaria or for 65% in Ukraine and for 33% in Russian Federation (FAOSTAT, 2019).

Sunflower production in Hungary

Sunflower is the third most important crop in Hungary regarding the size of its area. Basic data of the sector is shown in Table 2.

Table 2. Sunflower production in Hungary

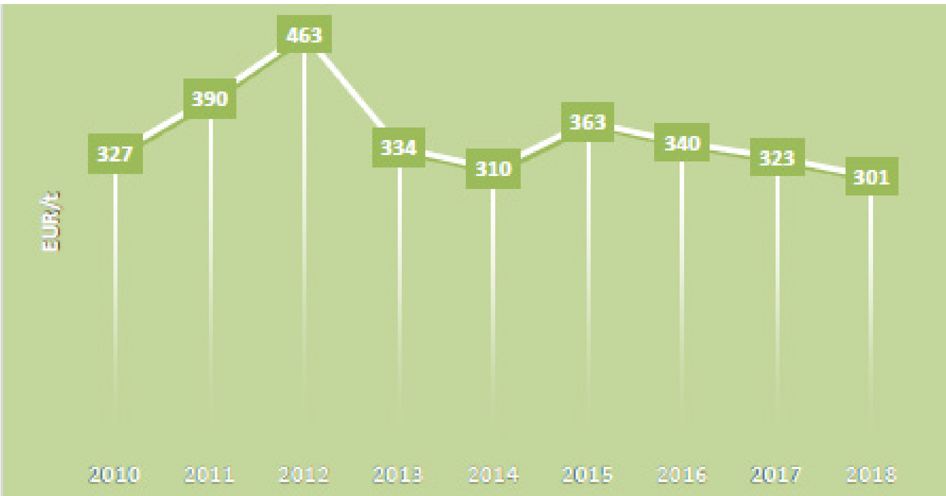
Parameter	2012	2013	2014	2015	2016	2017
Area, thousand hectare	615	593	593	615	630	696
Harvest (Million t)	1.31	1.48	1.59	1.55	1.87	1.99
Average yield t/ha	2.14	2.47	2.69	2.51	2.98	2.87

Source: FAOSTAT, 2019, KSH 2018.

Areas for sunflower production in Hungary have been increasing since 2013 reaching 696 thousand hectares with an increase of 15% by 2017. Further significant increase of production area is not possible with the current compulsory crop rotation. Over five years harvest also increased with 34%.

Figure 4. shows the average purchase price of sunflower seeds. This was around 105 HUF between 2010 and 2017. Lowest prices can be found in 2010 in the studied period and the annual average price was also around 90 HUF/kg. It has to be mentioned, however, that the price at that time was regarded high as it exceeded the average price of the previous year by 32% due to the small produced quantity. If the price was studied within the year a significant undulation could be seen with purchase prices of 77 thousand HUF/t in March and 125 thousand HUF/t at the end of the year. Prices have been on the rise ever since. Highest prices occurred in 2012 in the studied period. In that year unfavourable weather conditions resulted in 20-30% lower average yield for agricultural plants than usual triggering further increase in purchase prices.

Figure 4. Sunflower purchase price in Hungary



Source: KSH, 2018.

In 2017, nearly 2 million tonnes of sunflower were harvested. The plant's production area was close to 700,000 ha, an increase of 11% compared to the previous year. The average yield of 2.9 t/ha was 3.7% lower than in 2016 but was 12% higher than the average of the previous five years. The purchase price was 100 HUF/kg, which is 6.3% less than in the same period in 2016.

One advantage of sunflower is that it can be produced on land with relatively weak production capacity and in farms with low asset supply as well. In addition, it does not require special machinery, the machinery lines used for grain and corn are suitable for its cultivation. The production of sunflower improves machine utilisation, does not cause a peak of work. It's sowing and harvesting precedes those of corn, thus machine utilisation more effective. Early varieties can be harvested in August, therefore it is an acceptable fore crop to wheat. In recent times, it has had a secure market and has provided an adequate income.

The disadvantage of sunflower is that the processing is entirely in foreign control. The protection of the plant also involves difficulties, most types are sensitive to pathogens, and protection is difficult. Bird damage is also generally significant. It's sensitive to drying temperatures, doting and moulding, so storing should be in a thin layer, that are rotated several times.

Sunflower foreign trade of Hungary

Sunflower export of Hungary is associated with markets in Europe, especially in the EU. Most significant customers include the German, Dutch, Italian, Austrian, Romanian and Slovakian markets. It is worth noting that the German and Dutch markets receive 40% of the sunflower seed export from Hungary. Export in Hungary has been continuously expanding in the last decade regarding both quantity and value. It is changing, however, in composition as sunflower seed export decrease while sunflower oil export increases. The import of Hungary is insignificant compared to the export. Compared to the magnitude of export, import has ranged between 4% and 6% of the export value in recent years (Szabó, 2017).

Studying sunflower production at factory level

Economic analysis of sunflower production was performed on basis of data of an area with good (37 gold-crown chernozem soil) and another one with poor (12 AK clayey adobe soil) soil conditions and with good technological level.

Cultivation technology of sunflower

Sunflowers, due to their susceptibility to diseases, are very demanding against crop rotation. Sunflower cannot tolerate cultivation in areas where sunflower was produced in the previous year. It can be cultivated again in the same area five years later and this limits the growth of the plant's sowing area. The biological need for sunflowers includes the deep-cultivation of the soil and the average preparation of the seed bed. After soil preparation in autumn (ploughing, ploughing work), basic fertilization takes place in the spring, then the seed bed is prepared using a compactor, and the sunflower is sown in mid-April. Also in April, pre-emergent plant protection takes place, followed by a row space cultivation and further plant protection in May (foliage protection, head protection). At the same time as the chemicals are applied, Mg and B containing leaf fertilizers are usually used as well.

Desiccation takes place at the end of August, reducing the spread of weeding, diseases and animal pests at the end of the growing season. The harvest time can be moved forward reducing in this way the time period of possible damage. Desiccation is not performed always. Finally sunflower is harvested. Sunflower cultivation does not require special machines.

Expenditure and production costs

Hybrids currently used in sunflower cultivation, with good site conditions and agro-technology, and with appropriate input expenditure are able to achieve average yields of 4.0-4.2 t/ha. Based on our studies, this requires a direct cost of production of around 270 thousand HUF/ha. This corresponds to a direct first cost of approximately 65 thousand HUF per tonne. In the case of traditional varieties, or poor agro-ecological conditions, with a lower input expenditure, approximately 30% smaller yield, around 2.5 t/ha can be expected, with up to 30-40% less production costs, thus direct costs per hectare would be around 175 thousand HUF. The cost per tonne in this case is close to 70 thousand HUF. Of course, it is possible to cultivate sunflowers with inputs that best meet the plants' needs, if site conditions are poor. In that case, the direct production costs could rise up to 220-230 thousand HUF/ha that could realise a yield of 3.1-3.3 t/ha. In the above case, first costs could reach 70 thousand HUF/t.

Considering the composition of production costs (Table 3.), there are three major cost groups, including the work operation of nutrient management, soil cultivation and plant protection, plant care (including regulation), that may account for up to one third-fourth of the direct costs each. A high share of plant protection and care is due to the fact that sunflower is susceptible to diseases, therefore adequate protection is particularly important for yield stability. Nutrient management begins with basic fertilizing using NPK fertilisers carried out before sowing, followed by top dressing as needed.

Table 3. Costs of sunflower production by work operations at the studied farms

Work operation	Extensive conditions[1]			Intensive conditions[2]		
	Cost (EUR/ha)	Cost (EUR/t)	%	Cost (EUR/ha)	Cost (EUR/t)	%
Soil cultivation	136,1	54,4	24.9	136,1	33,2	16.3
Nutrient management	123,1	49,3	22.5	225,2	54,9	27.0
Sowing	91,4	36,6	16.7	101,8	24,8	12.2
Plant protection, regulation, plant care	114,2	45,7	20.9	288,0	70,2	34.5
Harvest, transportation	63,2	25,3	11.6	64,7	15,8	7.8
Desiccation, cleaning	0,0	0,0	0.0	0,0	0,0	0.0
Storage	0,0	0,0	0.0	0,0	0,0	0.0
Other direct costs	18,8	7,5	3.4	18,8	4,6	2.3
TOTAL DIRECT COSTS	**174 425**	**69770**	**100.0**	**834,6**	**203,6**	**100.0**

Source: own data collection and calculation.

Note: [1]Cost calculations are in line to yield of 2.5 t/ha; [2] Cost calculations are in line to yield of 4.1 t/ha.

Plant protection includes a pre-emergent weed control, followed by an overtreatment. Protection against fungi and pests usually requires two or three treatments. Sowing generally generates 12-17% of the costs. Depending on the hybrid purchased, the cost of seeds may range from 170-210 EUR/ha, so its share may vary. It is not possible to catch own seeds, thus it is not possible to reduce costs in this way. For the operations analysed above, material costs dominate, around 80-90% of nutrient management, 60-65% of plant protection and 70-75% of sowing are material costs. The remainder is predominantly the cost of operating machinery.

It can be concluded that more than two thirds of the cost difference between good and poor soil conditions is partly due to nutrient management – primarily the cost of fertilisers – and the applied plant protection chemicals and desiccation costs. Considering seeds, cost reduction possibilities are minimal.

In the case of sunflower cultivation, if an integrator is involved post-harvest operations such as transport, crop cleaning and storage are the responsibility of the integrator or the processor therefore the cost of the above operations were not included in the first calculation. However, at the larger farms, these costs typically exist, therefore they are included in the second calculation.

Other direct costs include insurance fees that typically account for 4% of turnover, but 50% of this cost can be claimed as state subsidy. Accordingly, the cost to the producer may be between 20-25 EUR/ha. In addition, land rents could be additional costs that were not included in the calculation either.

Table 4. Costs of sunflower production by cost type

Cost type	Extensive conditions			Intensive conditions		
	Cost (EUR/ha)	Cost (EUR/t)	%	Cost (EUR/ha)	Cost (EUR/t)	%
Material cost	235.6	94.2	43.1	493.6	120.4	59.1
Personal cost	2.1	0.8	0.4	2.1	0.5	0.2
Machinery and building costs	290.3	116.1	53.1	320.0	78.1	38.3
Other direct costs	18.8	7.5	3.4	18.8	4.6	2.3
Total Direct Costs	**546.8**	**218.7**	**100**	**834.6**	**203.6**	**100**
General cost	0.0	0.0	0	0.0	0.0	0
Total Production Costs	**546.8**	**218.7**	**100**	**834.6**	**203.6**	**100**

Source: own data collection and calculation, 2018.

The composition of production costs according to cost types reveals that material costs represent around 45-60% of the total costs are material costs and 40-55% of them are the cost of machinery. Clear difference can be seen again only in material costs in this respect as well. Therefore it is clear that cost reduction is only possible primarily in material expenditure – especially fertilisers and particular plant protection products.

Yield, turnover, production value

On the basis of data in Table 5, we can conclude that at a good level of production, good technological standards and selling prices realistic compared to the average of the past three years a production value of around 1,300 EUR/ha can be achieved. With low input expenditure up to 40% lower specific yield is only possible to achieve. Thus similar differences occur in turnover and production value as well and a total production value of around 800 EUR/ha can be realised.

Table 5. Turnover and production value of sunflower production

Description	Dimension	Extensive conditions	Intensive conditions
Yield	t/ha	2.5	4..1
Selling price	EUR/t	313.5	313.5
Total Turnover	EUR/ha	783.7	1285.3
SAPS, greening	EUR/ha	219.4	219.4

Description	Dimension	Extensive conditions	Intensive conditions
Agricultural – environmental management subsidy	EUR/ha	0.0	0.0
Other direct subsidy	EUR/ha	0.0	0.0
Production Value	EUR/ha	1003.1	1504.7

Source: own data collection and calculation, 2018.

In the case of sunflowers, the link between selling prices and yields for a particular year is simple, as there is no storage for months or years, as in the case of grain. Harvested sunflowers are sold during the season, only temporary storage can occur for up to a few weeks until the crop is delivered. For this reason, a clearer picture of the management conditions of the given year can be obtained, as the yields and selling prices of the season coincide on the time axis. This means, in particular, that the selling price realised by the producing enterprises better expresses the supply-demand conditions of the season, since the price is generated on the market when the crop appears. On the contrary, in such economic analyses for grain that can be stored long-term the distortive effect may occur that, for example, the high yield of a year, when prices are typically low due to the large yield at macro-level, is realised not at the low price but months or years later at a high selling price formed in market conditions not specific for the particular year.

Income analysis

Cost and yield data shown above are summarised in Table 6. It can be concluded that at a good production site with input expenditure 30-35% higher production value and with around 40% higher direct production costs about 30% higher contribution margin (sectoral profit) per hectare can be achieved.

Table 6. Results of management in sunflower production

Description	Dimension	Extensive conditions	Intensive conditions
PRODUCTION VALUE	EUR/ha	1003.1	1504.7
Total direct costs	EUR/ha	546.8	834.6
CONTRIBUTION MARGIN	EUR/ha	456.3	670.1
General costs	EUR/ha	0.0	0.0
Total production costs	EUR/ha	456.3	834.6
NET INCOME	EUR/ha	456.3	670.1

Source: own data collection and calculation, 2018.

Looking at these two cases, a significant difference of around 50% can be found in net income at company level in addition to the difference in sectoral income. As a result, with high input expenditure at a good production site high yield can be achieved and an income of up to 670 EUR/ha can be realised. Excellent results can be produced with sunflower also in extensive conditions up to 450 EUR/ha.

Summarizing the basic parameters of sunflower production the following can be stated (Table 7.).

Table 7. Summarizing the basic parameters of sunflower production

Yield:	2.5-4.2	t/ha
Direct costs:	546-834	EUR/ha
Out of the above:		
material costs:	45-60	%
machinery costs:	35-55	%
personal costs:	0-1	%
other direct costs:	2-4	%
Selling price:	300-313	EUR/ha
Turnover:	780-1385	EUR/ha
Production value:	1000-1500	EUR/ha
Contribution margin:	460-670	EUR/ha
Unit cost:	180-200	EUR/ha

Source: own data collection and calculation, 2018.

Efficiency of sunflower production and its income generating capacity

The results of production can be measured and evaluated using efficiency indicators. Profitability was also studied by Fenyves et al. (2019) and Nabradi (2013) from other aspects. Direct first cost indicates that it remains below the average selling price in the case of both technologies (Table 8.).

Table 8. Efficiency indicators related to income generating capacity

Efficiency indicator	Intensive conditions	Extensive conditions
	Value	Value
Direct unit cost (EUR/t)	203.6	218.7
Direct cost-proportional profitability (%)	80.3	83.5
Income level (%)	44.5	45.5
Cost level (%)	55.5	54.5
Material costs per 1 tonne (EUR/t)	120.4	94.2

Efficiency indicator	Intensive conditions	Extensive conditions
	Value	Value
Machinery costs per 1 tonne (EUR/t)	78.1	116.1
Material costs per 1 ha (EUR/ha)	493.6	235.6
Machinery costs pert 1 ha (EUR/ha)	320.0	290.3

Source: own data collection and calculation, 2018.

In both modelled cases, direct unit costs remain below 220 EUR/t, which, taking into account the selling price of 313 EUR in recent years, represents a profit of 90-100 EUR/t.

One of the most frequently used sectoral efficiency indicators is direct cost-proportional profitability that is a percentage of the result per unit cost at a given management level. The sectoral level is presented in the calculations therefore the sector-level version of the above mentioned indicator has been studied. At the level of direct costs, profitability is 83.5 % with extensive conditions and 80.3% with more intensive technology. The value of the indicator is more favourable in intensive technology because the costs and the result achieved do not increase at equal rates. The obtained values can be considered excellent at both cultivation standards.

In agriculture lower direct cost-proportional profitability can be expected in livestock sectors. The value is between 5% and 15%. Considering crop production significantly higher values are acceptable. Typical values for arable crop production are around 30-50%, while vegetable and fruit production, i.e. the horticultural sector, are valued at around 40-60%.

The value of income level and cost level indicators should be interpreted together, with a combined value of 100%. The aim of the productive farms is to achieve a higher level of income and, at the same time, lower cost levels. According to the calculations, in an economy with both technologies, income levels and cost levels range from 45% to 55%.

The difference between technologies can be seen in the amount of inputs, which is why it is worth examining the cost of machinery and materials per unit yield and area. In extensive cultivation technology, the cost of material per tonne is 94 EUR that is 22% lower than for the other technology with a value of 120 EUR/t.

In assessing the cost of machinery, it can be observed that due to higher yields, the use of machinery in intensive cultivation technology is better, the cost per tonne is 78 EUR, while at a lower technological level, the value of this indicator rises above 116 EUR.

There is a significant difference in the use of materials between the two technologies. The cost of material per hectare is 235 EUR at a low input level, while this value is almost double, 493 EUR/ha with other technology. Significant difference lies in the application of more fertilisers and pesticides.

The cost of machinery per hectare is also higher, as fertilization and soil works together with the harvest of higher yields due to higher input are also reflected in the machinery costs. In intensive technology, this value is 320 EUR/ha while in extensive technology it is 290 EUR/ha.

Of course, the two modelled cases represent the extreme values, based on the data obtained during the investigation, it is typical that producers do not restrain inputs on a soil with poorer conditions, even in several cases, producers compensate poorer soil conditions with higher nutrient application and costly micro-granules. Using the above, stable 3.2-3.3 t/ha yields with a direct cost of 690-700 EUR and production costs of 750-760 EUR can be achieved even in areas with poor conditions (12 gold-crown productivity). In this case, the sectoral income realisable on one ha with subsidy is around 300 EUR with a unit cost of 220-240 EUR/t.

Taking all the above into account, it can be stated that sunflower production in Hungary is currently competitive and effective, with a similar standard as the TOP producing countries in terms of its core efficiency indicators.

Summary

Sunflower has nice future that will be completely realised if yields continue to grow. Pressure at the side of demand for all crops initiate by increasing population in line to wish for protection of natural habitats leads to need for providing of much more from available farmland.

Improvement of hybrid seeds contributed to globally better yields transformation. Targeting the advancement of plant’s natural characteristics, such as making them more tolerant towards the drought, disease and pests, or boosting their nutritional value, selectmen will continue to provide high-quality and high-yield crop that will try to feed the global population in more sustainable way.

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SPECIALIZED MARKET INSTITUTIONS IN THE FUNCTION OF AGRICULTURE DEVELOPMENT[1]

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Abstract

Specialised market institutions in historical and modern context represent basic driving force of agriculture development. In ancient times, when markets first emerged, fairs and bazaars were basic trade mechanisms of that era. Development of production forces, traffic and social relations, especially after industrial revolution, the trade on auctions and stock markets makes significant growth. At the end of 21th and in this century, wholesale markets are dominant form of market organisation and wholesale of agriculture products. The aim of this paper is to demonstrate the importance of these market institutions in word's trade and based on that it is Agriculture complex has substantial share in trade and exchange in Serbian economy, so we wish to point out the basic principles of development through specialised market institutions. The main objective of this paper is based on analysis of historical and modern significance of specialised market institutions, which development will lead to trade increase in agriculture. Conclusion is that optimal combination of trade by these institutions within the planned strategy of agriculture development in Serbia, using innovations in agriculture may achieve competitive advantage and profit increase on regional and world markets.

Key words: specialized market institutions, trade, agriculture.

Introduction

Specialised market institutions in agriculture area represent the bases of beginning of the trade, depending on given historical circumstances and production forces and social relations development. Work paper is analysing roles, significance and

1 Paper is part of project III 46006 - Sustainable agriculture and rural development in function of achieving strategic goals of Republic of Serbia within Danube region, funded by the Ministry of Education, Science and Technical Development of the Republic of Serbia for period 2011-2019.

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advantages of trades on the fairs, bazaars (wholesale markets), auctions and stock-markets. The objective of this paper is analysis of trade of agriculture products through historical and modern dimensions, and also analysis of competitive advantages that may increase product trader's income in given trade moment.

The subject of analysis implies also particular significance of fairs, wholesale markets, stock markets and auctions in agriculture products trade in agriculture complex. Having in mind the significance of these institutions on agriculture products trade development in developed countries, the wish is to point out that these examples may contribute to the development of these institutions in Serbia, due to agriculture complex development. Adoption of certain laws and development strategies would create necessary assumptions for development of these institutions and increase the production of domestic products.

Having in mind current condition and perspectives of agriculture products selling on regional and world markets it is necessary for Serbia to make needed steps for agriculture product trade development through development of specialised market institution in agriculture complex, as soon as possible.

The basic aim of this work paper is to build such trade conditions that would enable efficiency of agriculture complex trade through specialized market institutions. Model that implies stressing the significance of agriculture products trade, having in mind significant extent of rural areas and their contribution to these areas development, and efficient trade system through specialised market institution should enable development of agriculture on the other side.

Methodology

Methods used in this paper are basically inductive and deductive methods, generalisation and specialisation, as well as desktop research.

Historical aspect of specialised market institutions development

Observing historical aspect of trade, we may say that fairs occurred in middle age, when trade coincided with church ceremonies where a lot of people used to gather, and that enabled trade itself. The most significant middle age fairs during 12th and 13th centuries were in Champagne in France, and later in Antwerp, Bruges, Lyon, Paris and (Veliky) Novgorod. The importance of these fairs has historical trade context that essentially represents the beginning of international trade. Church authorities provided security of trade and transport of merchandise Fairs were held beside churches and crossroads of main roads. On important international roads and markets, there were annual fairs independently of the church and church ceremonies. With development of trade, role of fairs also changes and they have different significance in trade of 18th and 19th centuries. A new role in fairs development in capitalist economy created so-called “sample fairs” which enabled trade without presence of goods. The first „fair of samples“ was organised in Leipzig at the end of the 19th century. Traditionally speaking, “wholesalers were closer to the markets they supplied than the source from which they got the products” (Chandler, 1994).

Over the 1,500 years fairs were the primary mechanism of transferring trade goods in money and vice versa. They represent world’s banking system (Chapman, 1995).

During trade and production forces development, especially after The Industrial revolution, fairs are overpowered by auctions and stock markets. This exchange manner was more efficient in given circumstances since it represented permanent market organised as needed. New conditions enabled massive production of different assortments of products, and international trade is performed more safely better conditions of payment. The development of international trade in 16th and 17th centuries, new geographic areas, improvements in credit systems and banking, have contributed to development of auction trade of agriculture products in worlds proportions.

Stock markets in trade are institutions of trade as product markets where represent trade institutions as production markets where agriculture products and industrial merchandise are sold. The most important role of stock markets in trade is achievement of trade effects in certain market moment. This trade effect is an investment that may generate profit in given market conditions. Stock markets trade may be organised as auction type or continual type. Auction trade is actually a stock market that enables the achievement of certain price. Stock market trade is mainly controlled by state laws and special commissions. Regulation by law of trade organising mostly precisely defined trade conditions in agriculture complex.

There are some other specificity of the wholesale markets and specialised market institutions. For instance, wholesalers who trade for cash and without delivery - wholesalers who have a limited range of running goods, such as groceries, toys, home care products, clothing, electrical appliances, office equipment and building materials. They sell the product to retailers and retailers with immediate payment and usually do not deliver.

The significance of specialised market institutions on development of trade and agriculture

Fairs

A fair in modern conditions, based on theoretical and practical knowledge, represents an instrument of marketing communication that meets buyers and it is based on several key elements:

1. Gross market is replaced by direct communication with known and potential buyers on the fair.
2. Buyers do not accept passive role. They want to be active participants of selling process and to participate in product design as well.
3. „A new buyer" demands to be involved in the process for the whole time, his attitude to be taken seriously and also wants sense of belonging to the enterprise from which he or she buys products.
4. Buyer's satisfaction is not enough. Enterprise has to delight its buyer, and to do that over and over again.
5. Assets invested in fair are dedicated to specific and particular buyers.
6. Process of selling has new dimension, that consists from activities and care for buyer after selling (Prdić, 2018).

Agriculture fairs development contributes to the development of local communities, towns, areas and country. A great benefit from fairs is international character of exhibitors and visitors that contributes to agricultural development and inclusion of domestic fairs and enterprises in international trade and financial flows. Fairs contribute to employment increase among agriculture population and development of rural areas. Effects of development of fair industry contribute to the development of regional infrastructure and full-fill the effects of total product transport. Countries with underlined agriculture politics by trade development using fairs increase macroeconomic indicators as GNP of agriculture population and strengthen economic position of country as international factor in agriculture trade. Novi Sad Fair as institution that organises International Agriculture Fair is geographic, market and institutional place for achievement of goals of fairs, enterprises and visitors. Agriculture fair is a sort of brand that enables the trade and concentration of great market in agriculture. Efficient fair management will enable development of fairs in disputable trade place in agriculture, selling the newest and healthy products. Development of congress activities will enable inclusion of fairs in all global researching institutions and institutions that follow encourage and enable agriculture production and innovations.

Wholesale markets

The wholesale markets in Russian Federation are defined this way: The Russia wholesale markets union (RWFM) is in control of sales and distribution of goods inside Russia as well as the exported goods towards their final destination, including safety control and quality control of goods arriving in main distributive centres (wholesale markets), ports, and other trade centres (www.export.gov, 2017).

The "total market volume is 26 million t/year, and it is approximately 40% of fruit and vegetable supply in Europe (24 million t/year), 10% of fish and fish products supply in Europe (1 million t/year), and 2% of meat and meat products supply in Europe (1 million t/year)", (WUWM, 2016).

In observation of total product trade on EU market, the conclusion is that wholesale markets in modern business conditions of big cities are irreplaceable. Their basic role of providing is achieved by good supply, great demand and healthy food. Control system of products in Russia is practically complete evidence of products distribution.

Kuzman et al. (2018) noticed that the wholesale markets as specialized market institutions in trade are most efficient place for agriculture products trade, mostly fruit and vegetable but also the other products, depending on place and role of wholesale market on the market.

Investments in wholesale markets represent a good project in modern condition of providing bazaars, discount centres, supermarkets and institutional consumers. They are development incentive of food production, infrastructure and agriculture. If we imply food and efficient management based on knowledge and innovative technologies, the path to consumer is safe, food is secure and profit is expected.

Wholesalers who trade for cash and without delivery are wholesalers who have a limited range of running goods, such as groceries, toys, home care products, clothing, electrical appliances, office equipment, and construction supplies. They sell the product to retailers and retailers with immediate payment and usually do not deliver (Kutsik et al., 2015).

Bazaars

According to data of Serbian Bazaar Association about 410 bazaars in Serbia are traditional, easily reachable and cheap distribution channel for agriculture producers. On approximately 70 thousands selling places on bazaars in Serbia, each day people is offered with fresh vegetables, milk and dairy products, meat and meat products, craftwork products and commodities. In total trade and purchase of agriculture products on the territory of Serbia, bazaars contributed with 19.5% in the 2012. During the 2012 product trade on bazaars in Serbia was 28 billion RSD, and it is 9.5% higher from previous year result. Each day on bazaars in Serbia work about 80,000 people. Only as additional tax value, bazaar management pays in the Budget of Republic of Serbia about 600 million RSD or nearly 5.5 million EUR.

Stock markets

Stock markets are specialized market institutions of meeting supply and demand, with precisely defined attributes of products that have to fulfil certain quality standards. Quality standards of products mean the same characteristics for small and great amounts of products. Standardization is simpler for raw products and for final products it is necessary make special checks. Product type and standard are basic trade elements since on the stock market the word or trust is base for trading. In trade in modern conditions, trust is objectivized through trade institutions and performed by rules of trade network. The importance of stock markets in global trade is huge, since trade goes on for 24 hours. Agriculture stock markets enable continuous trading through planning approach to market, by investing of assets in certain moment that enables a good investment on acceptable price.

Product stock markets – represent organised markets where standardized i.e. fungible products are sold. Its functioning is based on defined standards related to product characteristics. Fungibility enables trade with products based on signs and there is no need to see merchandise that is object of purchase. Such business manners enable the trade of great quantities of goods without quality control costs (Vlahović, 2013).

Supply and development based on foreseen standards depend on many factors that are present on free market and may influence on the price. The trade of merchandise and portfolios on the market is part of global world's trade. Trading enterprises using stock markets may achieve increased capital value as mean for investment in trade increase. Famous enterprises on stock market have practical experiences and based on that they generate sale or purchase, in order to make profit and preserve their credibility.

There are following methods of stock market trading:

1. Prevailing price method: Delivering and accepting of trading warrant; Auction (determination of prevailing price); Auctions for price determination on Belgrade stock market is made in defined time period (twice a month) based on previously determined calendar of auctions, and then the price is

determined and then announce in public); Trading (conclusion of transaction on prevailing price) and (or); Trading on closing (receiving of warrants and conclusion of transaction by prevailing price).

2. Method of continuous trading (issuing warrants, determination of opening price, continuous trading - matching warrants, determining closing price and trade on closing - conclusion of transaction by closing price).
3. Method of minimum price.
4. The book of supply and demand (Božić, Todorović, 2009).

Achievement of maximum price in stock market trade mostly depends on supply and demand and other economic factors. Achievement of good prices on stock market mainly depends on stability factors on domestic, regional and world's market. Trade methods on stock market based on prevailing price, continuous trading, minimum price, supply and demand on following index prices and basic stock market indexes may be an important indicator of certain economy trends.

Auctions

A theory of auctions implies the ability of a merchant or broker to, in one certain moment of call for bids, according to the communication information they possess, make a right decision on buying merchandise and make a good market position for their company. Auctions are such specialized market institutions whose characteristics are high concentration level of supply and demand of manufactured products, so they represent a realistic third indicator. The investment of paying the maximum price by the buyer entails a satisfied seller for the goods that can bring success to everyone.

The optimum conditions of auctioning imply the minimum price for which the seller is willing to sell their goods. Therefore, the seller must calculate the optimal minimum price for which they are prepared to sell their goods. How much a buyer is willing to pay depends on the competition itself, its market valuations and the sudden moves of competitors. In any case, the importance of a well-organized and standards-based auction gives importance to the sale and purchase price. Depending on the types of auction trading and other market information, buyers plan a trading strategy. Based on the above, we can conclude that auctions that are well organized are efficient markets.

Research results

Agrarian development involves comprehensive measures and activities undertaken by a country in the context of agricultural production and economic development. Countries with a huge amount of rural population, which according to the Market Association of Serbia are over 80%, in Serbia, must align their economic policies in agriculture with the development strategies of the country as a whole. The agricultural complex is characterized by the existence of large enterprises and small family farms. The basic goals of agrarian and rural development must be adapted to the needs of the large European market, the Russian market as well as to enhance the agricultural production competitiveness in the regional market. Investments are a big problem for large companies and small farms without which there is no sale to foreign markets. Knowledge is a major competitive advantage for SMEs to operate in rural and agricultural environments. The distribution of agricultural products must be a fundamental strategic priority of the state, which through trade fairs and stock exchanges should promote trade and through the wholesale markets and marketplaces to realize concrete economic effects of enterprises and agricultural producers.

According to the opinion of 500 companies, almost half, 47% want to participate in one or two fairs in Germany in 2019/2020, 21% in three to four fairs, 19% in five to ten fairs and 9% in eleven or more fairs. 5% could not provide accurate information[4].

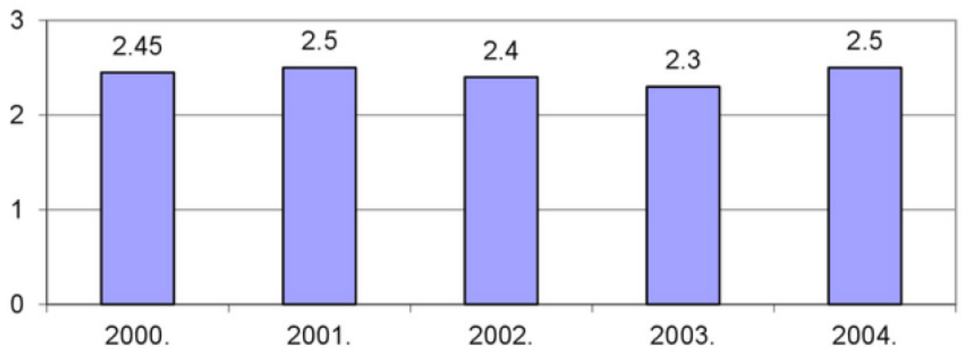
From the above data we can see how much German companies are interested in participating in fairs. The fair industry guarantees them access to the global market, innovative technologies in agriculture, as well as the production and sale of healthy and safe food by EU standards.

At the beginning of this century, in order to successfully research the importance of fairs, the example of Germany's leading country in the turnover of funds in the fair industry was taken. From the AUMA report, the fair industry is the leading branch of the German service industry. Positive demand for investment goods in agriculture, as well as the application of modern technologies and innovations, but also the standard, knowledge and needs of consumers have led to a positive business. The German fair industry must be an example of development for domestic fair institutions.

4 www.auma.de_medien/publikationen_/documents/auma-messetrend_2019/auma-messetrend-2019-pdf

Companies that organize international and regional events; crafts also include foreign fairs, congresses and service jobs. Five out of ten trade companies in terms of worldwide trades are based in Germany. Exhibitors and visitors spend a total of EUR 10 billion annually on trade shows in Germany. The overall economic output is EUR 23 billion; about 250,000 jobs are secured. The fair industry is therefore one of the leading service sectors of the German economy (www.auma.de, 2011).

Graph 1. The turnover of the fair organizers* (in billions of EUR)



Sources: FfH-Institut, info-Institut; AUMA-Messe Trend, 2005

When it comes to trade in agro-industrial products at fairs, wholesale markets or other places of trade, they are specific in terms of: a) Ways of organization; b) Pricing; and c) Standardization of goods and services exhibited or sold (Prdić, Barjaktarević, 2019).

When looking at retail (specifically: markets), they are the most important segment of the marketplace industry in Serbia. Our country has been more than ten years late in the transition to wholesale trade. Only now is the city of Belgrade involved in helping to build a wholesale market by constructing fruit and vegetable storage halls. Wholesale of fruit and vegetables is carried out in "kvantaš" markets, with very poor and inadequate trading conditions. Knowing that wholesale markets are a significant distribution channel for products marketed by marketers, their role in competing with super markets and discount centres are enormous. The wholesale market has the role of supplying small sellers, catering establishments, the public sector and other state institutions with fresh agricultural products. Only organized wholesale can compete with mega-markets. The interconnection of wholesale markets and marketplaces (retail markets) is the most significant market parameter for the movement of agricultural trade in this century.

The Mercase system consists of 23 wholesale markets, 17 wholesale fish markets, 7 meat wholesale markets, 3 flower wholesale markets, 16 manufacturers' wholesale markets and 4 wholesale trade slaughterhouses. There are 3,160 private companies in the system that employ 27,000 thousand workers. Annual turnover is 50% of the total fresh food trade in Spain, 6,822,831 tonnes of fish are sold or 11.8 trillion euros. The total area of the sales space is 7,700,866 m^2, with roughly 77,000 daily customers and 71,000 daily vehicles passing through the Mercase system[5].

Also, some 400 hundred wholesale markets exist in Italy. The ownership structure is the following, in the analysis of the Bologna wholesale market, owned by the city. It contains some 80% and the region of Emilia-Romagna, wholesalers, chambers of commerce, etc. with an annual turnover of around one billion EUR. The revenue is mainly invested in the development of new storage capacities for fruits, vegetables, fish and flowers, as well as storage, sorting and packaging chambers (www.caabmercati.it, 2014).

Based on a survey conducted at the Belgrade Wholesale Market on a sample of 30 sellers in the period June 14-15, 2019, the trading conditions are as follows: We are not satisfied with the terms of trade 23%; Conditions are much better now than before 27%; Relations with quantum market and wholesalers not resolved 21%; and Lack of serious investment in the wholesale market of 29%.

In order to promote wholesale and retail (market) agricultural products, especially fruits and vegetables, it is necessary to: 1) To define the interest of trade in the wholesale market and the market by the strategy of agricultural development. 2) To enable organized wholesale trade as equipped and infrastructural regulated premises to consolidate supply and market balance with mega markets and discount centres. 3) Markets (retail markets) must be adapted to modern conditions of trade, enable the sale from wholesale markets, individual domestic producers, traditional food, products of geographical origin, healthy, organic food, etc.

Namely, the concept of development of wholesale trade, mainly fruits and vegetables, has so far failed primarily due to the shortcomings of the national trade strategy in the agro-industrial complex (Prdić, Kuzman, 2019).

In the model of agricultural development, the development of trade through wholesale markets and marketplaces in the domestic market requires:

5 www.spainbusiness.com/icex/cma/contentTypes/common/records/mostravDocumento/?doc=4795852

- To enable domestic producers to produce more valuable products with geographical origin
- Cooperate with wholesale and market management to promote local produce and healthy eating
- Improve the overall trading system in the agrarian complex by innovation and information technologies
- Facilitate faster and easier regional and cross-border trade.

For the successful development of agrarian sector, it is necessary to adopt a development strategy through national and regional wholesale markets. There is also a need for infrastructure and technical and technological equipment of the markets, as well as the provision of modern services. It is also necessary to develop regional wholesale markets, depending on the region with agricultural and agricultural development opportunities. Regional wholesale markets are certainly necessary in cities such as Novi Sad, Niš and Kragujevac. At the regional level, the development of markets is important because of individual farmers, the supply of the population, and the social role in terms of the development of small holdings and poorer sections of the population. An indispensable condition for the development of wholesale markets and retail markets is the infrastructural equipment, the development of traffic through the opening of new markets or adaptation to the existing new market conditions. In addition to the aforementioned conditions of development, it is necessary to examine the attitudes and interest of large institutional customers, caterers, consumers as well as competitors, as well as strict control of the quality and origin of products. In addition, efficient market and wholesale market management has no alternative to invest in the development and development of the agricultural complex.

The most important segment of the trade made by auctioning in the agrarian complex is the ability to plan the investment of expected income. This theory implies a trader or broker as a person who has all the necessary communication information that can help him or her make a purchase decision. Also, it is important for decision making to know the risk neutrality and the consequences of risk. All items must be filled in for the buyer to estimate the maximum price for the goods. When a trader is not risk-averse it is more important for them to win than to pay a smaller price. Auctions have advantages and disadvantages, so from an economic point of view different types of auctions can be combined. Auctions with good organization and trading rules allow the participation of the most important actors in the trade of agricultural products. They allow maximum supply in the agrarian complex as well as create the role of a leading retailer in an individual or group of products. Auctions are currently most used in the agrarian complex for trade, wheat, cotton, flowers, fruits and vegetables, fish and other products. Auction trading also involves a large investment which, in the case of the purchase of goods, may also entail the role of the principal trader of a commodity in a particular market. However, some studies prove that the smaller the size of the settlement, the harder is to make a good supply chain. i.e. 'efficiency', as revealed by integration of wholesale and retail markets, cannot coexist with a complex and non-competitive market structure at the village level (Basu, 2010).

A good assessment of the auction structure is suggested to increase the likelihood of maximizing business benefits (Camilleri, 2015).

The problem of trading auctions is most important when a particular auction has a high level of rating in the agrarian market. The basic fact of an auction's value comes from knowing its value in the market. The value of an auction on the market is measured by competition, good terms and business rules. The concentration of the market for certain goods produces good supply and demand as well as an overall view of market potentials. When it comes to brokers and traders, their buying decision may be: a) Buying at maximum price; b) Buying at a lower price; and c) Purchases based on the sequence of circumstances that may arise from the auction.

Stock exchanges are the most important markets for agricultural commodity trade, which in a well-organized place, for a specific time, creates a market relationship between supply and demand of agricultural products under known rules by certain and well-known participants in trade. Modern stock exchanges allow trading electronically from anywhere and represent a continuous market. Continuous trading gives the stock market an advantage over other specialized market institutions. Everyday commerce provides the supply and demand at the time and moment that suits them best. Stock markets must be transparent markets where all trading reports, quantity, price and other significant decisions are seen. The supply and demand of commodities on the stock exchange can enable all interested entities to trade based on their estimates.

Belgrade Stock Exchange indices have been formed for the purpose of the public information process, as well as the desire to improve transparency and comparability of data on the market[6].

These indices create preconditions for trading, but much needs to be done in terms of openness to the regional and international markets to increase overall trade on terms and markets.

6 www.belex.rs/proizvodi_i_usluge/indeksi_opste

A key innovation is the guarantee of all stock exchange transactions that will be concluded through the commodity exchange. This system will operate on the principle of cumulative purpose accounts and guarantee deposits. In addition to the spot market, forward trading will be facilitated through the conclusion of "forward" contracts (www.proberza.co.rs, 2019).

One of the main disadvantages of trade in the domestic agrarian market is the problem of product distribution. As stated above, there are legal solutions that theoretically elaborate this area. The downside is the practical application of the law and the inadequate agricultural trade strategy that leads to seasonal problems in product distribution. The largest example is the distribution of raspberries from individual producers

The stock market is a basic indicator of stability and development of a country (Božić, Todorović, 2009).

We can conclude that the prevalence of trade by individuals, small and medium-sized enterprises, institutions and companies, gives the stock exchanges a great opportunity in the market. The development of stock exchange trading in commodities or securities presupposes the state of the economy on the basis of which investment security enables profit, and development of agriculture and trade in agriculture. Serbia has a real chance of increasing trade in the regional, Russian and EU markets by developing trade through specialized market institutions. The development of rural areas through investments in agriculture would have a positive impact in terms of increasing trade in the markets. Agrarian country must certainly have a vision of development that will contribute to the economic well-being of the country in the overall economic balance. Specialised market institutions in the world are a proven instrument of an optimal market strategy for agricultural development.

Conclusion

The historical and contemporary importance of specialised market institutions in trade has contributed to the development of agriculture and overall trade in the agrarian complex in general. These institutions intertwined with each other during the development of productive forces, traffic, and especially after the industrial revolution, depending on the conditions of trade, but they all have a historical significance for trade in agriculture. Considering the importance of agricultural food products and the standard of the people, the importance of these institutions in modern conditions has only been altered by the development of the information revolution, the application of innovations and the various communication information that enables optimal trade.

The example of German fairs provides a solid basis for concluding that domestic fairs can also increase their role in agricultural development. Novi Sad Agricultural Fair has the reputation of a regional and international trade centre that provides all the conditions for the development of agriculture and the development of congress activities in the agrarian complex. These pre-existing conditions combined with wholesale trade through wholesale markets, auctions and stock exchanges could undoubtedly bring success in the development of a national trading strategy. If we take as an example the experience of economically developed countries and the fact that Serbia is predominantly agrarian country, the effects of agricultural development are positive.

The Belgrade Stock Exchange with its historical role in trade can undoubtedly be the driver of trade development through auctions, and the Belgrade Fair is the venue for selling innovative products and technology. If we know that over 80% of the territory of Serbia is made up of rural areas, markets (marketplaces, retail markets) are undoubtedly efficient places for selling domestic agricultural products. A large number of markets, both in small communities and in urban areas, must in the future be the mainstay of the development of production and trade of domestic farmers.

Wholesale market institutions can only increase the supply of products at the market. With this optimum approach to trade as well as providing other services, markets would be more competitive for Sumer and mega markets. The example of the developed countries of Italy, Spain and Russia show the full advantage of wholesale trade in the supply of markets and the development of quality domestic products. Fairs and wholesale markets can also be trading venues through auctions. By developing and regulating existing specialised market institutions, synergy of supply and demand can be achieved and competitiveness of domestic agricultural products can be increased. By developing rural areas through investment in technology and innovation, in addition to population survival, there would also be an increase in production. The development of production contributes to the rise in the standards of the agricultural population, which in total economic potential means an increase in standards, productivity and national income.

It can be concluded on the basis of the goal of working on the importance of specialised market institutions in the agricultural complex in historical and contemporary context, and especially in economically developed countries on the one hand, the development of these institutions in the Serbia can enable the development of optimal trade in agriculture and increase competitiveness and market development on the other hand.

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ECOLOGICAL PRODUCTS: FORECASTS FOR THE DEVELOPMENT OF A SUSTAINABLE INFRASTRUCTURE IN AGRICULTURE AS A SUPPORT FOR AN EFFICIENT AND HEALTHY ECONOMIC ACTIVITY

Cristian George Popescu[1]

Abstract

Undoubtedly, the emergence of this "modern" nutrition entails the emergence and development of "modern" diseases. There are quite a lot of indicators on the degree of pollution of the foods that determine the occurrence and development of these diseases. By means of this paper we intend to correlate these data strings and present them as an alarm signal related to the current conjuncture of the development of the society. This proving once again, that the return to nature is a viable alternative for Europe, both through the available resources and the needs of society, to ensure both the development of its agriculture in a sustainable way through an eco-friendly alternative, but mainly by contributing to the health component, which consumes extremely many resources. There are studies that show that in the economy, the orientation of the consumption of the population towards the eco-friendly products may be an alternative with important economic consequences. Starting from the conclusions of these studies, but also the calculation of the indicators mentioned above, we will substantiate our conclusion that eco-friendly products can be a viable solution in the development of a nation's economy, starting from the durable development of the agricultural sector. Especially for the Eastern European countries, eco-friendly agriculture may be a competitive advantage over the other European countries in the centre and the Western parts of the continent. All these are very interesting statistical data proving that the eco-friendly products are the support for an efficient and healthy economic activity, especially for the Eastern European countries.

Key words: sustainable development, modern food, ecological agriculture, competitive advantage, organic farming, modern agriculture.

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Factors influencing the lifestyle with impact on human health

One of the biggest problems faced by the Romanian society consists in the importance of the connection between economy and health, but which is as difficult to tackle as it is important. In the field of medical sciences, there are many professional writings based on the researches carried out and on the publications in the form of several articles, professional books, themes delivered at national and international specialized conferences, presenting the problems and providing solutions from the perspective of the specialists in human health. Currently, various opinions on maintaining a correct lifestyle are confronting, some focusing on a healthy diet (see the opinions of vegetarians, row-vegans, for example Ligia Pop, Cristela Georgescu, etc.), others on a balance in daily activity, but also among the main foods with nutritional value, without making any abuse (the opinions of the professional nutritionists, Colin Campbell; of some physicians with certain specializations, Pavel Chirilă; the problem of vaccinations as one of the causes of triggering certain diseases, Christa Todea Gross), and the newest and most interesting opinions emphasize the influence of physical and mental traumas on human health, which can trigger a serious autoimmune disease, especially in the context of the accentuated sensitization of the body (Hamer's theory). The most important source of information is the statistical data which have shown that in the last 10 years, the cancer mortality rate has risen from the 5th place to the 2nd place in Romania, and it is estimated, following the upward trend, that in the next 10 years it will reach the first place. It is an unprecedented ascent of a disease within an extremely short period, given that its course has been extremely slow over time. If we take into account only one factor that can influence the evolution of cancer, nutrition, Richard Beliveau said that at least 30% of all the cancers are correlated with the nature of the diet. In the statistical records there are approximately 480,000 patients with cancer annually in our country, namely 160,000 patients diagnosed every year who could have avoided getting cancer if they had been aware of the importance of a proper lifestyle, only in terms of food. In essence, lifestyle is one of the most comprehensive concepts, concerning: nutrition, environmental pollution, clothing, body hygiene, type of social relationship, attitude towards the main events of life, resistance to stress, religiosity, morality, addictions and others. All these are influencing factors that can be quantified and correlated with health indicators. Because their approach is complex and at the same time involves a large volume of information, we will focus especially on analysing the dietary factors of the lifestyle that can influence human health.

The most important sources of information are the statistical data consisting, on the one hand, in the health indicators, and on the other hand, in the indicators that can influence the health status. The latter could be divided into internal indicators that we could control independently of the environment, consisting in the lifestyle that the individual would have, but also in the external factors, which cannot be influenced by our behaviour, such as environmental pollution (air, water, soil, etc.), stress level in the urban/rural environment, the duration of exposure to these factors, standard of living, education level, and other indicators that can be quantified.

Eco-friendly products: The support for an effective activity

In a continuous development of society and adaptation to the needs of its citizens, people are the central element. Therefore, depending on the level of our understanding of the adaptability needs of our behaviour to climate change, people will be able to further develop communication, society, the economy of a country and the world in a friendly way with the environment. Another alternative cannot exist (Chen, Yan, 2011). Therefore, we should look at what people consume, use with a much higher frequency, and through their actions, directly or indirectly, they can cause environmental damage. According to this idea, what is unimaginable is that these destructions, sooner or later, directly or indirectly, will affect all of us, people, health and ultimately life.

All the great moments in the history of mankind have caused the emergence of new technologies: the plough in case of the agricultural revolution, the electricity and the internal combustion engine for the industrial one. Today we are witnessing the unfolding of another great moment, at least equally important and spectacular: the microprocessor and the Internet communication network are the ingredients of the new revolution, already known as the Knowledge Society (Orzan, 2007).

Nevertheless, humans feel the need to protect their health somehow and to preserve the riches of nature, bringing forward for the population the risks we are facing daily if we do not comply with certain rules of conduct necessary for a decent living. Despite all these major changes that occur year after year, due to the strong desire for innovation, people abandon thinking about consequences and use everything to the fullest without thinking for a moment about the consequences.

There are three major factors of very great importance that demonstrate the role which communication plays in the development of the Romanian society:

1. The complexity of the contemporary international life increasingly demands carrying out some negotiations (consisting in direct, bi-, or multi-lateral com-

munication) that should provide mutually or unanimously accepted solutions;

2. Information has become a resource alongside land, labour and capital. Considered as resource, information is divided into the following two categories:
   - Information – “instrumental resources”
   - Information – „infra-resources”

   “Instrumental resources” suggest direct action, while “infra-resources” are those information-resources that provide the necessary conditions for instrumental resources to act in an efficient way.
3. The development of the means of communication is another factor that has determined the evolution and enhanced the importance of communication in society (Bistriceanu et al., 1981).

In the narrow sense, the behaviour of the consumer reflects the conduct of people in the case of purchasing and/or consumption of material goods and services, in the broad sense, the concept encompasses the entire conduct of the end user of material and non-material goods (Catoiu, Teodorescu, 2004).

Starting from the set of definitions proposed by the well-known specialists in this field, the consumer behaviour can be defined as representing “the totality of the decisional acts performed at the level of the individual or at the level of the group, directly related to obtaining and using goods and services, in order to satisfy the current and future needs including decisional processes which precede and determine these acts” (Balaure, 2000).

By systematizing these approaches, we can highlight a number of characteristics specific to consumer behaviour, such as, for example, the development of human individuality both naturally and through education, which is reflected in his/her behaviour by means of preferences, antipathies, beliefs, attitudes, values , the position occupied in the society, the entourage and others (Catoiu, Teodorescu, 2004).

The development of the company is monopolized by automation, electrification, mechanization, information, which has led to the degradation and development of some epidemics caused by changes in lifestyle, work and other health-related social problems.

The concept of quality of life contributes greatly to the development of society as it represents the ensemble of the elements that refer to the sociality as a whole and provides the access to its. The consumption patterns adopted convert our behaviour to the lifestyles, the evaluation of the circumstances and the results of the activities carried out, the subjective states of satisfaction / dissatisfaction, happiness, frustration (Marginean, 2004a).

The quality of life and its improvement are based on the consumption behaviour, so that each individual understand its individual life to be lived as good as possible, consuming the products as well (Constantinescu, 2011). In order with this idea, we realise that our behaviour is the main enemy in the development of the society in a sustainable way.

In view of the evolution of the society and of the social trends, the quality of life has become increasingly important, mainly due to the environmental movement, which imposes its valences both at the macroeconomic level (through directives and legislative norms) and at the level of the individual (by imposing a socially responsible behaviour). During this period, the individual was concerned about his/her well-being, but also about that of the society in which he/she lives, given the alarm signals that were drawn regarding the limited resources of the planet, but also the imminent dangers that excessive industrialization can bring to the environment. The immediate influence on the marketing activity could be seen in the policy of reallocating the resources but also in the ecological campaigns that emerge on the market to improve the corporate image of the organizations (McDonald, 1998). The source of the researches on the quality of life is the occurrence of the awareness that economic development does not bring wealth and happiness (Baltatescu, 2011).

The consumerism of the period 1960s-1970s was considered to have a destructive effect not only on the life of the individual, but also on society, which leads to material overproduction substantially affecting the limited natural resources and destroying the environment, so that the specialists of that period considered that a limitation of industrial development was necessary in order to mitigate its destructive effects on humankind, which could be achieved by means of a limitation of overconsumption (Marginean, 2004b).

In order to create a harmonious society, people have to comply with certain codes of ethics and be receptive to novelties, which could make it easier for us to move through new concepts and technological developments.

Modern nutrition is faced with a lot of errors consisting in the use of chemical products in the finished products, genetically modified organisms, sugar, refined foods, abuse of meat and fats, unnatural methods of preservation, all of which leading, inevitably, to the modification of the health indicators and to negatively influencing the pathology of the last century.

Most professional nutritionists agree that the essential changes in nutrition in the 20th century are responsible to the highest degree for the frequency of some diseases specific to it. According to the British Medical Association, exposure to pesticides determines: Carcinogenicity (predisposition to cancer), Mutagenicity (aggression on the genetic material), Teratogenicity (harmful effects on the fetus), Allergy, and Neuropsychiatric syndromes (Chirila, 2000).

Someone has even issued the hypothesis that an emigrating population is at risk of catching the diseases of the new region, those who come to the West, for example, get degenerative diseases. Numerous studies conducted by various doctors in the field have shown that poor nutrition and misuse of foods can lead to the aggravation and development of some quite serious diseases.

A set of six prospective studies and 24 epidemiological studies have shown that vegetarians have a much lower rate of high blood pressure, also a study on the same topic has highlighted the level of lipids in the blood of vegetarians, compared to the subjects fed in other variants, finding that the former have lower levels of cholesterol, at the same time, the consumption of fish has turned out to be neutral and that of dairy products and eggs has also led to an increase in lipids (Kushi, Esko, 1989).

It is said that after changing the ancestral type nutrition into a modern one new diseases have occurred or the frequency of others has increased vertiginously. Today, the pathology is dominated by the following sufferings (Chirila, 2016): sudden cardiac death, most often caused by cardiovascular causes such as high blood pressure and ischemic heart disease; cancer; diabetes and hyperinsulinemia; obesity; atherosclerosis; immune diseases; and dyslipidaemia.

The technology that provides new properties to the body by transferring genes from one organism to another or interfering with its genetic structure is called gene technology. By this technology, the genetic structure of foods is changed, which is why these foods are called genetically modified foods. The safety of these foods remains a topic opens for discussion. The risks that characterize these foods include:

- genetically modified foods that can acquire unwanted properties
- the preservation of the genetic variety within a species is endangered. Technology practically determines the farmer to cultivate only one type of fertile plants.

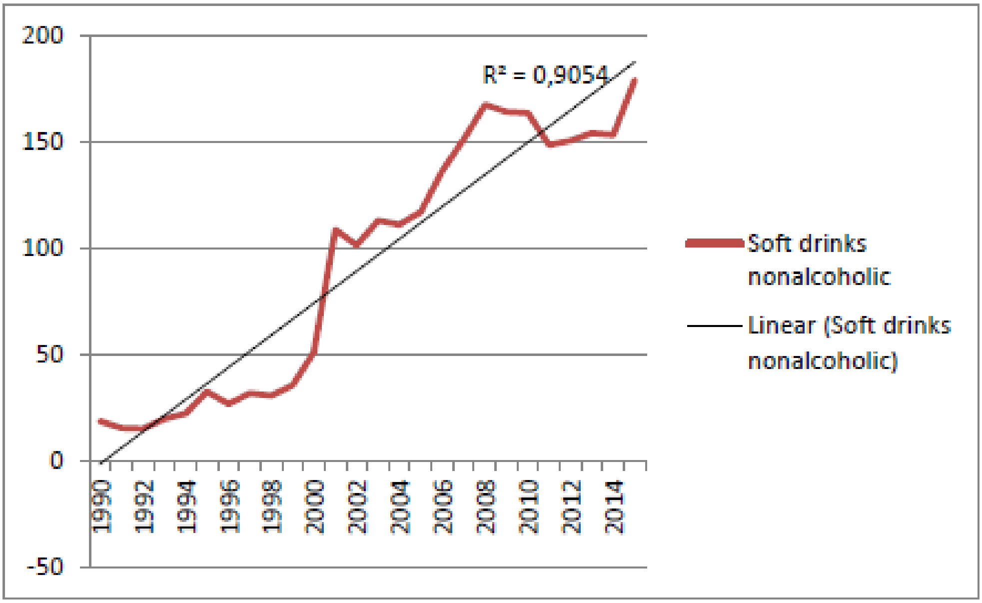
- technology may cause unwanted degeneration. So, even if it is surprising, products that are also of poor quality may be obtained.
- genetically modified foods can alter soil flora, thus leading to the loss of some significant microorganisms in the soil that can cause imbalances.
- when genetically modified microorganisms are consumed along with foods, they can be reunited with the human or animal organism. This combination can cause losses, metamorphoses or other strange organisms.
- if, following a genetic intervention, antibiotic-resistant foods are created, this property could also be transferred to the consumption of these foods with harmful effects on health.
- the antibiotics prescribed for curative purposes in various diseases would no longer have the expected effect.
- within the closed circuit of nature, insects consuming these genetically modified foods could develop resistance mechanisms.
- there is a risk of occurrence of a single type of flora.
- by this technology, the transferred genes could contaminate the other organisms unwantedly with disastrous biological effect, even the foods with an initial beneficial effect could end up carrying genes with toxic effects that could generate diseases.

Analysis of the main polluting factors influencing human health

Water vs drinks

In accordance with the above, we begin to analyse some food products, more important in human nutrition. Of these, we consider that those consumed with a very high frequency should be prioritized in the analysis. Thus, the most used food and most important for the existence of the human being is water. Water pollution with substances from agriculture is already a well-known topic. The surface groundwater is compromised, and their depollution is practically impossible (Marinov, 2014). If the water, formerly drinking, has been polluted, more or less accidentally, the soft drinks are substances manufactured already “polluted” and informed to the general public through their labels. Thus, there are a number of endless substances in these soft drinks, which at the same time should replace the water, but in the present conjunctions we do not know how much this is achieved. We list some of the non-stop substances in soft drinks: sodium benzoate or E211, potassium sorbate or E202, but also other substances such as sugar or phosphoric acid E338 (Chirila, 2016). These substances are known to be carcinogenic already being investigated so far, but only apparently, this is because, according to specialized research, all these substances, more or less significantly contribute to the deterioration of human health, especially those mentioned above, already being investigated for carcinogenic effects (Holland et al., 2015). From the point of view of human consumption, the most serious problem is that in the period after 2010, the soft drinks have experienced the most significant increase in consumption in Romania.

Figure 1. Consumption of non-alcoholic drinks in Romania (period 1990-2015)



Source: author calculation according to INSSE, 2019.

There is an alarming increase in non-alcoholic beverages until 2015, which shows the inclination towards the consumption of some contaminated food products, which can have an effect on human health. Considering that the total amount of water needed by a human body is about 3 l of water per day, that is, about 35ml of water per kilogram of body mass we realize that an increasing amount of polluted liquids will replace the drinking water needed by the body, which becomes very alarming. This is more than that, so because every day, the person consumes food that also contains about 30% of the total water requirement, so we get to drink usually only 2 l of water per day. And from here comes the natural question, if the food, and implicitly the water in it, is polluted, we drink more polluted beverages, then how much more water (non-polluted) remains to drink every day so that we can say our body will remain healthy? From the statistics of the year 2016, according to the INSSE (2019) it turns out that the monthly average is the one below: mineral water and non-alcoholic beverages 5,178 l; alcoholic beverages 2,513 l; wines 0,893 l; and beer 1,382 l. From this statistic we observe that alcoholic beverages become consumed almost as much as water and non-alcoholic drinks (bottled).The exposure to the risk of illness of those who consume soft drinks, as shown by the treatises on oncological pathology (Marginean, 2004c), is related to digestive tract (liver, pancreas, colon, stomach) cancer. In Romania, the incidence of digestive tract cancer is high. It is practically the second cause of illness after lung cancer, undergoing a 10% increase in terms of new cases diagnosed within only 5 years, from 2007 to 2012.

Air

We could say that air is more important than water, being a gaseous element, inspired daily, with a higher frequency than we would consume any other substance, regardless of its condition. The big urban agglomeration represents a problem from this point of view, this because in Romania after the 90s there was known a marked migration from the village to the city, registered in all economically developed countries. The percentage of the population in developing countries is up to 50% living in rural areas, while in developed countries this percentage drops to 15-20%, according to statistics. However, from this percentage, the labour force population, the active population, is much smaller, Romania facing a high degree of aging of the rural population. Specific to this phenomenon is that the cities of the county municipality are crowded, increasing the number of the population, and at the same time the pollution, and the rural areas are depopulating, facing a shortage of labour force. For example, the air in the central area of Bucharest no longer registers in any day normal limits, being exceeded these pollution limits and 3-4 times.[2]

Is a specific component of the lifestyle that may have devastating consequences for human health, especially in heavily polluted areas?

Air is the most important element in maintaining health being a negative factor in reducing immunity in children and elderly people (WHO, 2014).

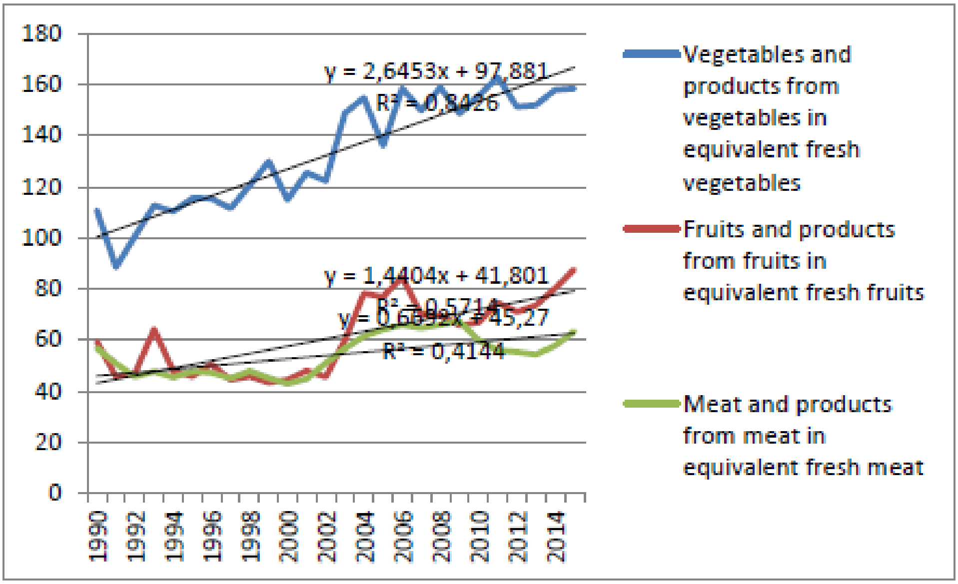
Meat and meat products vs fruits and vegetable

Even though meat very popular in our diet and almost all medical specialist has the idea is a basic food, containing protein nutrients important especially for the

2 According to Centre for Sustainable Policies

nutrition of children or anaemia treating (Longo et al., 2011), meat abuse can cause health problems though cancer disease (Segal, 1983) Other research results came from Dr Annie Sasco, researching for a long time the lifestyle Brazil. The most important conclusion was there is a higher incidence of cancer when the meat is consumed more than 3 times per day.

Figure 2. Consumption of meat vs fruits and vegetables in Romania (period 1990-2015)

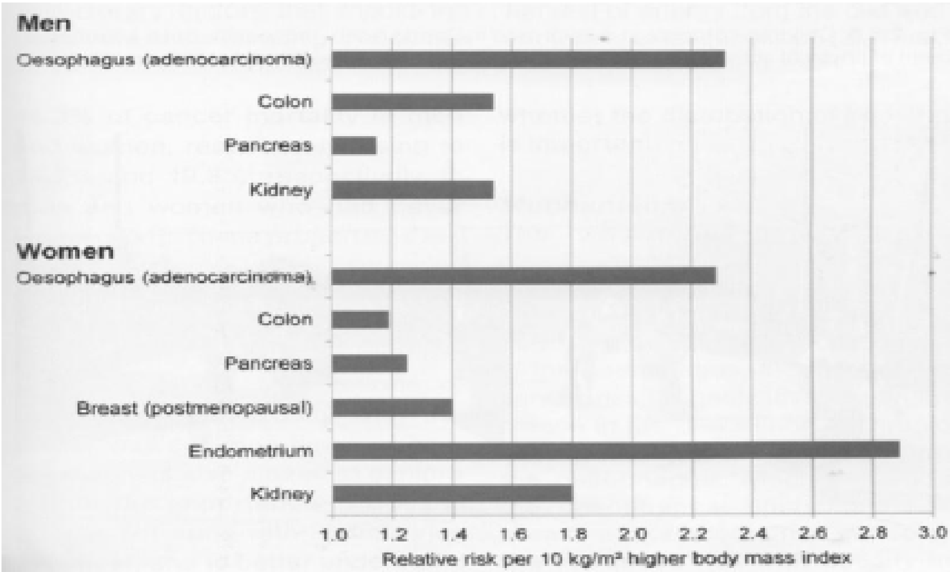


Source: author calculation according to INSSE, 2019.

What is noticeable in the trends in meat consumption and meat preparations vs fruits and vegetables, as all the consumption of these foods, are increasing significantly, the largest trend is recorded in vegetables, the slope of the line being 2.6453, at the pole the opposite being the meat with a growth trend of 0.6692. Although we are quite good at consuming these products, however, over-processed products contain substances that are hazardous to human health. Thus, meat preparations contain nitric substances that mainly cause colon cancer, the effect of which has already been investigated (Chirila, 2016).

The relationship between obesity and other diseases is demonstrated, the most important diseases for every 10 additional kilograms, according to Figure 3., such as in men cancer of the oesophagus, colon, kidneys, pancreas, or in women cancer: the uterus, oesophagus, kidney, pancreas, and colon. Unhealthy eating leads to the emergence of modern diseases, including obesity, and cancer is one of the most important societies facing today, as shown above.

Figure 3. Relative risk of diseases (cancer) appearing per 10 kg higher body mass affecting different organs



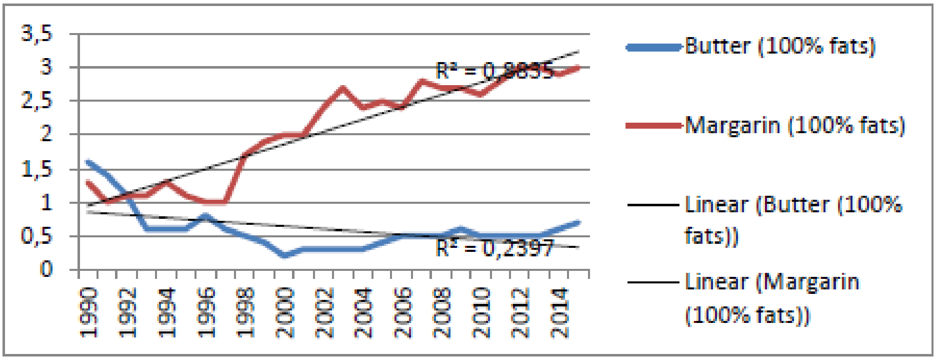
Source: WHO, 2014, p. 129.

Sugar (substitute products) and margarine

Sugar in the professional literature is named "white death". This substance apparently from nature, is synthesized too excessively, so that, as in the case of margarine, the finished product resulting from the production process, white sugar, can no longer be identified with the raw material entered in the production process (fructose from molasses). Therefore, the effects of sugar on human health are manifold, among which the most significant would be to stimulate the occurrence of cancer (WHO, 2014), or as Dr. Schreiben says (and quoted by Popescu, 2016) "cancer is fuelled by sugar". There are many other diseases in correlation with sugar: obesity, decrease of immunity with appears of many other health risks, ulcerous haemorrhagic problems, recto colitis, Crohn's disease (Gorschall, 1994, quoted by Popescu, 2016). In new era, as we already said, modern food modern nutrition gives birth to modern diseases. Appears of new products to replace the sugar gives birth to new substances, more dangerous than sugar: cyclamates, aspartame, and so on. Aspartame and Saccharin are other dangerous substances, second one appeared in 1997 in the USA industry, and reintroduced on the condition that the fact that when it is administered to animals is carcinogenic should be mentioned on the packaging, afterwards, under pressure from the food industry. This action of providing information was dropped out.

Margarine is a product that has been placed on the market to replace alimentary butter, but having disastrous effects compared to butter on human health. This product is not related to the butter that it substituted for consumption. Margarine has a very complex production process, which is closer to the petrochemical industry than to the food industry. In fact the refined oil is synthesized with the help of nickel powder, a production process at high temperature, and used also hydrogen. The end product, the margarine results, is treated with other substances, for taste, odour, etc. all kinds of organoleptic enhancers are added in the production process. The alimentary nutritional benefits doesn't exist, this product is done to be replaced the butter in food industry, margarine being much cheaper, very easy to be made, and with very good results ensuring "food safety". But looking up just on this very short research we realize this product is a disaster for nutritional food with many bad results on human health. There are many problems generated by margarine, as cancer, obesity, inflammatory syndromes, etc. (WHO, 2014).

Figure 4. Consumer trends for the period 1990-2015 for butter and margarine



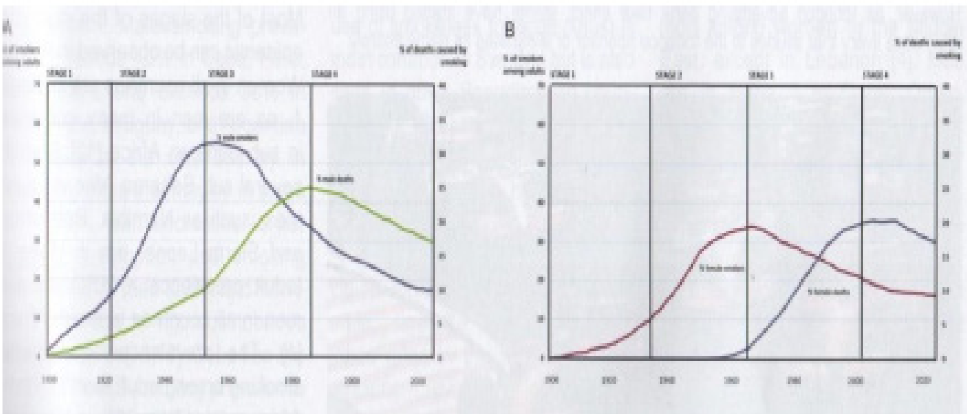
Source: author calculation according to INSSE, 2019.

Considering Figure 4., the consumption of margarine in Romania increases alarmingly, being on a linear increasing trend, the regression function can be used considering the very high correlation coefficient of R2 = 0.8835. On the other hand, the consumption of butter decreases in Romania. It seems to the detriment of the substitutable margarine product, which cannot even exist in shops in an ecological form because the consumers of organic products do not buy it. There is, however, this problem facing the market in the EU, the emergence of excessively processed organic products, but which, because of their very complex and controversial production processes, are being boycotted by consumers of organic products.

Cigarettes

There is a whole series of research that shows the destructive effect of smoking and alcoholic beverages on human health, which need not be justified by other research or bibliographic references. What is very interesting, and it is worth drawing some conclusions, is to see what is the average period from the moment the human begins to consume these addictive substances, until, statistically speaking, he faces a serious health problem. From Figure 5. It could be observed that the evolution of the use of cigarettes worldwide has a maximum during the 1960s, that then in the 1990s the highest rate of lung cancer diseases was recorded, both in men and women. The most important conclusion from this chart is that from the moment a person starts smoking, on average it takes about 30 years until he or she has a high probability of getting lung cancer.

Figure 5. The disease correlated with smoking lung cancer in men and women in the twentieth century



Source: WHO, 2014.

In other words, this statistic shows that from the moment a young man of about 20 years begins to smoke, with a high probability, around the age of 50 he will have lung cancer.

Conclusion

There is at present a problem in the consumption of food from the point of view of perception which represents a higher quality of a food product. From what we have observed, with the increase of the standard of living, we would have expected to increase the consumption of foods dedicated to the sector of organic products in Romania, such as butter at the expense of margarine, vegetable products at the expense of meat preparations, natural water in to the detriment of soft drinks. Only the statistics on food consumption in Romania over the last 25 years show us something else:

- The consumption of margarine grows alarmingly, reaching triple in the last 25 years, this product increasingly replacing butter, as a traditional product and easy to adapt to the organic industry. Moreover, the consumption of butter over the same period of time has registered significant decreases in Romania.
- Air and water remain the most important substances consumed with a high frequency, and that, in order to maintain health man must take great care so that the sources of consumption are not polluted. In the big urban agglomerations of Romania, the air is much polluted, as in Bucharest. The pollution is exceeded 3-4 times, almost daily with no normal limits. Although these substances are not accredited as environmentally friendly, due to their importance in preserving human health, they may in the future also become standardized.
- Sugar and its substitutes are a result of the new food industry, which has experienced unprecedented development in the last century. On the other hand, all these substituents, as well as the sugar itself, are modern products that cause modern diseases, of which cancer is the most important. That is why it is very difficult to use sugar and its substitutes mentioned in research in the organic products industry, because consumers of such products themselves want to pay more to invest in the prevention of their health.
- Cigarettes and in general smoking, represents a maximum risk factor for smokers. Statistics show that there is an almost perfect correlation between smoking and lung cancer, which shows with a very high probability, since the moment a person starts smoking, most probably in average 30 years he has lung cancer.

Few of those who smoke are aware of cigarettes' harmfulness, especially due to their content of chemical substances with over 7,000 components, many of which are known to be carcinogenic. Therefore, these components contribute significantly to making the body get sick via multiple pathways, including genetic mutations that can be transmitted also to the fetus, inflations, oxidative actions, or epigenetic changes. Specialists (WHO, 2014) sound the alarm with regard to the products used to quit smoking, which contain more than 3,000 such chemical substances, many of which are carcinogenic. According to the latest epidemiological studies, in accordance with the source cited above, in addition to cardiovascular diseases, smoking could cause 14 different types of cancer, where the most significant is lung cancer, while the products used for quitting smoking cause cancer of the oral cavity and pancreas.

Food pollution is a major factor in the emergence and development of modern diseases. Therefore, as a safe effect, organic farming represents an alternative, both for the development of the economies of the countries of Eastern Europe and for the prevention of serious health problems. As we have shown, modern nutrition causes the appearance of modern diseases, among which cancer is one of the main causes of death, both in Romania and in developed countries.

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IMPORTANCE OF FARMERS' ASSOCIATION AND EDUCATION FOR AGRICULTURAL POLICY IN THE SEE

Dori Pavloska Gjorgjieska[1], *Boban Ilic*[2]

Abstract

Evidence-based policy uses specific mechanisms that informs the policy process and suggest rational, strict and systematic approach. Agricultural policy in the Western Balkans is often formed on an ad hoc basis, rather than by evidence-based adaptation. There is a lack of awareness, understanding and involvement of stakeholders in the policy-making process.

Based on literature review this paper elaborates on two important factors for farmers' involvement in the policy making process: capacity of the farmers' organizations and their level of education/information.

Farmers' organisations don't have the sufficient strength and capacity, and therefore, have weak voice in raising their issues and concerns. Consequently, they are not seriously considered by policy and decision makers.

In addition, farmers lack proper information and education needed to be actively engaged in the policy making process. This issue becomes especially critical when it comes to farmers' information on the EU.

Key words: farmers' associations, evidence-based policy, Western Balkans.

Introduction

Evidence-based policy uses specific mechanisms that informs the policy process and suggest rational, strict and systematic approach (Sutcliffe, Court, 2005). Thereby, different groups in society have critical influence on the policy making process. Those groups could be formed on a political, economic, religious, ethnic basis etc. They could appear as associations, parties, movements etc. (Wiggins, 2015).

The influence of the well-organized agricultural groups could be clearly seen in the OECD countries, which consequently results in a heavy support for agriculture. In the developing countries the level of organization of farmers is low and therefore, their voice is not heard in the policy making process (Wiggins, 2015).

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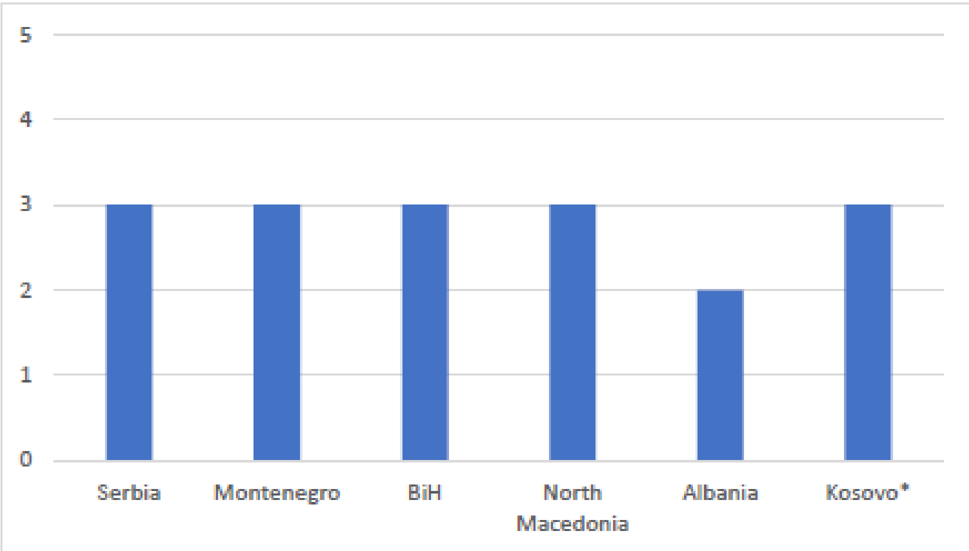
In the Western Balkans agri-policy is usually created on ad hoc basis and its driven by vested interests rather than by serious consideration, monitoring, evaluation and evidence-based adaptation (Volk et al., 2019). Such a situation can be result of factors disabling evidence-based policy making, characteristic for developing countries, such as substantial limitations in academic freedom, media freedom and civil society involvement (Sutcliffe, Court, 2005).

Indeed, countries from the Western Balkans that targets the EU find themselves in long-lasting and requiring process of advancing available policymaking systems. Tenable results asks not just for complex tools and procedures, but also for involvement of all stakeholders, such are civil sector, media, interest groups, within the policymaking. Public consultations in the Western Balkans, as part of the policy making process, are mostly done formally, on a very short-term notice and with limited and selective involvement of stakeholders from the civil and private sector (Think for Europe Network, 2016).

Figure 1. Usage of public consultation in policy making in the Western Balkans



Source: Think for Europe Network, 2016.

Figure 1 presents the level that involves public consultation in developing policies and regulative in the Western Balkans. Thereby, 0 means that no consultation is used in the policy making process; 1 means that consultation happens on an ad hoc basis, avoiding the regulative that sets strict procedures; 2 means that acts are well developed, but their execution is sporadic and inconsistent; 3 means that acts with clear procedures are introduced, execution is regular but without monitoring mechanisms; 4 means that regulation with clear procedures is in place, execution is regular and monitoring mechanism exists; 5 is same as 4, and in addition outcomes of the consultations are made public. The figure shows that in all of the Western Balkan countries/territories except Albania regulation for using public consultation in developing policies and legislation with clear procedures is in place, execution is regular but without monitoring mechanisms.

All of the countries/territories of the Western Balkans are aspirants for EU membership and are in different stages of the EU accession process. That process imposes reforms in policy making and has so far been the most effective source of pressure for the policy makers. The civil sector (such as farmers' associations) should play a more important role in pressuring the policy makers for reforms and involving relevant third parties in the policy making process, since despite some important efforts so far their results have been limited (Think for Europe Network, 2016).

This paper elaborates on two important factors for farmers' civil society involvement in policy making process in the Western Balkans: capacity of the farmers' organizations and their level of education/information.

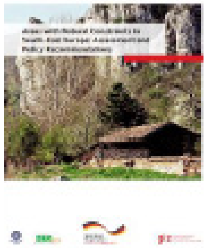
The hypothesis states: farmers' organizations in the Western Balkans are not strong and the level of education/information of farmers is low resulting in their limited involvement in the policy making process.

Methodology

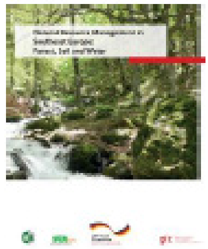
In order to validate the hypothesis positivist data collection method is used with secondary data analysis. Namely, this paper summarizes the findings of eight policy studies produced in the period 2016 – 2019 as part of the SWG policy assessment work on topics related to agriculture and rural development in the Western Balkan countries/territories: Albania, Bosnia and Herzegovina, Kosovo[3*], Montenegro, North Macedonia and Serbia. All of the studies assess current policies in the respective countries/territories and provide relevant policy recommendations:

3 This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

- Objective of "Areas with Natural Constraints in SEE: Assessment and Policy Recommendations" (Zdruli, Cukaliev, 2017) is to provide recommendations for development or adjustment of relevant policies in the Southeast European countries/territories that refer to the areas natural constraints and methodology for their characterization, mapping and delineation of those areas according to EU standards.



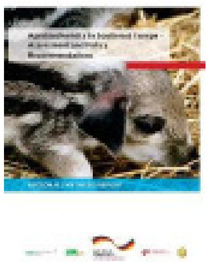
- "Natural Resource Management in SEE: Forest, Soil and Water" (Dragovic et al., 2017) provides regional assessment of the management of forest, soil and water resources in the countries/territories of the Southeast Europe, as well as recommendations for the sustainable management of natural resources in line with EU policies.



- "Application of the LEADER Approach in the Western Balkan Countries – from a Local Initiative to a Mainstream Concept in the Rural Areas" (Bogdanov et al., 2018) focuses on screening the state of the countries/territories regarding the implementation of the LEADER like approaches and providing recommendations for improved mainstreaming of the LEADER approach in SEE.

- "Agri-Environmental Policy in SEE" (Cukaliev et al., 2018) provides evaluation of agri-environment policies in the Southeast European, and recommendations for introduction of tenable agricultural practices strongly linked to EU policies.

- Aim of "Agrobiodiversity in SEE – Assessment and Policy Recommendations" (Rivera et al., 2018) is to analyse the state of the art on conservation and sustainable use of genetic resources in agriculture (animal and plant) in the SEE countries/territories, and to provide recommendations for an alignment of regional / national priorities with EU policies and international conventions and agreements.



- “Agricultural Policy Developments and EU Approximation Process in the Western Balkan Countries” (Volk et al., 2019) follows the developments of the agricultural policies in the Western Balkans and provides their comparative cross-country analysis and state of harmonization with the CAP.

- Overall objective of “Land Market Development and Small Farms’ Access to Land in the Pre-Accession Countries” (Bedrac et al., 2019), draft report) is to analyse the operating of land markets in the Western Balkans and to assess the opportunity for access to land for the small farms.
- Objective of the report “Food Quality Policy: Schemes of Geographical Indications and Traditional Specialties in South East Europe” (Srbinovska et al., 2019, unpublished report) is to provide an assessment of the quality policies in the Western Balkans and respective policy recommendations in line with the EU requirements.

Results

Farmers’ associations

Western Balkans is characterized by a big number of very small agricultural holdings. For illustration, over 70% of the farms in Montenegro, North Macedonia and Kosovo* have less than 2 hectares of utilised agricultural area (UAA). The average UAA per holding in the Western Balkans in significantly small than the average in the EU-28 (it varies from 1.8 ha in Macedonia to 5.4 ha per holding in Serbia, while in the EU-28 it is 14.4 ha). The small fragmented farms in the Western Balkans cause high production cost, low productivity and efficiency and consequently low competitiveness. With such economic limitations farmers do not prioritize environmental issues and respective actions for adaptations for the present and upcoming environmental challenges, such as climate change. (Zdruli, Cukaliev, 2017). Poor economic position and social insecurity of small farmers is identified as one of problems that impede the development of functional agricultural land market, which is in some cases still highly unregulated (Bedrac et al., 2019).

In addition, the lack of organization of the predominantly family farms in cooperatives or other forms of associations, makes this sector vulnerable and noncompetitive compared to the EU agriculture (Srbinovska et al., 2019, unpublished report).

Although the legislation of most of the Western Balkan countries/territories is aligned with the European one, the implementation is weak. Some of the reasons for that is lack of information, knowledge and low level of awareness among the farmers about their role in the policy creation and implementation and their weak interest in association (Srbinovska et al., 2019, unpublished report). This is especially the case when it comes to the implementation of the quality policy and schemes of geographic indication and traditional specialties where cooperation and association among producers has a key role.

Over the last decade, there has been a growing trend in the number of non-governmental organizations focusing on agri-environmental issues in the WBs, which is the result of the increase in the public awareness about the need to preserve the environment (Cukaliev et al., 2018). When it comes to non-governmental farmers' organizations that deal with sustainable use of genetic resources in the SEE countries/territories their number and focus varies (Table 1.).

Table 1. Non-governmental organizations involved in agrobiodiversity

Type of organization	Albania	BiH		Montenegro	N. Macedo-nia	Serbia	Kosovo*
		FBiH	RS				
Professional associations active in plant and/or animal genetic resources	X	X	X		X	X	X
Farmers cooperatives/associations (incl. breeders associations)	X	X	X		X	X	X
Extension services and rural development associations		X	X	X		X	
Organic farming associations	X	X	X		X	X	
Environmental and natural protection organizations (having ABD also in focus)	X	X	X	X	X	X	
Slow food and regional food initiatives		X	X		X	X	
Education and research associations			X		X	X	

Source: Rivera et al., 2018.

The number, capacities, structures and activities of farmers' organizations dealing with the LEADER approach differ considerably among the Western Balkan countries/territories. In almost all of them LAG-like partnerships have been created and they are in different stage of development. There is lack of information regarding their capacities and implemented projects, so that at this point one cannot make a firm conclusion on their strength. Bogdanov et al., 2018 have identified the following LAG-like partnerships in each of the Western Balkan countries/territories:

- In Albania four LAG-like partnerships were created as a result of donor projects. They are not financially sustainable and lack mutual cooperation, so that their territories overlap;
- In the Federation of Bosnia and Herzegovina a UNDP project supported the creation of three LAG-like partnerships;
- In the Republic of Srpska three LAG-like partnerships set up;
- In Kosovo* almost in each municipality there is a LAG-like partnership established, equalling total of 30. However, less than 50% of them are really active and implement projects in their territory;
- In North Macedonia 16 LAG-like partnerships have been established;
- In Montenegro there are no active LAG-like partnerships;
- In Serbia there is no reliable data on the number of active LAGs. An EU-funded project supported creation of 20 local partnerships as potential LAGs.

In most countries these organizations are very active, but they face certain common issues and constraints. The main activities they preform are (Rivera et al., 2018; Bogdanov et al., 2018; Cukaliev et al., 2018):

- Advising role in the formulation of policies,
- Awareness raising and training activities,
- Surveys, research, production and marketing activities.

The main problems they face are (Rivera et al., 2018; Bogdanov et al., 2018):

- Activities mainly performed in the framework of international projects and lack of long-term perspectives and long-term funding and engagement,
- Insufficient commitment from farmers and lack of financial commitment to co-finance projects,
- Lack of coordination with governmental institutions and policy framework to foster and support their activities within objectives set-up in national strategies and action plans,
- Lack or insufficient level of governmental financial support.

Farmers' education

When it comes to the agrobiodiversity policies, farmers and farmers' associations are among the main stakeholders for public awareness as a key element in mainstreaming agrobiodiversity in the overall developing strategies at the public level, but also in agriculture and the food value chain. There is lack of knowledge about the key role of agrobiodiversity for the social and economic development of rural communities also with the inclusion of related sectors such as gastronomy, culture, retail, tourism, research and education, media, etc. Thereby, education is an important element, as awareness raising through education can trigger knowledge transfer and show long lasting effects (Rivera et al., 2018).

The low level of awareness of the farmers is also one of the biggest obstacles for proper implementation of the agri-environmental measures. Thereby, farmers are the most important stakeholder group for raising the awareness. The level of education of the farmers is low, the average farmers' age is increasing and they are very tied to their traditional technology of production (Cukaliev et al., 2018).

Similarly, in the area of natural resources management education and capacity-building are under-developed in the region. That is the result of the low prioritization by the government, lack of funding, as well as the lack of regional international cooperation (Dragovic et al., 2017).

Data sharing and flow of information is also important for proper implementation of the policies on Areas with Natural Constraints. Decision makers should facilitate the process among all stakeholders, including farmers as key players, developing and implementing the legal and institutional process (Zdruli, Cukaliev, 2017).

Functioning Agricultural Knowledge and Innovation Systems (AKIS) are necessary for effective functioning of agricultural policy and achievement of sustainability. This involves both public systems in the fields of research, education and extension, but also a more prominent role for the private sector and a commitment to achieving sustainability objectives at the level of agricultural holdings and agricultural policy in general. WB countries/territories are still quite far from achieving this. Despite some attempts and efforts, even with donor funds, to build a modern AKIS, results are still poor (Volk et al., 2019).

Recommendations

In the area of policies on agrobiodiversity and in relation to farmers' association and education the recommendations are (Rivera et al., 2018):

- Countries/territories should have a clear approach towards implementation in all programs, strategies and action plans for in-situ and ex-situ conservation of genetic resources, including financial support to farmers and farmers' associations and stakeholder involvement;
- Existing institutions dealing with agrobiodiversity should be adequately funded, including education, NGOs, associations and private companies;
- Cooperation and synergies between different authorities and stakeholders should be fostered, such as ministries, central and local public authorities, public and private agencies, the research and education communities and the private sector, including farmers, farmers associations, and other economic sectors;
- Research institutions, farmers and farmers' associations, NGOs and other stakeholders should be involved to ensure a solid evidence basis for the development and prioritization of conservation efforts;
- Farmers and farmers (or breeders) associations should be financially supported, including, if not yet existent, the creation of a breeders registry to foster transparency of support and cooperation;
- Training plans should be developed to foster knowledge transfer within the research and education community, to public administration, local authorities, agricultural extension services, farmers and farmers' associations and other stakeholders;
- Awareness should be raised and knowledge transfer facilitated for farmers, farmers' associations about sectors such as tourism, food production, gastronomy and retail, e.g. on the importance and opportunities for marketing of farm animal products and the diversification of rural economy through agrobiodiversity.

In area of agri-environmental policies and in relation to farmers' association and education these are some of the recommendations (Cukaliev et al., 2018):

- Education and vocational training of farmers and also of the administration/ institutions as well as of the inspection bodies (capacity building) are needed to spread up-to-date knowledge and exchange experiences;
- Demonstration farms or pilot regions should be established with agri-environmental activities and agro-ecological farming systems, eventually in sensitive areas.

For a more successful implementation of the LEADER approach and related to farmers' association and education some of the recommendations are the following (Bogdanov et al., 2018):

- Networking and cooperation among different stakeholders from public, private and civil sector should be promoted and supported. It should result in increased awareness and strengthening of the role of the local stakeholders in the decision-making processes on the local level, enhanced activity of the representatives of all three pillars of the society (public, private, civil) and trigger local initiatives originated and implemented jointly by local stakeholders;
- Advantage should be taken from the EU LAGs experiences, to learn from and implement in the Western Balkans. LEADER-like pilot initiatives should be tested and practiced in order to promote and experience the benefits of the bottom-up, community-based actions;
- Local human capital should be strengthen to manage the LAGs, to implement Local Development Strategies, and to absorb the LEADER measure funds in the WB countries/territories.

In the area of natural resources management recommendations related to farmers' association and education are (Dragovic et al., 2017):

- More focus should be given to the private land owners and their organization. Organized land owners would have better capacity to manage land properly and according to given standards. Organization would strengthen their voice when it comes to policy making for their own benefit and for the benefit of the society;
- Communication should be improved with private land owners in order to develop and implement public policies. Stakeholder exchange platforms should be established, which would bring together local communities in developing and implementing local initiatives;
- Capacity building and education in natural resource management need to be improved especially considering the new trends and new demands such as preparing for EU accession and its rules;
- Education and capacity building in integrated natural resource management should be supported by sufficient funding;
- Regional and international cooperation should be strengthened to contribute to improved training and life-long learning programmes, as well as access to funding;

- Awareness should be raised in the broader public on the importance of the integrated and sustainable natural resources management, its opportunities and threats.

In the area of quality policy and schemes of geographic indication (GI) and traditional specialties these are some of the relevant recommendations (Srbinovska et al., 2019, unpublished report):

- The role of producers and the creation of groups/organizations should be recognized and highlighted. Forming a group can be a vital step to developing a GI;
- Collective approach is required in order to promote and preserve the origin-linked product and local resources. It is vital to develop a system that allows all stakeholders to be involved;
- There are potential stakeholders that have to be involved: farm union, cooperative, consortium, specific group of producers that are collectively establishing the GI local community (e.g. rural settlements), municipality or regional authorities, commodity exchange, processors, traders and distributors (e.g. all stakeholders involved in transfer of food-products to final consumers), informal groups, etc.;
- Introducing education programmes for the specialized small-scale processing facilities is needed for implementation of standard technologies and necessary food safety requirements;
- Additional training on labelling, packaging and traceability of traditional products are needed;
- There is a need for continued and improved involvement of the agriculture extension services to assist farmers in administrative, technical and marketing fields;
- A forum for exchange of ideas, best practices and knowledge should be provided to the stakeholders from the entire food supply chain;
- Key stakeholders should be engaged in targeted and focused consultations for consensus building and commitment.

These recommendations have been endorsed by wide audience of stakeholders at the annual Agricultural Policy Forum organized by SWG. Thus, Ohrid Agenda, set of policy recommendations produced at the Agricultural Policy Forum 2019 in Ohrid, North Macedonia states: “Timely involvement of rural communities and farmers into the planning and implementation of policies, considering territorial approach, LEADER/Community-led Local Development (CLLD) and Area-Based Development Approach (ABDA) are strongly recommended. Additionally, it is advisable to strengthen the capacities of the national and local administrations, advisory services, civil society organizations, farmers/producers and service providers in rural areas" (SWG, 2019).

Similarly, Jahorina Agenda 2018 produced at the Agricultural Policy Forum 2018 in Jahorina, Bosnia and Herzegovina, states: The Forum "recommends that policymakers introduce a mix of policy measures, including investment support, intensive knowledge transfer and support to establish and manage various types of cooperation, such as cooperatives, cluster initiatives and producer groups/associations" (SWG, 2018).

Conclusion

The review of the policy studies produced in the period 2016 – 2019 as part of the SWG policy assessment work on topics related to agriculture and rural development in the Western Balkan countries/territories (Albania, Bosnia and Herzegovina, Kosovo[4*], Montenegro, North Macedonia and Serbia) shows that farmers' organizations in the Western Balkans are not strong and the level of education/information of farmers is low resulting in their limited involvement in the policy making process. By that the initial hypothesis is validated. The current situation can be improved through:

- Developing training plans to foster knowledge transfer to farmers and farmers' associations and other stakeholders;
- Education and vocational training of farmers and life-long learning programmes;
- Raising awareness and facilitating knowledge transfer for farmers, and farmers' associations;
- Installing new forms of communications with farmers;
- Strengthening farmers' associations by providing financial support;
- Fostering cooperation and synergies between farmers' associations and different authorities;

4 This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

- Practicing diverse models of networking of various local stakeholders (public, civil society and business) and participation in joint activities;
- Involving farmers and farmers' associations, NGOs and other stakeholders to ensure a solid evidence basis for policy making.

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ANALYSIS OF THE MARKET VALUES OF LEMEŠKA SPA: IMPORTANCE AND POSSIBILITY OF RENEWAL THROUGH THE CLUSTER SYSTEM[1]

Drago Cvijanović[2], Tamara Gajić[3]

Abstract

After the II World War, with the development of medicine and awareness of the value of medicinal thermal waters, the trend of spa tourism was gaining enormous proportions. As for Vojvodina, this trend has never had an upward movement. There was no interest from social and economic organizations for greater investments in tourist offer, and the spas survived only by joining health institutions. Visitors no longer had enough of the standard offer placed on the market, and spas became the seat of social tourism. The authors of the paper presented part of their long-term research, related to the analysis of market values and the possibility of renovation of Lemeška Spa. More specifically, only part of feasibility study and research of the authors, which were done for the needs of the Spa restoration project, in collaboration with the city of Sombor (collaboration of Serbia and Hungary) are presented. The aim of the paper is to show the importance of reconstruction of the spa facility, both for Vojvodina itself and for the wider tourist market, and to point out the importance of the cluster system in the tourist positioning of Lemeška Spa.

Key words: Lemeška spa, clusters, Vojvodina.

Introduction

Spa tourism is based on the use of thermal and mineral waters for the purposes of healing, rehabilitation and recreation. In connection with this, health, sports, recreational activities are taking place in the spas, but also with regard to the totality

1 The paper is part of the research at the project III-46006 "*Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region*", financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

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of infra and suprastructural facilities, more and more congress and manifestation tourism. The spas in Vojvodina have in time become centers of stationary tourism, in which the tourist season lasts all year (Vujko et al., 2017; Cvijanović, Gajić, 2019). The increasing number of needs for spa treatment and recreation indicates the need for concrete and organized actions, which would contribute to the construction, arrangement and revitalization of spa centers. Near the town of Sombor, in the Western Bačka District, is the Lemeška Spa. It belongs to the municipality of Svetozar Miletić, and was founded in 1885 and was widely visited according to the then. Lemeška Spa has a favorable tourist position, which is evidenced by the relation to the sources of tourist demand, represented by large cities, the relation to the more important routes of road and rail roads, as well as the relation to competitive tourist values in the region (Petrović et al., 2017b; Gajić et al., 2018a). As a result of the process of transition of the economic system in Serbia, the current tourist, economic and social image of the suburban settlements and municipalities of the town of Sombor is characterized by unfavorable labor market situation, insufficient economic activity and a clear lack of new investment projects (Petrović et al., 2017a). It is also obvious that in the future, the development orientation of all municipalities and the entire economic area of Svetozar Miletić will be a development that will rely on support for the development of domestic tourism and entrepreneurship, and support the process of attracting investments, in order to open new tourism capacities and achieve greater employment (Papić et al., 2016; Gajić, Cvijanović, 2019). Today the topic of the cluster system in tourist positioning is the current topic in the world. Clusters are geographically focused groups of interconnected enterprises, and institutions (universities, branch associations and agencies) in a particular sector, which connect togetherness and complementarity. Clusters are models of economic development created by networking of economic and non-economic entities and institutions in one area of work at lower levels, cities/regions (Blanke, Chiesa, 2007; Kang, Kang, 2014).

The authors of the paper presented a small part of their long-standing research into the importance and the possibility of renovating Lemeška Spa for the purpose of developing a feasibility study and a planned project with the same goal of restoring a given tourism product. All available literature, secondary and primary data were used, as well as a great deal of research in the development of a feasibility study, and for the purposes of this paper, an analysis of the current state and potential market values of the destination will be presented, as well as the significance of the renewal of a given product. The authors also highlighted the importance of the cluster system in the possible positioning of Lemeška Spa on the wider tourist market.

Literature review

The oldest form of health tourism was primarily related to spa resorts with favorable climates where adequate spas were erected. A spa tourism product has emerged to meet certain human needs for active rest and relaxation in the imposed lifestyle and pace of modern society (Bushell, Sheldon, 2009). It brings together a large number of different components: mental, social, emotional, physical, which differently affect the quality of life. Today's socio-economic trends indicate a high demand for health and spa tourism, which will continue to grow significantly in the future. The development of spa tourism can be explained by the great economic and demographic changes in countries around the world (Carneiro, Eusebio, 2015). The share of spa tourism in global tourism is on the rise, and more and more people are consuming wellness and spa services to improve their health and well-being. In the past centuries, many countries have recognized the possibility of preventing and maintaining good health and fitness, as well as the possibility of treatment. This tourist product used to be a luxury, but the increased attendance at these centers is influenced by the following factors: personal space, time, escape from reality and desire for relaxation. For the development of spa tourism, it is essential to have a complete health and tourism offer, which has certain facilities, facilities, as well as professional staff to provide these services (Gajić et al., 2017). By definition (Bushell, Sheldon, 2009), wellness tourism is a set of relationships and phenomena arising from the travel and stay of people whose main motive is to preserve or improve their health status. The backbone of tourism in many of our spas is not hotels, but hospitals and rehabilitation centers, while catering facilities are a companion (Cvijanović, Gajić, 2018).

Today, the development of tourism related to human health starts from standard treatment with a natural factor to improve the health status of other components, which are necessary for human health and fitness (Aarstad et al., 2015; Czernek, Czakon, 2016). It should be noted that today there is an increasing tendency to create specialized healthcare facilities that have educated staff and the best possible medical equipment for the most complex medical procedures. Most of the visits so far have been realized mainly through informal channels or as a result of the visitors' initiative. According to the Statistical Yearbook of the Republic of Serbia, a total of 2,227,945 overnight stays were registered in Serbia in 2017, while the data also show that there are a total of 11,211 accommodations in Serbia, or 25,207 registered beds (www.stat.gov.rs). In a time of pronounced global economic globalization, it is considered to be one of the best ways to survive in the tourism industry market, precisely through interconnecting at various levels, by creating a cluster concept (Guler, Nerkar, 2012; Zechary et al., 2015). In this way, the emergence of a spa tourism product and its survival in the competition market fits perfectly into the cluster system in order to participate in the economic development of Serbia. The cluster that connects medical and recreational tourism with other organizations and associations (private, state, business, scientific, health, tourism organizations) aims to create a recognizable and competitive tourism product that follows global trends while remaining in the tradition and purpose of existence (Dawson, 2014; Ooi et al., 2015). In addition to the role of suppressing competitors in the tourism market, clusters play a major role in the operational sense of innovative processes.

It is possible for the state to provide its support, enhancing the tourism value chain through promotional activities by placing it on the market, as well as adopting adequate legislation to support the development of spa tourism (Ketels, 2004; Haans et al., 2016). The main task of the cluster in the initial stages is certainly investment. It is necessary to understand the current state of the market, which is low level of economic development, low technological equipment and inadequate managerial education, and in this respect, it must be understood that both local and state authorities have a role to play as catalysts for development and some entrepreneurs in the initial phase (Fosfuri et al., 2013; Pavlovich, 2014).

Research area

Lemeška Spa belongs to the Western Bačka District, and belongs to the area of Svetozar Miletić. It is located at an altitude of 93 m, in the area of Bačka diluvial terrace. The spa was open to visitors from 1885 until 1979, when it was completely closed. From the spa there is a collapsed central building that once housed a restaurant, sleeping rooms, as well as the remains of two swimming pools. The first pool was built in the 1950s, while the second, which had otherwise never been licensed and never officially operational, was completed in the 1980s. The tub building and changing rooms no longer exist. The size of the area covers about 20 hectares and is state-owned and the beneficiary is the Local Community (Mrkša, Gajić, 2014).

In 1929, the Royal Chemical Laboratory in Belgrade performed a water analysis, when it was determined that water and medicinal mud, called peloid, were extremely medicinal. The laboratory also concluded that water can be used in balneotherapy for bathing, as an adjunct to treatment, as part of medical rehabilitation for the following chronic diseases: chronic, inflammatory, degenerative and extraarticular rheumatism, as well as the consequences of trauma. By its healing properties, the water from the spa is equal to the water from the Harkanj spa in Hungary, and the healing mud equals the mud from Igalo in Montenegro. Based on the chemical analysis of the water, performed by the Institute for Physical Medicine and Rehabilitation in Belgrade, it is concluded that the water is cloudy, with a precipitate at the bottom of the bottle, colored slightly yellow, with a slight odor of rot and alkaline reactions. The mud contained plant matter residues. The cations are dominated by magnesium and sodium - Na_2O contains 0.2881 gr per liter and MgO containing 0.1196 gr per liter.

Analysis of market values Lemeška Spa as a contribution to determining the importance of the cluster system in the positioning of the spa complex

The current situation on the labor market in the Western Bačka District is very unfavorable, as well as insufficient economic activity and a clear lack of new investment projects, all as a result of the process of transition of the economic system in Serbia. Obviously, in the future, the development orientation of all municipalities will be development that will rely on support for the development of domestic tourism and entrepreneurship and support the process of attracting investments, with the aim of opening up new tourism capacities and achieving greater employment (Gajić, Cvijanović, 2019). Today, local entrepreneurs and foreign investors in Sombor face numerous problems in functioning, precisely because of certain problems with water supply, sewerage and electricity supply. Also, to businessmen and the local administration of Sombor, problems are posed by the construction of business buildings in parts of municipalities for which there is no spatial planning documentation, and which have been given mostly agricultural land for construction. The above examples are just some of the many problems that have determined the approach to the design of the Study and the establishment of a business zone in the area of Lemeška Spa.

With activities planned in the area of the Spa, it is possible to influence the solving of the mentioned problems in different areas of life and work of citizens and businessmen from the area of Sombor and the District. The closeness, the largest limnological facility in Vojvodina, to Palić Lake, is about 60 km away. Then, 65 km away from the Spa, there is the Karađorđevo Military

Institution, with its rich hunting grounds and stud farm (Gajić et al., 2018b). These destinations can contribute to the creation of a complementary tourist offer, which would substantially enrich and extend the stay of tourists. With the renovation and revitalization of Lemeška Spa and the way of doing business, it will enable them to enter the tourist market, become one of the main participants in the spa tourism system and lead an equal fight with competitors in the domestic and foreign markets. In the long term, Lemeška Spa will provide quality services and a better quality of life to all consumers as well as to the local population, revitalizing all other sectors of the economy in the environment. The realization of the project of forming business zones in the area of Lemeška Spa, significantly contributes to local and regional economic development, which brings with it a modern and dynamic business environment, respecting and adopting the highest standards and principles of successful business, and provides all participants in the process with quality services and strong support in all areas of business (Petrović et al., 2017a).

Lemeška Spa will become a recognizable unique balneological destination, with very unique natural healing resources, with improved business standards and quality of services, traditional and cultural values, unique infrastructure that respects the principles of sustainability and ecology in the function of health and will be a recognizable brand of the Autonomous Province of Vojvodina. With the establishment of business zones, the Spa and Svetozar Miletić will gain capacities that can provide significant tourist and economic activity and thus become one of the most attractive locations for the realization of investment projects, which will be based on available resources, investment potentials and a new proactive approach in creating a competitive and prestigious business environment. Choosing a location to build a tourist infrastructure and supporting content is crucial. All resource bases must be included in the site analysis as well as in the construction of tourist infrastructure. When analyzing the location of the center, it is necessary to analyze the location from the macro and micro aspects.

In order for Lemeška Spa to be able to meet the changes and challenges that come from the environment, ie. to ensure its continued growth in the tourism market, and to be surprised, it is necessary to use different methods, concepts, “tools” and techniques in the process of strategic analysis. SWOT matrix is used for strategic planning.

Table 1. Analysis of Resource and Market Values of Lemeška Spa (SWOT analysis)

ADVANTAGES	WEAKNESSES
- Favorable tourist-geographical position. A large part of the roads were reconstructed. - Natural environment - no pollution, noise, stress, untouched nature, proximity and richness of rural areas. - Existence of natural healing factor (water and peloid), richness of mineral springs. - Traditionality of all tourist products on offer. -Traditional, healthy and quality rural gastronomy. -Cultural-historical heritage. -The existence of cultural manifestations. -Different offer of excursion activities. - Hospitality of the local population. - Positive attitude of the local population on the development of tourism. - Awareness of the importance of tourism development and support for the development of Sombor and other municipalities. - Interest of households in tourism and contribution to development. - Initiatives for new basic and additional tourism products. -Awareness of the problems in the development of the spa, with the local population and other participants in the development. -Developed basic telecommunications network. -Existence of awareness on the development of environmental protection systems. -Continuous energy supply of electricity and water. -Increasing demand in the spa tourism market.	Inadequate connectivity to the most important traffic hubs, despite its good location. -Low market projection. - There is no adequate cooperation with tourism organizations in order to jointly solve the current problems of the Spa. -Insufficient investment for restoration and construction. -Very bad communication of local economy with potential investors. - Outdated water and sewage network. -Technological obsolescence of electricity distribution capacities. -Inadequate, nonexistent and outdated tourist signage. -Lack of parking space. - Non-implementation of laws and penal policies (protection of the living environment). -Not maintaining the remaining resources. -Lack of space under the state protection system. -Lack of planning measures for spatial-urban development of Banja. -The initial infrastructure for building certain capacities is non-existent. - Existence of wild construction in surrounding spatial units. -Drawing of all accommodation capacities and very low stability of nearby facilities. -Low marketing of all existing tourist activities and attractions. -Management system underdeveloped. - Poor economic awareness of the importance of development. -Lack of educated staff for occupations in tourism industry. -Lack of involvement of households in the development of tourism and complementary activities.
CHANCES	**THREATS**
- High ranking among the spas of Vojvodina. - Close and good connectivity to broadcast areas. -Various complementary tourist values that complement the tourist offer of Lemeska Spa. -Opportunity to invest in private equity. - Conservation of nature in accordance with the principles of sustainable development. -Hiring experts in field of tourism with a university degree. -Interest for investing in infrastructure. - Applying a novelty in the tourism business. - Interest of the city of Sombor, the state of Hungary and all municipalities in the area for tourism development. -Expectation from tourism is high by the locals and all stakeholders. - Market segmentation: more frequent and shorter vacations. -Fast privatization and stability of tourism companies. -Conditions for development of large number of tourism products. -Formation of a recognizable tourist brand with modern tourist offer - Implementation of European labor regulations and employment policies. - Internet accessibility. -Education of personnel.	-Uncertain economic flows. - Lack of incentive funds. -Lower the payment power of the wider social classes. -Lack of local sources of financing for infrastructure and transport. -Lack of standards in service quality. -Decaying locations for tourism development. -Fastly develop competition for spa destinations. -Lack of professionally crafted product. -Low growth of complementary activities. -The level of awareness of the population towards public goods and interests is very low. -Difficulties in agreeing on development priorities. -Lack of public-private partnerships in tourism business and development. - Undeveloped cooperation of tourism actors in the wider environment.

Source: author's research.

Table 2. Seasonal schedule and occupancy of planned facilities and accommodations

Tourist Products - Annual MaintenanceFlow (Seasonality) Main Season Pre-season	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Health and Recreational Services												
Welness and spa	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Medical treatments	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Business Tourism												
Congresses, conferences, seminars	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Sports and recreational tourism products												
Hiking	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Horse riding	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Cycling	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Sports activities	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Accommodation and food												
Hotels	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Bungalows	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Restoration facilities	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Ethno-eco tourist facilities												
Field trips	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Special interests												
Hunting	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Fishing	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Other facilities												
Souvenir shops, shops, etc.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII

Source: author's research

The tourism product of Lemeška Spa should be specific and contain multiple forms of tourism, for which there is a real demand in the tourism market. However, it is necessary to work on stimulating or stimulating new forms of tourism, for which there is a resource base. Emphasis is placed on thermal water and its quality as the primary resource of market demand. The quality of the tourism product is reflected, among other things, in the longer duration of the season (Covin et al., 2000; Hjalager, 2002). Since different forms of tourism have seasons in which tourist traffic is most pronounced, the development of Lemeška Spa should be based on a year-round offer. Therefore, the production portfolio in the Study is tentatively designed to meet the dynamics of the seasons and the demand for individual product groups. When it comes to spa tourism product, the great advantage is that it directly affects the extension of the tourist season. This is a great success for spas that have institutes, institutes and rehabilitation centers, where they can work all year long. Lemeška Spa had a limited supply, with insufficient investment funds to expand the offer. The only option for attracting more tourists is to enrich the offer, extend the season, and organize cultural and sporting events. There are some wanderings about the realization of the health and tourist function of the spa, as well as their harmonization, that is, highlighting and developing one at the expense of the other (Mrkša, Gajić, 2014).

There is inevitably a misunderstanding between healthcare professionals and tourism professionals. Mostly medical experts try to subordinate the entire offer of the spa to the health function and the contents that enable its realization, while the supporters of exclusive tourist orientation of the spa want to reduce the spa treatment to one of the services in tourist traffic. However, looking at the experience of European spas, it can be concluded that the spa will still retain its healing function to a greater or lesser extent. In order for the Lemeška Spa to survive on the tourist market with its renovation, clustering is recommended. This way of association enables fuller and more efficient functioning, in order to meet all the needs of consumers, both domestic and foreign. The cluster system will enable the problems of reconstruction of the spa complex, as well as the formation of different forms of supply, in a more efficient and rational way (Gajić, Cvijanović, 2019). In this sense, it is necessary to base the construction of all complementary facilities on the basis of the concept of sustainable tourism development, with the aim of preserving and protecting thermomineral springs, protecting nature and respecting the ecological standards of the spa complex. Introduction of the cluster system in the reconstruction of the spa and its placement on the market, a guide to the improvement and development of health tourism in Serbia. The cluster should bring together all interested, state and private entities in the field of health and tourism-catering services. Some of the main goals of introducing the cluster system in the placement of the Spa on the tourist market are: cooperation with all line ministries for marketing activities in positioning Vojvodina as a spa destination; enable membership in international health tourism associations and promotion of domestic offerings at specialized congresses, fairs and conferences for health tourism; organizing regional regional conferences, educating target groups, then users, and the local population as users or consumers of potential services; creating a complete database of health tourism offerings and identifying all potential members and factors of the cluster (Delgado et al., 2014; Weidenfeld, Hall, 2014). The cluster could include related associations from Serbia and the countries of the region (associations of spas and climatic places, associations of rehabilitation centers, associations of spa and wellness tourism, medical institutions of Serbia and the region, and state institutions such as Chambers of Health Institutions, Development Agency of Serbia, etc.).

Looking at the Lemeška Spa and its position, it is evident that there are natural regions that usually by themselves possess a number of necessary resources for the development of a tourism cluster. It can only be the initial value that needs to be upgraded with formal: organizational, managerial, innovative, production, social capital building measures. The basic model of the cluster would be to connect the public sector, technology, suppliers of products and services and sales channels, most often to travel agencies, that is, to connect the economy of smaller companies from two or more regions to ensure competitiveness in appearing in other markets (Eiseman, 2013). Using communication technologies, technologies and investments of local inputs from different areas and different clusters, the Spa will develop its business and position itself globally. In positioning they will greatly benefit from a built brand, on the basis of which they will be easier to market and sell (Mueller et al, 2012). Within the cluster Lemeška spa as a tourist product will develop faster, apply modern methods of work and, under modern management, draw maximum from the market environment, and the destination economy will gain competitive advantages over others. The cluster system will certainly contribute to building a competitive export economy of the tourist destination, through their direct influence on the acquisition of new skills, job creation, regional development, increasing living standards and other goals related to economic and social development (Lee et al., 2001; Su, Lin, 2014).

Emphasis must be placed on the marketing system. Its main role should be the continuity of the development of spa and health tourism and a fuller satisfaction of the needs of consumers by placing Lemeška Spa on the market, and in accordance with the increase in the level of their self-awareness, or the social concept of marketing application in health tourism (Merinero, Pulido, 2016). Lemeška Spa seeks to market and position itself in the minds of consumers, with a specific tourism product different from that offered by competitors in the surrounding area and region. Considering the market situation, it is possible to define the target geographic markets of Lemeška Spa. The primary market includes countries: Croatia, Montenegro, Bosnia and Herzegovina, and Slovenia. In these countries, there is a demand for spa and other tourism products, primarily because of the relatives and friendships that have existed and still exist, so the reaction is positive for the tourism potential of the region. One can distinguish the primary foreign market: Hungary, Austria, Italy, Czech Republic, and Slovakia, whose population also has positive perceptions of tourism products in Serbia. The secondary regional market covers other European countries.

Conclusion

In the planned development of the settlement of Svetozar Miletić, the town of Sombor and its surroundings, the construction of the spa-recreational center Lemeška Spa will represent one of the most significant undertakings in this process. Although the need for the revitalization and construction of this center existed much earlier, the financial and strategic conditions for its reconstruction and further development were not achieved. Bearing in mind the investment potential in the territory, the city of Sombor and the local community, Svetozar Miletić, have identified and initiated activities to develop a feasibility study. Water quality has been a topic of research in the past, and it has been confirmed that Lemeška Spa has healing water sites.

With its tourist offer, Lemeška Spa needs to meet the needs of segmented consumer groups. Placing on the tourist market of Lemeška Spa can be achieved by adequate valorisation and presentation of all the natural beauties of the environment, specific elements of quality that are sought to be achieved, by providing a diverse range of tourism products, such as top-notch recreation, as well as achieving economic benefits for the local population, thus for all municipalities in the surrounding area. Creating ideal marketing, it is necessary to attract tourists, but primarily by highlighting the implications of the product created on the psychophysical and health, as well as recreational value of stay.

The tourist function of the spa as a tourist object in general, according to many experts, was not the subject of more creative approaches in designing directions of development, and in Vojvodina it was largely neglected. It should be emphasized that the tourist offer of the spa as a tourist product has a more complex mechanism of formation and functioning since it arises in the integration and complementarity with the tourist values of the environment. As it has been observed, the tourist function is based precisely on the establishment of links between natural, anthropogenic resources and the material base of the spa core and its surroundings. In their immediate surroundings, Vojvodina spas do not have so much pronounced attractive resources, which remodeling could create natural and anthropogenic tourist values of high level of competitiveness, and independent use value, which is often characteristic of spas in central Serbia.

All the predispositions of the development of the Spa are located in the resource base, but certainly the marketing plan is the way to place in the tourist market strong competition. Exactly so dominant competition in the sphere of spa tourism requires strict differentiation of products with competitors. The construction of the spa, without its specific qualities, cannot find a firm position in the market, especially when it is noticed that the competition is already well positioned for many years. The tourism market is becoming more diversified and tourists are becoming more educated, knowledgeable and, consequently, more demanding in terms of the quality of the tourist offer (Li Vanhaverbeke, 2009; Tuppura et al., 2010). The tourism product that will be marketed to consumers must first and foremost satisfy all the needs of consumers, from the availability of information from the Internet, through appropriate transportation to the destination, the comfort of accommodation, content at the destination, new experiences and the increasingly complex offer that destinations have to offer. The offer has to be innovative, to provide new value compared to the existing ones in the market (Sarkar et al, 2001). Natural wealth and other resource values can be a great basis for creating an innovative and specific product. As a key driver of development, it will be health tourism, whose effects will be further extended to additional facilities such as wellness, sports and recreational activities, eco-ethno events and the like.

The authors of the paper presented a part of their long-standing research, which deals with the possibility of renovation of the Lemeška Spa and its positioning on the tourist market through a cluster system. The authors participated in the development of a feasibility study for the project at the request of the city of Sombor in cooperation with Hungary. In this paper, they highlighted only some of the market values of the Lemeška Spa, which are of key importance for restoration and return to the market after many years of stagnation. Then, the importance of clustering for the potential placement of the Spa on the tourist market is given in the paper.

Marketing efforts related to the development of a spa tourism product must focus on linking supply, creating a price advantage over the prices of the same services in the identified primary markets, and creating special packages that will cover transportation, accommodation and medical services (Brambor et al, 2006). There is also a chance for significant development of spa tourism by following and adjusting to contemporary trends by designing targeted programs with high quality service, combining spa and wellness services with medical treatments. Clusters will mean networking on a global scale, more precisely the interaction of many entities in the tourism and the entire economic sector. Creating a tourism cluster to position the Lemeška Spa on the tourism market will require significant investment in infrastructure, upgrading, cluster expansion and technical training. The biggest obstacle to clustering lies precisely in the underdeveloped infrastructure. Many countries' experiences show that the two main sources of funding for government tourism clusters (national and regional) as well as the local tourism industry are.

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EXPORT OF FROZEN RASPBERRY FROM REPUBLIC OF SERBIA[1]

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Abstract

Raspberry production has a high share in the structure of fruit production of the Republic of Serbia, which is one of the largest producers of this fruit species in the world. Frozen raspberries account for about 62% of the total foreign exchange inflow due to the export of products from the Republic of Serbia, which makes this fruit one of the most important in foreign trade with the European Union. The aim of this paper is to present basic tendencies in raspberry production movement in the Republic of Serbia in ten-year period (2009-2018), respecting to perceive economic effects of foreign trade exchange of frozen raspberry. With average raspberry production of 93,521 tons our country takes third place in the world, behind Russia (141,078 t) and Poland (106,158 t) in analysed period. Raspberry is one of the most profitable export items of all agro-industrial products, since 2017 it was third in achieved export value (behind corn and tobacco). In Serbia about 92% of produced raspberry is exported in frozen form with 4.9% average year growth rate. Exporting frozen raspberries in Germany, France and Belgium average foreign exchange inflow of about 240 million USD per year is achieved.

Key words: frozen raspberry, export, market, economic effects

Introduction

The Republic of Serbia is one of the few countries that, on a relatively small area (88,407 km), on about 3.5 million hectares of utilized agricultural land, have favourable agro-ecological conditions for cultivation of all continental fruit species. Thanks to such conditions, there is a long tradition of fruit production and processing, as well as farmers' interest in this branch for agriculture. Fruit growing

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1 Paper is a part of the research at the project III 46006 - Sustainable agriculture and rural development in the function of accomplishment of strategic goals of the Republic of Serbia within the Danube region, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

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has proven to be a good model for the development of underdeveloped areas of Serbia and for the solution of social, economic and demographic problems that are increasingly present in the villages. Fruit production achieves 10-20 times the value of production and employs about 20 times more labour per acre than wheat cultivation (Gulan, 2017). There is great involvement of the workforce in a number of supporting activities related to fruit production. In addition, fruit growing drives the manufacturing industry. Fruit production plays a significant role in the economy of the Republic of Serbia due to the exploitation of land potential and other natural factors, as well as the fact that our fruit has the perspective of marketing on the world market (Maksimović, 2012).

Raspberry production in Serbia takes a very important place, due to the current production volume, and even more so because of the potential that Serbia has in terms of favourable conditions for raspberry production in this area (Kevrešan et al., 2013). Apart from plums and apples, raspberries are one of the three most important fruit species in the Republic of Serbia (RS). In the total production structure, it participates with almost 4%. The agro-ecological conditions of Serbia enable better quality of raspberry fruit and higher yield per unit area compared to most of the individual countries in which raspberries are produced. Raspberry fruits produced in Serbia are aromatic and contain a higher percentage of sugar, given the convenience of climatic conditions (Veljković et al., 2006). The largest part of the raspberry production in our country (about 85%) is frozen, and the smaller part is used for various forms of processing. This production is safe, because quality fresh and frozen fruits, as well as products can be placed on domestic and foreign markets easily and under favourable conditions (Blagojević et al., 2012). In recent decades, the RS has become one of the largest raspberry producers in the world. In addition to favourable natural conditions and increased areas under this fruit specie, a positive trend of production was followed by the introduction of new varieties and continuous improvement of raspberry cultivation technology (Radosavljević, 2014).

Export of agricultural products is a key determinant of agricultural development in one country. Exports are the result of high and efficient domestic agro-ecological conditions for production, as well as the functioning of an adequate agricultural policy in the country (Vlahović, 2010). In addition to expanding the export of fresh fruit, an important place is occupied by the turnover of processed fruit, which equals supply on the market year after year. The processing of raw materials, in this case fresh fruit, into a large number of final products, is important in order to achieve higher foreign exchange inflows, both for the processors themselves and for the state, thus ensuring greater employment and a better standard of citizens. Demand for fruit and processed products from Serbia are increasing. According to the ranking analysis of NEP (National Export Profile), the most significant products of Serbian export in growing markets are frozen fruits (Presnall et al., 2006). Also, the importance of frozen fruit export is indicated by previous research. According to Radojevic (2008), for the period 1996-2003 in the commodity group, fruits and vegetables were dominated by fresh and frozen fruits, primarily raspberries and significantly less cherries. Đurković (2012) asserts that Serbia, the United States and Poland, ranked as the world›s largest raspberry producers, after Russia, and are also the largest exporters of raspberries, contributing more than 33% of total raspberry trade by value. Stegić (2016) indicates that trade in frozen raspberries and other berries is the most significant trade product in the exchange of agro-industrial products with the EU. Frozen raspberry exports play an important role in the processing of processed fruit, which, alongside corn and tobacco, is the most important export product in the agriculture sector.

The subject of the research in this paper are, primarily, the results of the raspberry production in Serbia, as well as the realized export of this frozen fruit from the Republic of Serbia. The aim of this paper is to present the basic tendencies in the development of raspberry production in RS for the period 2009-2018 and to provide the insights into trends, structure and regional destinations of frozen raspberry export from the Republic of Serbia.

Material and method

The research is based on the processing of secondary data, using standard statistical-mathematical methods. The source of data is database of the Statistical Office of the Republic of Serbia (SORS), Food and Agriculture Organization of the United Nations (FAO), ITC (International Trade Center) for the period 2009-2018. Moreover, the analysis of the content of the adopted documents and the results of previous research was used. Descriptive statistics method, as well as the comparative method of data analysis was applied. The intensity of the movement of changes is quantified by calculating the annual rate of change.

Results and Discussion

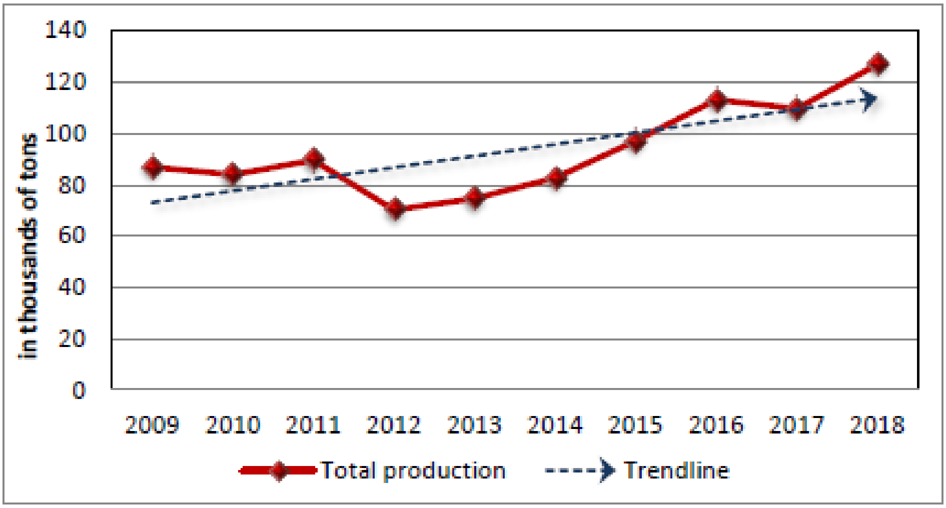
Raspberry production in Republic of Serbia

Raspberry production in Serbia has been developed under the influence of many factories. “It is first and foremost a rich tradition of raspberry cultivation in rural parts of Serbia, which has been cultivated on small farms for generations with parcels with an average area of 0.36 ha. Another condition is the composition of the soil (physicochemical and water characteristics) and the microclimatic specificities which are conducive for raspberry cultivation. The third, probably the most important factor, is price movements in the world market, as demand and price increases have made this production extremely profitable"(Kljajić, 2014). For years, Serbia has been the largest producer and exporter of raspberry in the world, so that Russia has been ranked top in terms of productivity in recent years, and Serbia has remained the most important world exporter. The Republic of Serbia, with an average production of 93,521 tons, ranks third behind Russia with production of 141,078 tons and Poland with production of 106,158 tons in the period from 2009 to 2018 (FAOSTAT, 2018). As stated in the beginning, many factors have influenced the development of this production, among the most significant are:

1. "Relatively high value of production, income and profit per unit of invested capital and labour" (FAOSTAT, 2018)
2. "The labour-intensive nature of production, which significantly reduces the problem of unemployment in many areas of the Republic of Serbia; Impact of raspberry production on overall economic development, which is achieved by building and expanding the capacity of the food industry, indirectly influencing the development of ancillary economic activities, significant net effects in foreign currency, and especially by significant investments in infrastructure (especially local roads) as a basic condition for overall social and economic development" (Mišić et al., 2004).

It is noticeable that the total production varied in the observed period, as indicated by the coefficient of variation, which is 13.4% (Graph 1.). In the period from 2009 to 2018, raspberry production grew at an average annual rate of 4.3%. The production of raspberries is accompanied by numerous problems such as: drought in 2012; inadequate assortment, agro-technology, protection, as well as inadequate organization and inefficient agrarian policy. "In underdeveloped hilly-mountainous areas, the problem of raspberry production is poor and inadequate infrastructure, while the long tradition in this production is a great advantage. The specialization of agricultural farms and the formation of associations and organizations of farmers are also necessary so that the producers themselves can be more familiar with the latest trends in raspberry production. It is necessary to provide direct assistance to producers through seminars and production training. Another problem in the production of raspberries is certainly the outflow of the labour force of rural areas and the increase in the number of older households" (Kljajić, 2017).

Graph 1. Raspberry production in Serbia (2009-2018)



Source: SORS, 2018a.

Raspberry cultivation technology in Serbia moves in two directions. On one side are producers advancing this production by land consolidation, accurate utilization of all agro-technical measures, introduction of irrigation systems, but the number of such producers is extremely small. On the other side are producers not investing sufficiently in the care of already aged plantations, thus regularly harvesting less crops with lower quality of produced fruits. The current ratio between these two groups is close to equal, reflected in the maintenance of production levels, but unfortunately with the decreasing quality of raspberries. While the first group yields over 20 t/ha, the second records significantly low yields that amount to approx. 5 t/ha. Due to insufficient production of certified cuttings and harvesting of shoots from production plantations, but also due to the drought in the last couple of years, the raspberry production is experiencing fluctuations (KZK, 2017).

Considering that raspberries are a strategic fruit species in Serbia, as it is in the top three among exported agricultural products in the last ten years, the production technology (land preparation, irrigation, installation of anti-hail nets and shading nets) should be improved. The introduction of new varieties is difficult and slow for a number of reasons, among which are the producers' habits, the undeveloped market for fresh raspberries where these varieties would be more prevalent, as well as the long maturity of the two-row varieties, which leads to some seasonal changes in the quality of their fruits. Growing place in production is also occupied by remontant raspberry varieties, the most famous of which are the Polish varieties: Polana, Polka and Pokusa (Nikolić, Radović, 2010).

In the observed period, there was a tendency of increase the area at a rate of 7.9% as a result, primarily, of decentralization in recent years. There is a new raspberry planting with dual varieties of raspberries and in places where traditional raspberries have not grown until now such as Bačka in Vojvodina, Raška district and Southern Serbia. On the other hand, the yield is reduced at an average rate of 3.4% (from 7.6 t/ha in 2009 to 5.6 t/ha in 2018), (SORS, 2018a). The shown growth of the product leads to the conclusion that it was constantly working on the modernization of raspberry cultivation technology. Deviations that interrupt this trend are caused by unfavourable climatic conditions that destroyed the raspberry family.

Raspberry is very important for a mountainous area that has favourable natural conditions for highly productive production (Petrović, 2004). The highest average raspberry production was recorded in the region of Sumadija and Western Serbia (82.2% in 2016), and the lowest production in the Belgrade region, (4% in 2016). The highest production is recorded in the region of Zlatibor (municipalities: Arilje, Bajina Basta, Kosjeric, Nova Varos, Pozega, Priboj, Prijepolje, Sienica, Uzice and Cajetina), which accounts for a quarter of domestic production. In addition to this district, the following are significant: Moravici, Kolubarski, Rasinski and Macvanski (Vlahovic, 2010). "In these areas, indigenous raspberries are represented with various types representing a wealth of genetic resources for this type of fruit. It is of great importance that this indigenous material has a remarkable adaptation to the soil and climatic conditions of the environment in which it is found" (Kljajić, et.al., 2017). Raspberry is a very attractive product for production, which is why new producers appear, i.e. countries competing with Serbian producers. This is important to keep in mind as a future strategy to develop the competitiveness of products such as raspberries may be concentrated on a differentiation strategy or a comprehensive cost reduction (Kljajić, 2017).

Raspberry production is the backbone of rural development in Serbia. For our country, it represents a competitive advantage from the aspect of quality, that is, the advantage of the difference with the existing competition in the foreign market (Sarić et al., 2009). Therefore, intensive raspberry production requires the application of modern agro-technics for raising and growing raspberries, as well as the application of irrigation systems to maintain competitiveness in the market. A problem in this branch is the low level of raspberry processing in the Republic of Serbia, which is conditioned by the underdeveloped processing industry (i.e. food industry), which automatically indicates low competitiveness in foreign markets.

The existence of a larger assortment of processed products contributes to greater exports of processed and frozen fruits. The emergence and construction of refrigerators, industrial processing and refrigerated vehicles have played an important role in the development of fruit production. With the advent of cold stores, the seasonality of the use of certain types of fruit is significantly reduced during the year. Fruit freezing plays an important role in preserving the quality and quantity of fruit as well as meeting the needs of the growing urban population. An average of 300 million tonnes of food is lost annually worldwide due to the lack of freezing (Dimitrijević et al., 2013). Processed fruits are among the products that can increase the chances of Serbia's export opportunities (Ignjatijević et al., 2014).

Frozen raspberries export

In 2017, agricultural exports reached a value of $ 2.4 billion. "The most important export products were: maize worth 314 million, cigarettes worth 235 million and frozen raspberries worth 233 million" (SORS, 2018b). Serbia is the leading export market for frozen raspberries (Table 1). "To find a place in the global market where competition is ever more present and more brutal, one needs to focus on quality, professionalism, price, etc."(Kljajić, 2017). The value of exports of the mentioned fruit in the analyzed period was on average USD 240,790. Viewed quantitatively, it was on average 101,046 tons, while the average export price was $ 2.4 / kg. "In terms of value and volume of frozen raspberry exports, Serbia's main competitors in this market are Poland and Chile" Kljajić, 2017). Average export value of frozen raspberries from Poland is 161,989 USD and 154,299 USD from Chile.

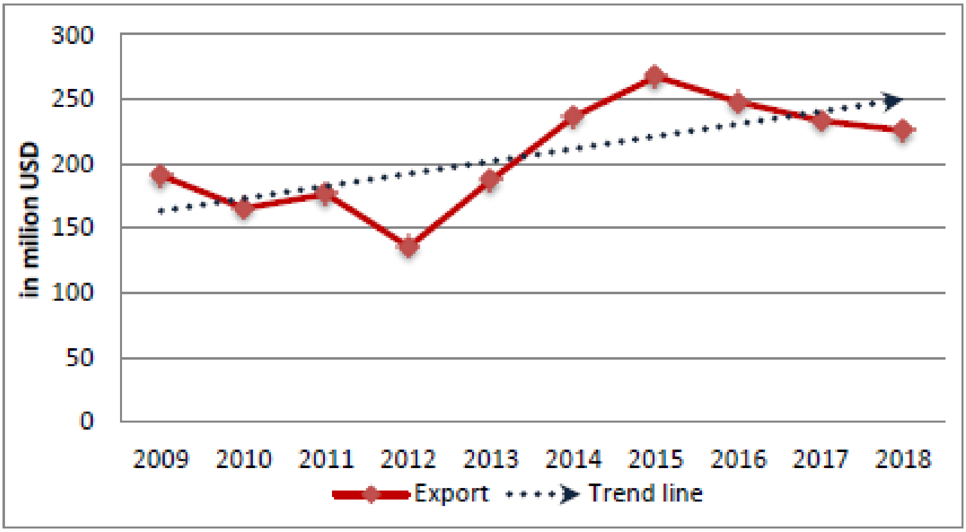
Table 1. Leading exporters of frozen raspberry in the period 2009-2018.

Territory	Average value of exports (thousands of USD)	Average quantity of exports (tons)	Average price of exports (USD/kg)
Serbia	240,790	101,046	2.4
Poland	161,989	100,668	1.6
Chile	154,299	53,471	2.9
Belgium	53,546	20,572	2.6
Netherlands	41,725	17,497	2.4

Source: Author's calculation based on data from ITC, 2018.

Republic of Serbia exports frozen raspberry in over 30 countries of the world and leading ten countries absorbs over 90% of total export value of mentioned product. Export of frozen or processed raspberries would improve the foreign trade performance of Serbian agrarians, as well as the recognition of Serbian raspberries. The export of packaged fruit would increase the employment of labour force, processing capacity and the value of foreign trade. This is not done on a larger scale because some producers do not have the finishing and processing facilities. Fresh raspberry export records decrease tendency at 8.8% rate, while frozen raspberry export is increasing average rate of 6.4% what enhance profitability of holdings which are involved in this kind of production (Graph 2).

Graph 2. Frozen raspberry export from Republic of Serbia (2009-2018)



Source: SORS, 2018a.

Republic of Serbia realizes almost one third of total export of frozen raspberry on the German market. Average export in this country was almost 33 thousand t/year with average growth rate of 5.1% (Table 2). Beside Germany, the highest importers of frozen raspberries are: France, Belgium, Austria and Great Britain, which absorbs 72% of total export of our country. In export, four categories of frozen raspberries are distinguished: “Rolend“ (most expensive), “Bruh“, “Crumble“ and “Block“[4], where “Rolend“ and “Crumble“ make about 90% of frozen raspberries (KZK, 2017). Small quantities go on USA market (about 1.500 t on average in analysed period) and on Russian Federation market (about 500 t on average).

4 Frozen berries could appear in traffic as: “Rolend“, “Bruh“, “Block“ i “Crumble“. Term “Rolend“ is considering frozen berries which contains at least 80% mass of whole individual frozen fruit. “Bruh“ implies 50%-80% whole individual frozen fruit, and “Block“ less than 50% of whole fruits. Term “Crumble“ is considering frozen berries which consist of frozen fruit parts (Rule book about quality of fruit, vegetables and pectin preparation products, Official Gazette of RS, no. 43/2013, 72/2014 and 101/2015).

Increased export from Serbia is a result of forbidden fruits and vegetables import from Poland to Russia starting from August 1st 2014 because of great number of confirmed cases of excessive pesticides and nitrates uses. Also, Russia brings in economic sanctions to some countries which influences on rising export from Serbia. Export in all mentioned countries records growth tendency, except export in Austria which is decreasing at 1.8% rate per year. Also the economic sanctions imposed by Russia on individual states, are opening the space for export growth of products from Serbia (PKS, 2018). Export to all the above countries are on an increasing trend, except for export to Austria, which is decreasing at a rate of 1.8% annually. Reason for such tendency of export movement can be taken into account a number of circumstances, starting with the competition, the impact of the economic crisis as external factors, but also the application and monitoring of world trends,which is strongly insisted on in the transport sector of this fruit. Also, significant factor affecting export is lack of organization and spontaneous presence on the world market.

Table 2. Frozen raspberries export from Republic of Serbia (2009-2018)

Countries	Average	Interval of variation		CV (%)	Structure (%)	Rate of change (%)
		Min	Max			
Germany	33,200	25,911	40,246	22.6	32.9	5.1
France	20,364	14,197	24,674	16.4	20.2	5.3
Belgium	9,008	7,017	11,210	19.3	8.9	2.3
Austria	5,554	2,600	9,343	56.9	5.5	-1.8
Great Britain	4,958	1,664	4,231	36.2	4.9	15.3
Other countries*	27,962	-	-	-	27.7	-
Total	**101,046**	**48,189**	**93,732**	**19.7**	**100.0**	**6.74**

Source: Author's calculation based on the data from SORS, 2018a.

Note: *without continuity in the time series

Most of the exported raspberries are concentrated in the EU market. This market has many advantages when it comes to raspberry export from Serbia:

- The relatively high standard of living provides a significant level of demand for raspberries, as an exclusive fruit.
- The EU is scarce in raspberries - total production of raspberries in this economic grouping is lower than production in Serbia.

There is already a relatively well-known picture (product image) of Serbian raspberries in this market (Vlahovic, Tomić, 2003).

The average export value of frozen raspberry in the analysed period was about USD 240 million. The highest value is achieved by export to Germany (over USD 65 million) which participates with 20.5% in total value. Export to France is in second place with an export value of USD 44 million per year and Belgium is third with USD 22 million per year (SORS, 2018b). The average export price of frozen raspberries in the analysed period was USD 1,498 per ton, while the export price of frozen raspberries to the market in 2016 amounted to USD 2,844 per ton. The highest export price in 2016 was realized to the Norwegian market in the amount of USD 3,722 per ton, and the lowest to the Irish market in the amount of 2,123 USD/t. The exported price to the German market was about an average of USD 2,844 per ton, while the highest price of exported raspberries was achieved by exports to the United Kingdom of USD 3,328 per ton, and the cheapest raspberry was paid by buyers in Austria USD 2,491 per ton. Comparing the average export price of fresh raspberries (1,977 USD/t) and frozen raspberries, we can say that we are competitive when it comes to the export price of frozen raspberries. Higher export profitability would be achieved by exporting fresh raspberries, due to higher export price

Stevanović et al. (2006) state that internal factors affecting the volume and quality of raspberry exports include volume and quality in the chain. problems related to purchase, etc., while external factors include measures of agrarian protectionism that imply customs tariff, bans, contingents, subsidies, etc. which protects the agriculture of developed countries. During the Raspberry Market Survey, number of problems identified by raspberry producers in Serbia was considered, previously classified into four basic categories:

1. Problems arising from the purchase itself (lack of classification. quality control and health security of raspberries. control of the buying process),
2. Problems arising from long-term business cooperation contracts in production and purchase, which producers conclude with purchasers early in the year. Based on these contracts, producers receive pesticides and fertilizers from the purchasers, which they do not pay out in cash but return in raspberries during the purchase period. At the time of the conclusion of the contract, manufacturers know only the price of repro-material, but not the price at which they will sell raspberries, which in the contract stated that it will be “marketable”, and the producer is not sure how much his product will be worth at the time

of purchase, that is, how much he will really have to pay for the fertilizer. The producers generally supply all the raspberries during the purchase period to the cold stores with whom they have contracts concluded and to whom they have delivered in previous years, that i.e., with whom they have already established cooperation and good billing experience,

3. The problem of disorganization of shredded producers, primarily from villages in hilly areas, whose estates are small (less than one hectare), but the income from such estates is extremely significant due to raspberry cultivation. These producers, which significantly participate in the total raspberry production, do not have a sufficiently strong bargaining position in relation to the purchasers, and often need assistance in financing raspberry production, information on quality and safety standards required by export markets, etc.,
4. The problem of buying at a single purchase price, which does not depend on the quantity purchased, on the one hand, and the cost of production of individual producers, which depends on the technology of cultivation and yield, on the other. This situation leads to the fact that the offered advance price for producers with higher yields covers the costs and brings some profit, while for those with lower yields such price often does not even cover the costs of cultivation and harvesting (KZK, 2017).

Raspberry Development Strategy - Since raspberries are an extremely important type of fruit for our country, it should be based on the following (Cecić et al., 2007):

1. “To expand the growing season by introducing new types of fruit suitable for long-term storage, modernization in pomotechnical measures and introducing fruit in semi-restricted or confined spaces or protected areas;
2. Fruit selection and quality control using new selection techniques, applying international quality and certification standards;
3. Packaging and logistics through the upgrading of packaging facilities and improvements in the transport of products to foreign markets;
4. Sales and marketing through promotion of regional and foreign fresh fruit market information, international promotion from Serbia through the media and participation of fruit producers at international fairs.”

The main objective of export should be to maintain the positions acquired, from one, as well as conquering new markets, on the other hand. Also, it is important to build processing facilities in in each area and thus to ensure a more secure placement of raspberries. The competitiveness of the Serbian raspberry producer would be achieved if the proposed marketing channel had a concentration of products through the establishment of marketing organizations of the producers, with the maximum preserved quality of the products in modern cold storages by standardization in quality and packaging.

In the Republic of Serbia, three categories of support measures for berry producers are needed: structural (planting improvement), market (export stimulation) and investment (in warehouses, placement and processing of fruit). Opportunities for production improvement should be sought in the education of agricultural producers and experts, in the integration of production, in the development of the raspberry brand, in improving agro-technical measures, in improving infrastructure, in increasing the efficiency of work through improving the work of advisory services, in reconstructing production capacity in order to obtain EU standards, etc. Given the economic importance of raspberries, both for export or processing, and given the trend of growth in exports of frozen raspberries in previous period, a further trend of growth in export of frozen raspberries can be expected in the coming period.

Conclusion

As the raspberry is the third exported item of agrarian origin, the production of certificated planting material and production and processing technology should be improved. The value of exports of the mentioned fruit in the analyzed period was on average USD 240,790. Viewed quantitatively, it was on average 101,046 tons, while the average export price was 2.4 USD/kg. Exports of frozen raspberries are increasing annually at a rate of change of 6.5%. Republic of Serbia realizes almost one third of total export of frozen raspberry on the German market. Intensive processing of this fruit and final products placement on foreign markets could be more useful for producers and, also, for Serbian economy.

Considering tendency of growth of raspberry production and its significance as exporting item, in next period can be expected further increasing in this kind of production. However, is necessary to work on supporting measures to berries producers, like: structural (promotion of planting), market (export stimulations) and investment (in warehouse. placement and fruit processing), The export growth can be achieved by increasing domestic raspberry production, by organizing associations of commercial producers, by increased support of the state institutions and by more aggressive marketing. Improving production possibilities should be looking in education of individual producers and experts, in integration of production.

In development of raspberry brand in improving agro-technical measures. Infrastructure in increasing work efficiency through the improving advisory services. production capacity reconstruction in order to acquire EU standard, etc.

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AN IMPROVED APPROACH FOR STRATEGIC PLANNING FOR SMALL EUROPEAN AGRIBUSINESSES: PERFORM EFE, IFE, AND SWOT ANALYSES USING AQCD FACTORS

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Abstract

Agribusiness is one of the most diverse and fragmented industries in the world and includes firms operating in production, wholesale, and processing levels of the food supply chain. This paper addresses recent trends in the industry, in particular: the increased involvement of large multinational firms and cooperatives in Europe, the growing trend of vertical integration within the industry, the reduction of fragmentation in production and processing, and the trend toward fewer but larger farms. In order to facilitate success among small European agribusinesses, this paper develops and introduces to that sector a new strategic planning methodology. The new approach includes the development of an EFE (external factor evaluation), IFE (internal factor evaluation), and SWOT (strength-weakness-opportunity-threat) matrices that include AQCD (actionable, quantitative, comparative, divisional) factors. The new methodology presented in this paper can serve as a guide for small agribusiness firms doing strategic planning.

Key words: strategic planning, agribusiness, cooperatives, small farms, SWOT, AQCD.

Introduction

For centuries past and centuries to come, agribusiness is a vitally important industry in east European countries. But this industry is rapidly changing as technological advances reduce the need for extensive manual labour and large multinational firms dominate the landscape. This paper addresses other recent trends in the industry such the growing trend of vertical integration and the reduction of fragmentation in production and processing, as well as the trend toward fewer but larger farms. Small firms in particular in this industry need financial support and strategic management guidance. With regard to the latter, this paper introduces to the small European agribusiness sector a new strategic planning methodology that is based

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on developing EFE and IFE matrices that utilize AQCD (actionable, quantitative, comparative, and divisional) factors in performing traditional SWOT (strength-weakness-opportunity-threat) analysis.

The new EFE/IFE/SWOT with AQCD methodology can enable small farms and agribusinesses to design strategies that lead to sustainable competitive advantages for firms that today face a proliferation of multinational firms and cooperatives in agribusiness. This paper reveals how the new EFE/IFE/SWOT with AQCD methodology can enhance decision-making among small agribusinesses, thus enabling small firms to compete more effectively against larger firms. To exemplify this new methodology, this paper develops and provides author-developed EFE, IFE, and SWOT matrices with AACD factors for a hypothetical small European agribusiness. The matrices, analyses, and methods presented in this paper can be used as a guide for strategic planning in the small European agribusiness sector.

This new methodology presented in this paper could enable small farms and agribusinesses to design strategies that lead to sustainable competitive advantages for firms in a sector where face an incoming tsunami of multinational firms and cooperatives in agribusiness. This paper reveals how developing EFE, IFE, and SWOT matrices that include AQCD factors can enhance decision-making and enable small agribusinesses to effectively compete against larger firms.

Literature review

Trends in Agribusiness

A major reason cited by researchers for utilizing cooperative businesses to help support family farm economic operations is to facilitate the creation of economies of scale. However, despite the benefits of improved economies of scale, social, cultural, and other attributable changes often result and adversely affect the family farmers. For example, the benefits of being a member of a producer organization are substantial (Williamson, 1985). Most notably, the pooling of agricultural output enables farmers to increase their downstream bargaining power with prospective buyers in addition to their upstream bargaining power with suppliers. Risk reduction associated with farming activities including reducing fixed costs and transaction costs all support greater economies of scale.

In addition to the financial benefits derived from economies of scale, other benefits correlated with producer organization membership include skill development, conflict resolving, social cohesion, and simply learning from others (Doitchinova et al., 2017). It is important to note here that generally cooperatives are discussed as aiding the value chain in a vertical fashion, yet with the above example horizontal benefits of cooperatives are a benefit that should not be overlooked (Farina, Zylbersztajn, 2003).

(Doitchinova et al., 2017) reported that the need for cooperative businesses is likely dependent on the particular sector of agribusiness being examined. For example, foods such as dairy and fruits and vegetables that are vulnerable to spoiling are much more dependent on quality cooperative business alliances. A significant barrier to forming cooperatives in Bulgaria is a lack of trust between farmers, producers, and traders (Doitchinova et al., 2017). The broken tradition of private farming and damaged links between elements on the value chain also contribute for limited distribution of networks in Bulgaria. In addition, various programs place constraints on the volume of sales and this contributes to low levels of famer motivation to develop collaborative.

The number of traditional cooperatives related to production declined 37% from 2007 to 2013 in the EU. Many small to medium sized agricultural businesses are often too small to participate in larger cooperatives or fully qualify for funding from government agencies, so these businesses are increasingly turning to forming their own smaller cooperatives specializing on a geographic region or creating other specialization in their products or services. As recently as 2016 with respect to Bulgaria and as early as 2014 in other regions, the Rural Development Program lowered annual turnover minimums for establishing producer programs.

The Small Agribusiness Sector

In recent years, the relative market share of small farms in Eastern Europe has declined significantly as large farms and cooperatives using more advanced technologies have grown dramatically. Davis (1956) was one of the first to introduce the interdependence of marketing and agriculture production citing the improvements in technology. With technology today light years ahead of its 1956 counterpart, it is easily concluded this need for interdependence is more now than ever before. Some young and more dynamic small farmers still compete commercially, but less dynamic and older farmers have retired or produce goods only for household consumption (Burkitbayeva, Swinnen, 2018). Extensive variation exists today across countries in Eastern Europe regarding the nature of agribusiness and the prevalence of and overall success of small farmers. For example, Falkowski (2018) reports that in countries and municipalities in which small farmers have access to political offices, the prevalence and success of small farms increases significantly.

The good news is that good strategic planning matters and can immensely benefit small agribusinesses across all countries, even as political, technological, social, economic, and competitive variables differ substantially. This paper therefore proposes and exemplifies how small agribusinesses can develop EFE, IFE, and SWOT matrices with AQCD factors to effectively formulate and implement strategies to gain competitive advantages over rival businesses. Specifically, external and internal factors that provide the foundation for effective SWOT analysis must be actionable, quantitative, comparative, and divisional to the extent possible, so that resultant alternative strategies formulated can be specific and on target.

As reported by Lerman and Sedik (2018), small family farms can outperform large enterprises that possess greater economies of scale, but enhanced strategic planning is a key to success for small firms. This finding provides impetus for this paper. Wegren and O'Brien (2018) report that without effective strategic planning, such issues as land annexation, social and economic omission, and poverty can be worse now than during the Soviet regime times. A growing lack of financing has recently plagued the agribusiness industry and devastated many projects that otherwise would have made economic and business sense. Small farmers are increasingly being marginalized by rapid technological changes led by agro-holdings. As technological advancement accelerates, the gap between large farms and smallholders will widen (Wergen, 2018).

Refrigeration is increasingly important in agribusiness to maintain the food's condition and safety while enabling food to be provided to a demanding world. As reported by James and James (2010), about 40 percent of all food requires refrigeration and about 15 percent of the electricity absorbed around the world is used in keeping food cool or frozen. Agribusiness in general has witnessed a shift increasingly towards the manufacturing of more foods requiring refrigeration (Garnett, 2011). Frozen food demand was appraised in 2012 at USD 224.74 billion and increased to 295 billion by 2019 (Meneghetti, Monti, 2015).

AQCD Factors

SWOT factors need to meet AQCD criteria to the extent possible and should be prioritized (Capps III, Glissmeyer, 2012). As the term *finite* suggests, the external and internal assessments do not aim to develop an extensive tally of all possible variables that may impact the firm. Normally ten opportunities, ten threats, ten strengths, and ten weaknesses comprise the foundational information in a SWOT analysis (Kearns, 1992).

Actionable

In a SWOT analysis, the term "actionable" refers to the need for each external and internal factor to be meaningful and helpful in ultimately deciding what actions or strategies a firm should consider pursuing. The actionable aspect of factors is needed so that firms can effectively respond either offensively or defensively to the external and internal factors by developing strategies that capitalize on opportunities, and reduce the risk of threats, take advantage of strengths, and/or improve upon weaknesses. Actionable factors should be specific and within the control of management (Coman, Ronen, 2009). Thus, to include a factor such as "the firm's current ratio is 2.25" is not actionable because it gives no insight on what to do about the issue.

Quantitative

The importance of quantitative strategic planning has long been advocated in management literature (David, 1986; Tavana, Banerjee, 2015). In a SWOT analysis, the term "quantitative" refers to the need for each external and internal factor to include percentages, ratios, dollars, and numbers to the extent possible. Quantification is essential so strategists can assess the magnitude of both opportunities/threats and strengths/weaknesses and take necessary actions. For example, rather than saying "The use of refrigeration is growing in European agribusiness," small farmers need to conduct research and find, for example, that "40% of all food requires refrigeration and 15% of the electricity consumed worldwide is used for refrigeration." Numbers matter in strategic planning. Formulated strategies should be based on concrete information before implementation because of the high stakes associated with strategic planning.

Comparative

In a SWOT analysis, the term "comparative" refers to the need for external and internal factors to reveal changes over time. It is difficult to put any fact or number in perspective without another comparative fact or number to reveal the change over time or versus a rival firm or industry average. Thus, factors to be included in a SWOT analysis ideally should be couched in comparative terms, so the strategist or user can more effectively use the information in the matching process to generate feasible alternative strategies. For example, comparative factors can help to identify distinctive competencies (Kumar et al., 2006) or reveal the most appropriate locations to source and market products (Kogut, 1985). Vagueness is harmful in factor generation, particularly considering that millions of dollars could ultimately hinge on the strategic decisions resulting from the factors.

Divisional

In a SWOT analysis, the term "divisional" relates to the firm's products and/or regions. Contrary to the consolidation of factors, divisional factors allow inferences to be drawn regarding what products and regions are doing well or poorly. This distinction is especially important since more and more firms are shifting strategic management responsibilities from the corporate level to the divisional level (Grant, 2003). Arguably the most important strategic decision that faces companies and organizations annually is how best to allocate resources across its segments (divisions), regions, or products. Therefore, to the extent possible, couching external and internal factors in divisional terms, rather than whole firm terms, is helpful and actually essential in deciding how to allocate scarce resources across divisions/segments. For example, in a small agribusiness, the firm's profit margin may be 14% from corn up from 8% the prior year, and 4% from soybeans, down from 9% the prior year.

Key Sources to Obtain AQCD Agribusiness Information

An abundance of vital information is assessable to small agribusinesses from a variety of sources. Examples of unpublished sources include, market research surveys, expert holding workshops at meetings, agricultural related television shows and much more. Examples of published articles of information include magazines, journals, government reports, textbooks, newspapers, and more. A corporate website in particular the "Investors" section is an excellent starting point.

There are numerous websites for finding strategic information, but five that the authors utilize routinely in performing an external audit are:

1. http://finance.yahoo.com
2. www.hoovers.com
3. www.morningstar.com
4. www.mergentonline.com
5. Corporate website of companies

Many college libraries and companies subscribe to excellent online business databases that can be used to gather AQCD information. Some outstanding database sources of external audit information are described in Exhibit 1. The authors use all of these sources, especially S&P Net Advantage's *Industry Surveys* and IBISWorld, to obtain AQCD external and internal factors for inclusion in performing SWOT analysis. Note also in Exhibit 1 that the PrivCo source is helpful for obtaining information about privately held firms.

Exhibit 1. Excellent Online Sources to Obtain AQCD Factor Information

IBISWorld
Lexis-Nexis Academic
Mergent Online
PrivCo
Regional Business News
Standard & Poor's NetAdvantage
Value Line Investment Survey
Company Annual Reports Online (CAROL)

External Factor Evaluation (EFE) and Internal Factor Evaluation (IFE) Matrices

After utilizing sources such as those listed above for obtaining key AQCD external opportunities and threats facing the firm, EFE and IFE matrices can be developed. Economic, cultural, environmental, and competitive changes are external opportunities/threats that have the potential to impact the firm for the good or bad. Not under the control of companies, opportunities/threats are considered *external*. Conversely, factors the firm can control are strengths/weaknesses and are internal in nature. Internal factors are derived from the activities of management and other business aspects. Itemizing and considering organizational strengths/weaknesses in the principle areas of a firm are a vital strategic-management task. Firms intend to pursue strategies that take advantage of opportunities and strengths, improve upon weaknesses, and mitigate the impact of threats.

EFE Matrix

The purpose of the EFE is to access how well the firm's current strategies are taking advantage of the current top 10 opportunities and top 10 threats facing the firm. It is important to note that the "weight" represents "importance of the factor to success in the industry" and does not pertain to the focal business. In contrast, the "rating" is related to how well the focal firm's current strategies are addressing or capitalizing on the external factors, based on a scale of 1 to 4, as follows:

1. Response is poor
2. Response is below average
3. Response is above average
4. Response is superior

An example EFE Matrix is provided in Exhibit 2 for a small European agribusiness. Note in Exhibit 2 that key opportunities and threats are listed from high weight to low weight to reveal an array of "most important" to "least important" factors. Note also that working row-by-row in the matrix, weights are multiplied by ratings to obtain weighted scores, and weighted scores are summed to yield a total weighted score at the bottom right of the matrix. A total weighted score of 2.5 would indicate that the organization's strategies are performing "average" on exploiting opportunities and mitigating threats, since 2.5 is the mid-point between a low of 1.0 and a high of 4.0 possible for a total weighted score.

Exhibit 2. A Hypothetical EFE Matrix for a Small European Agribusiness

	Opportunities	Weight	Rating	Weighted Score
1	A close rival agribusiness, ABC Company, is liquidating and seeking a buyer.	0.10	2	0.2
2	China has increased its imports of fruit from our country by 20% from a year ago.	0.09	1	0.09
3	Russia has reduced its exports of grain by 25%, so prices for our grain has increased 15%.	0.06	4	0.24
4	Interest rates have declined to 5% from 7% two years prior.	0.05	3	0.15
5	Political support for small agribusinesses is growing 10% annually.	0.04	2	0.08
6	A neighboring country, DEF, to the north has a 5% GDP.	0.04	4	0.16
7	Our country's political stability has improved 25% in two years.	0.04	3	0.12
8	The demand for poultry products is increasing 10% annually.	0.04	2	0.08
9	Our country's GDP increased from 3% to 4% in the last two years.	0.03	1	0.03
10	The market price for eggs is growing 8% annually.	0.02	4	0.08

	Threats	Weight	Rating	Weighted Score
1	The population of our country is declining 3% annually.	0.09	2	0.18
2	Consumption of red meat is declining nationally by 5% annually.	0.07	3	0.21
3	The market share of large cooperatives has grown to 60%, while small farms' market share has declined to 30% in neighboring country RST; small farm MNO in RST is available for sale.	0.06	4	0.24
4	Government financial support for small farms is 33% less than for large farms.	0.06	2	0.12
5	Increased world wide awareness to eating high sugar diets has increased 15%.	0.05	1	0.05
6	Large companies have 20% higher economies of scale than our small farm.	0.04	3	0.12
7	Country GHI has political unrest that curtails our exports 40% to that region.	0.04	2	0.08
8	Local banks have reduced their lending to small firms by 33% in the prior two years.	0.03	3	0.09
9	Demand for packaged meats is growing 8% annually yet we do not package meats.	0.03	4	0.12
10	Transportation (trucking) costs are increasing 10% annually yet we own no 18-wheel trucks.	0.02	3	0.06
	Total EFE Score	**1.00**		**2.50**

Internal Factor Evaluation (IFE) Matrix

Analogously, after utilizing online and offline sources such as those described in Exhibit 1 to obtain key AQCD internal strengths and weaknesses facing the firm, an IFE Matrix can be developed. The purpose of the IFE is to access how well the firm's current strategies are capitalizing on the current top 10 strengths and improving upon the top 10 weaknesses facing the firm. Just as with development of an EFE Matrix, the "weight" in an IFE Matrix represents "importance of the factor to success in the industry" and does not pertain to the focal business. In contrast, the "rating" is related to how well the focal firm's current strategies are addressing or capitalizing on the external factors, based on a scale of 1 to 4, as follows:

1. Response is poor
2. Response is below average
3. Response is above average
4. Response is superior

Exhibit 3 provides an example for a small European agribusiness. Note in Exhibit 3 that key strengths and weaknesses are listed from high weight to low weight to reveal an array of "most important" to "least important" factors. Note also that working row-by-row in the matrix, weights are multiplied by ratings to obtain weighted scores, and weighted scores are summed to yield a total weighted score at the bottom right of the matrix. A total weighted score of 2.5 again would indicate that the firm's strategies are performing "average" on capitalizing upon strengths and improving its weaknesses, since 2.5 is the mid-point between a low of 1.0 and a high of 4.0 possible for a total weighted score.

Exhibit 3. A Hypothetical IFE Matrix for a Small European Agribusiness

	Strengths	Weight	Rating	Weighted Score
1	New irrigation systems give us 40% better insurance against possible droughts.	0.10	1	0.10
2	Our vendors are asking for more of our product, up 14% annually the last two years.	0.09	3	0.27
3	The pooling of 25% of our agricultural output has enabled us to increase our downstream bargaining power with prospective buyers in addition to our upstream bargaining power with suppliers.	0.08	2	0.16
4	Our profit margin for grain production increased from 6% to 10% in 2019 vs 2018.	0.05	2	0.10
5	We increased our # of vineyards by 10% in 2019 vs 2018.	0.04	2	0.08
6	Our waste and pollution control systems were improved 30% in 2019.	0.04	4	0.16
7	Our two new combines have enabled our labor costs to decrease 31%.	0.03	3	0.09
8	In June 2019, we obtained a new line of credit for $500,000 from XYZ Bank.	0.03	3	0.09
9	We social marketing and website effectiveness improved 40% in the last twelve months.	0.03	4	0.12
10	We hired a new accountant and technology officer in 2019.	0.02	1	0.02

	Weaknesses	Weight	Rating	Weighted Score
1	Our exports to other countries declined 7% from 2108 to 2019.	0.08	2	0.16
2	Our labor costs related to apple harvesting grew 8% from 2018 to 2019.	0.07	3	0.21
3	We have no clear vision, mission, or long-range objectives.	0.07	2	0.14
4	We only obtain 35% of customers from online versus rival firms that average 50%.	0.05	3	0.15
5	Our employee morale has declined 10% in past twelve months due to large farms encroaching on our business.	0.05	4	0.20
6	Our fruit tree operations yield only a 4% annual return versus 12% for our key rival firm.	0.05	3	0.15
7	Our fertilizer suppliers are merging and increasing prices to us by 5% annually.	0.04	4	0.16
8	Our available cleared land is 25% of what we need given our 10% annual growth.	0.04	2	0.08
9	The average age of our equipment is 14 years versus 8 years for our key rival firm.	0.03	3	0.09
10	Our return on investment for turkey operations is 6% compared to our 11% average overall.	0.01	1	0.01
	Total IFE Score	**1.00**		**2.54**

SWOT Analysis

Once EFE and IFE matrices have been developed, SWOT analysis can be performed. The foundation for SWOT analysis is the matching of key external and internal factors (Weichrich, 1982). A useful matching tool, the SWOT analysis, aids managers in constructing four types of strategies: SO (strengths-opportunities) strategies, WO (weaknesses-opportunities) strategies, ST (strengths-threats) strategies, and WT (weaknesses-threats) strategies. Linking important external and internal factors is a critically important activity in strategic planning. Thousands of organizations and companies annually perform SWOT (strength-weakness-opportunity-threat) analysis. However, most of those entities incorporate way too much vagueness in the process. Vagueness is disastrous in strategic planning (George, MacMillan, 1985; Love et al., 2002), thus providing part of the impetus for this paper. Underlying external and internal factors that comprise SWOT analysis need to be specific in order to provide an adequate foundation for the generation of strategies (David et al., 2019). The need for specificity is where AQCD (actionable, quantitative, comparative, and divisional) comes into play. SWOT analysis is considered by many to be the most commonly used planning tool for strategic management in the world, and AQCD factors are mandatory for its success.

This paper reveals how and why the key to effective SWOT analysis and strategic planning is the inclusion of external and internal factors that meet AQCD (actionable-quantitative-comparative-divisional) criteria. Each external and internal factor included in a SWOT analysis needs to be stated in AQCD terms to the extent possible in order to minimize misinterpretation and to pave the way for the generation of strategies that are sufficiently specific, enabling the assignment of costs to those actions. The need for specificity is too commonly neglected in doing strategic planning. Small agribusinesses can gain competitive advantages in the marketplace by formulating and implementing effective strategies.

An Exemplary SWOT Matrix for a Small Agribusiness

In order to describe how the new, proposed EFE/IFE/SWOT with AQCD methodology can be effectively applied in the small European agribusiness sector, Exhibit 4 provides a comprehensive SWOT Matrix developed for a hypothetical small agribusiness firm. Note the high level of specificity among the external and internal factors listed, which provides a basis for a high level of specificity among the resultant strategies. Note the SWOT matrix includes the same external and internal factors listed previously in the EFE and IFE matrices respectively. As shown in Exhibit 4, more factors that just the 20 provided in the EFE and IFE may be included in a SWOT, but the key aspect of SWOT is the generation of feasible alternative SO, WO, ST, and WT strategies that should be considered for implementation by the firm.

Exhibit 4. A Hypothetical SWOT Matrix for a Small Agribusiness

Strengths

1. We increased our # of vineyards by 10% in 2019 vs 2018.
2. Our profit margin for grain production increased from 6% to 10% in 2019 vs 2018.
3. Our two new combines have enabled our labour costs to decrease 31%.
4. In June 2019, we obtained a new line of credit for USD 500,000 from XYZ Bank.
5. New irrigation systems give us 40% better insurance against possible droughts.
6. Our vendors are asking for more of our product, up 14% annually the last two years.
7. We social marketing and website effectiveness improved 40% in the last twelve months.
8. Our waste and pollution control systems were improved 30% in 2019.

9. We hired a new accountant and technology officer in 2019.
10. The pooling of 25% of our agricultural output has enabled us to increase our downstream bargaining power with prospective buyers in addition to our upstream bargaining power with suppliers.

Weaknesses

1. Our fertilizer suppliers are merging and increasing prices to us by 5% annually.
2. Our labour costs related to apple harvesting grew 8% from 2018 to 2019.
3. Our exports to other countries declined 7% from 2108 to 2019.
4. Our available cleared land is 25% of what we need given our 10% annual growth.
5. Our return on investment for turkey operations is 6% compared to our 11% average overall.
6. We only obtain 35% of customers from online versus rival firms that average 50%.
7. We have no clear vision, mission, or long-range objectives.
8. Our employee morale has declined 10% in past twelve months due to large farms encroaching on our business.
9. Our fruit tree operations yield only a 4% annual return versus 12% for our key rival firm.
10. The average age of our equipment is 14 years versus 8 years for our key rival firm.
11. Our marketing budget is handled externally by a firm who does not fully understand our industry.

Opportunities

1. Our country's GDP increased from 3% to 4% in the last two years.
2. A close rival agribusiness, ABC Company, is liquidating and seeking a buyer.
3. Political support for small agribusinesses is growing 10% annually.
4. A neighbouring country, DEF, to the north has a 5% GDP.
5. Interest rates have declined to 5% from 7% two years prior.
6. Our country's political stability has improved 25% in two years.
7. China has increased its imports of fruit from our country by 20% from a year ago.
8. Russia has reduced its exports of grain by 25%, so prices for our grain have increased 15%.
9. The demand for poultry products is increasing 10% annually.
10. The market price for eggs is growing 8% annually.

11. cooperative businesses to help support family farm economic operations is to facilitate the creation of economies of scale
12. Our pesticide supplier has lowered prices 12% annually the last two years.
13. Generally cooperatives are discussed as aiding the value chain in a vertical fashion, yet horizontal benefits of cooperatives are a benefit that should not be over looked.
14. Foods such as dairy and fruits & vegetables that spoil much more dependent on quality cooperative business alliances.
15. Our small peers are increasingly turning to forming their own smaller cooperatives specializing on a geographic region or creating other specialization in their products or services.
16. Rural Development Program lowered annual turnover minimums for establishing producer programs.
17. Increased need for interdependence of marketing and agriculture production.

Threats

1. Consumption of red meat is declining nationally by 5% annually.
2. The population of our country is declining 3% annually.
3. Large companies have 20% higher economies of scale than our small farm.
4. Local banks have reduced their lending to small firms by 33% in the prior two years.
5. Country GHI has political unrest that curtails our exports 40% to that region.
6. Transportation (trucking) costs are increasing 10% annually yet we own no 18-wheel trucks.
7. Demand for packaged meats is growing 8% annually yet we do not package meats.
8. The market share of large cooperatives has grown to 60%, while small farms' market share has declined to 30% in neighbouring country RST; small farm MNO in RST is available for sale.
9. Increased worldwide awareness to eating high sugar diets has increased 15%.
10. Government financial support for small farms is 33% less than for large farms.
11. A significant barrier to forming cooperatives is a lack of trust between farmers, producers, and traders.
12. The broken tradition of private farming and damaged links between elements on the value chain also contribute for limited distribution of networks.
13. With the short time window for many products such as fruits & vegetables creating limited opportunity for additional value creation in these items also can be attributed to the decline in cooperatives.

14. With many small to medium sized agricultural businesses, often too small to participate in larger cooperatives or fully qualify for funding from government agencies.
15. In the past decade, the market share of small farms in Eastern Europe has declined significantly as large farms and cooperatives using more advanced technologies have grown dramatically.

Exhibit 5. SWOT Strategies (need to re label these as numbers have changed and probably write a few new ones to address the higher weights)

SO Strategies

1. Increase our beef exports to DEF country by 10% annually (S1, O4)
2. Acquire ABC Company (S4, O2)
3. Increase our grain exports to neighbouring countries by 20% annually (S3, O8)
4. Launch an email campaign in country DEF to obtain new customers (S8, O4).

ST Strategies

1. Increase our poultry production by 10% annually (S5, T1).
2. Shift 25% of our marketing effort from beef to pork operations (S2, T1).
3. Purchase two new 18-wheel trucks to transport our product to markets regionally (S7, T6).
4. Increase our advertising 15% annually to promote our clean operations (S8, S9, T9).

WO Strategies

1. Purchase 1,000 more turkeys to gain economies of scale in these operations (W5, O9).
2. Acquire ABC Company that has much needed new equipment (W10, O2).
3. Increase our marketing efforts in China by 25% annually (W3, O7).
4. Build two new one-acre hen houses (W9, O9).

WT Strategies

1. Acquire small farm MNO in country RST at below market value of 12M USD (W4, T8).
2. Acquire a poultry packaging operation in neighbouring country GHI (W9, T2, T5, T7).
3. Clear 30 more acres of our owned land this year (W4, T3, T8).
4. Lease 50 more acres of land that adjoins our farm (W4, T3, T8).

Conclusion

Every day small agribusinesses make strategic decisions regarding what crops to grow, what livestock to increase in numbers, what suppliers to use, what customers to offer discounts, and what new equipment to purchase. A small firm's survival can hinge on these types of decisions being made correctly. Deciding what to produce and where, when, and how to compete is what leads to a sustainable competitive advantage. Even the best strategies must be implemented well through operational- or tactical-level activities like hiring and motivating employees, cutting costs, benchmarking, outsourcing, securing financing, and keeping facilities warm (or cool). Implementation activities are vitally important and must be monitored by strategists. However, effectively formulated strategies, more so than operational tactics, are generally what lead to sustained competitive advantage. Accordingly, this paper aims to enhance the strategy formulation process engaged in by small European agribusinesses by proposing the new EFE/IFE/SWOT/AQCD methodology.

To gain a sustainable competitive advantage, small agribusiness firms need to provide unique products and services. Uniqueness matters. For example, growing organic products or providing superior animal welfare can offer competitive advantages in agribusiness. To assure "effective uniqueness," small firms must accept concessions in the strategy process to gain a sustainable competitive. All successful firms thus make trade-offs and tough decisions to establish uniqueness in developing, producing, and selling products and/or services.

A well-developed strategy is synonymous with a game plan for an organization. Profit margins among agribusiness firms are generally so miniscule that there is working slack left for mistakes in the strategic plan. A strategy plan results from difficult managerial decisions being made among numerous attractive and viable alternatives, and it signals devotion to select markets, select policies, select procedures, and select operations in lieu of other, alternative courses of action. The essence of strategic planning is gaining and maintaining competitive advantage. This paper aims to arm small European agribusinesses with a powerful new strategic planning methodology, EFE/IFE/SWOT/AQCD analysis, which can enable small firms to outperform their larger counterparts.

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APPLICATION OF ADVANCED TECHNOLOGIES IN THE FIELD OF SUSTAINABLE AGRICULTURE[1]

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Abstract

With the development of new software solutions, techniques and methods, conditions have been created for modern advanced technologies to find their place in agriculture. Modern technologies must increase productivity per unit area while reducing production costs. Modern technologies include the application of Global Positioning System (GPS), Geographic Information Systems (GIS), Remote Sensing (RS), Variable Rate Technology. Research using these technologies has a wide range of uses in agriculture: determining the extent of land capacity utilization; space; study of soil quality for individual crops; determining the degree of contamination of plants; determining vegetation status; determination of damage caused by natural disasters; forecasting yields at different stages of vegetation and relatively quickly and inexpensively can provide timely information on the crop. The aim was to analyse and review modern advanced technologies and their contribution to sustainable agricultural production, which is in the function of producing health-safe food, developing rural areas and protecting the environment. The use of advanced technologies contributes to optimizing investments, reducing losses and maximizing revenue.

Key words: advanced technologies, sustainable agriculture, modern technologies.

Introduction

The development of agriculture is conditioned not just by natural, but by economic and political factors as well. Along with globalization and advanced technology development came a growing economic dependence between countries. At the end of the 21st century, as foreseen by The United Nations, earth will be inhabited by 10 billion people. The right choice of technology

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1 Paper work is part of the project research no. III46006, financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

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may result in constant economic growth accompanied by the simultaneous respect of nature. For the growth to be in harmony with ecology and ecological demands, the world's economy must develop in a different way in the future (Praća et al., 2017). In plant cultivation technology, it is also important to rationally apply nitrogenous fertilizers, therefore avoiding water pollution. (Cvijanović et al., 2013; Dozet et al., 2013). Advanced technologies have an important role in all spheres of human activities. One of them is agriculture, where they have the role of enabling agricultural producers or employees in some organisation to collect and use necessary information as easily as possible, as well as to communicate with other people in the organisation, and henceforth contribute to the making of right decisions. The past modest use of advanced technologies in our country's agriculture is explained via economic arguments. New scientific knowledge and application of technological achievements (technological innovations) enable a greater growth of necessary food amounts than the growth deemed by some as difficult to meet the needs of an ever growing population.[4]

With the development of new software solutions, techniques and methods, and an ever greater presence of computers, conditions for implementing contemporary advanced technologies in agriculture have been established. This primarily concerns sophisticated equipment that is installed in agricultural machines. The Global Positioning System (GPS)[5] is used to determine the exact location of an agricultural machine, at an exact moment in time. Collected data is used for determining location so that, during sowing or application of fertilizer or protective mediums, the exact necessity of intermediate goods at a certain spot can be known. For a precise agriculture, valid maps with soil characteristics are needed, whilst classic methods of soil sampling and analysis are not significantly helpful. Graphic organisation of soil data is best obtained in real time via satellites and GIS methods. There is a need for integral solutions obtained on the basis of integral information. As a response to that need, the Market Information Systems (MIS) concept was introduced. In this paper, contemporary advanced technologies and their contribution to agricultural production. The new era of agriculture demands new, sustainable solutions and technologies, as to enable producers to produce more, while investing less. Universal solutions for overcoming future obstacles are given to

4 Available at: http://artnit.net/dru%C5%A1tvo/item/638-tomas-robert-maltus-porast-stanovni%C5%A1tva.html,accessed at: 19th November 2019.

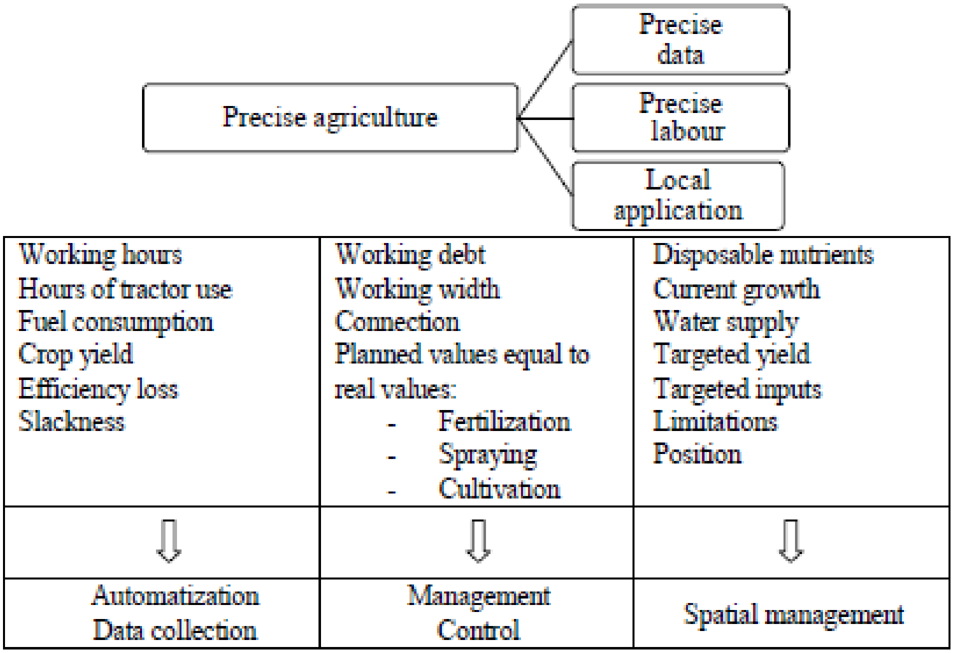
5 Available at: www.poljoberza.net/AutorskiTekstoviJedan.aspx?ime=AR00308_1.htm&autor=12

producers via protecting crops by making a good choice of seeds and by using tools of digital agriculture. The development of Information and Communication Technologies (ICT) enabled new solutions in the field of agriculture, as well as among others. The use of ICTs enables monitoring and documenting production, and with the help of a suitable Geographic Information System (GIS), data processing and labour process management as well. Advantages that come with the use of advanced technologies in agriculture are undoubtable, yet the level of their application in our country is low-lying. The prime reasons for this are the lack of professionals' engagement in this field and insufficient education of agricultural engineers. Farmers should be trained to efficiently use new advanced technologies. The aim was to analyse and review modern advanced technologies and their contribution to sustainable agricultural production, which is in the function of producing health-safe food, developing rural areas and protecting the environment.

New Concept of Agricultural Production - Precise Agriculture

Precision Agriculture (PA) was already defined in the first half of the 20th century and therefore resembles a relatively new scientific approach to agricultural production worldwide. The basic concept consists of using inputs in accordance with needs and being able to describe soil condition (geological, hydrogeological, sanitary and hygienic characteristics, self-refinement and contaminant migration capabilities, as well as the microbiological soil complex). Nowadays, the term „precise agriculture" is acquainted with certain new techniques which are used in the process of agricultural production (Ludowicz, et al., 2002). The key to precise agriculture is data obtained during production. The private sector of today, which disposes of vast production surfaces, cannot even imagine it's business without the help of contemporary technology. The need for Information Technology (IT) in the sector of agriculture is becoming ever greater. „Precise agriculture" resembles the application of advanced technologies, GIS and GPS in managing agricultural production. It is an agricultural system that has the potential to dramatically change 21st agriculture. Precise agriculture is a proactive approach which reduces risks in agriculture. It is in essence ecological, because it contributes the preservation of natural resources (Bongiovani, Lowenberg DeBoer, 2004).

Scheme 1. Schematic depiction of the precise agriculture concept

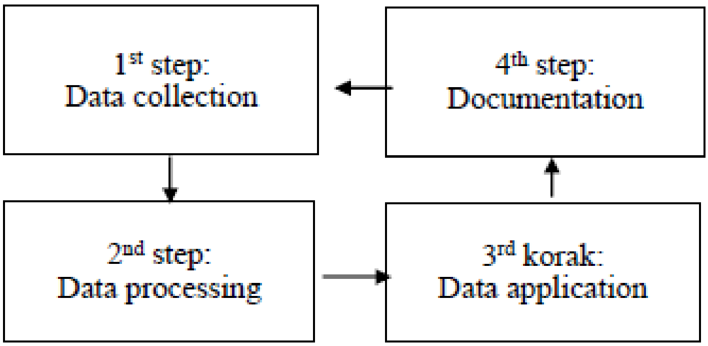


Farmers in developed countries have started using laser-controlled levellers for precise levelling and irrigating vast agricultural surfaces for the first time in the 1970's. The starting hypothesis of precise agriculture is based on a great number of precise data necessary for decision making. Immediate comparison of perennial parameters obtained from plots enables optimal means of production utilization, minimizes ecological risks, enhances product quality and, foremost, increases production profitability, i.e. profits (Marković et al., 2013). The precise agriculture concept is depicted in Scheme 1. The principles of „precise agriculture" can be achieved by applying new techniques: fitting in pathways[6] - leading agricultural mechanisation via GPS, technology of changeable norms, yield mapping, remote sensing, geo-information system (data processing and analysis). Precise agriculture increases productivity, diminishes production cost and diminishes negative influence on the environment. These systems were designed to be applied in all fields of agricultural production, from crops to dairy farms, and the technology is acknowledged all over the world. Precise agriculture includes geo-information technology application, as well as agricultural means (use of computers and satellite locating), databases, statistics and farmland and climate modelling. It also includes connect-

6 Available at: www.poljoberza.net/AutorskiTekstoviJedan.aspx?ime=AR00308_1.htm&autor=12, accessed at: 24th November 2019.

ing geo-informatics, biotechnology and bio-technics. Precise agriculture depends on a precise monitoring process (sensors for temperature, humidity, lighting, etc.), estimating the ultimate result via models and computer simulations and the analysis of various scenarios that are helpful during profitable decision making. When an optimal decision is made, for it to be realized, it is necessary to have adequate, precise machines and intelligent tools used for conducting precise activities. For precise agriculture to be implemented, a strong connection between electronics, advanced technologies and communications is needed. An ever greater amount of data is of vital significance for precise agriculture, since they will help farmers during their decision making (Scheme 2.). Producers that have a management-type approach during production also achieve greater profits.

Scheme 2. Principles of Precise Agriculture



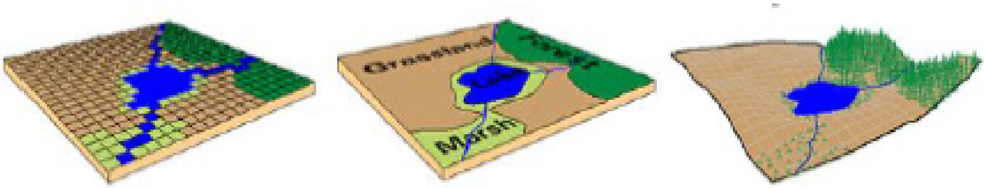
Information Technologies and Precise Agricultural

Digital geographic data that may be reconciled, analysed and shown in multiple presentations make the core of precise agriculture. Systems that are used for managing this data are called geographic information systems[7]. Geographic information systems are available in a wide range of price and capability, yet showing geographic data is something they all have in common. GIS operates via two fundamentally different models for real world depiction in digital form: vector and raster (Picture 1.). The vector model represents our surroundings in the form of dots, lines and polygons (surfaces). These geometric elements are kept as pairs of X, Y coordinates. The raster model is exceptionally adequate for that kind of values. A raster picture is (e.g. a scanned map) resembles a matrix, where every cell has specific attributes and values (Čekeravac et al., 2010). GIS can also be seen as a decision making support system. It enables spatially-referent data integration for

7 Available at: http://yuinfo.artkey.rs/zbornici/2012/html/pdf/581.pdf, accessed at: 24th November 2019.

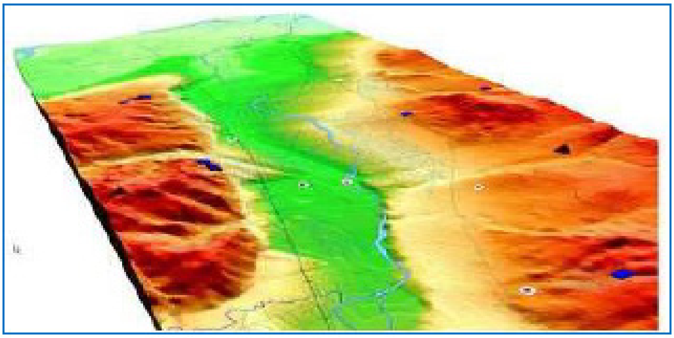
solving problems. Agriculture is an ideal field for applying geographic information systems, because it represents a natural resource, demands movement, large product amount and service distribution. Almost all agriculture-related data has some spatial component, and it is exactly GIS that enables the visualisation of that data, extenuating its interpretation and transforming it into information.

Picture 1. Raster, vector and real model



The visualisation of information in map form has many significant advantages in comparison to numeric reports. GIS enables creating various forms of reports - from themed maps to 3D terrain models, via multimedia depictions to classical tabular reports (Picture 2).

Picture 2. 3D model of the terrain of Niš and its surroundings – depiction with water conduit objects[8]



The significance of GIS for agricultural needs is ever growing. GIS is an advanced technology that will accelerate agricultural spatial data assemblage, management and analysis, e.g. when one country's precipitation data could be connected with aerial footage of the same country, knowing which parts are arid and in which part of the year could be possible. One of the more important roles of GIS in precise agriculture is the ability to place agricultural data in a base, as well as their further utilization during decision making. That data can be related to: espaliers, tilths,

8 Available at: http://yuinfo.artkey.rs/zbornici/2012/html/pdf/581.pdf, accessed at: 24th November 2019.

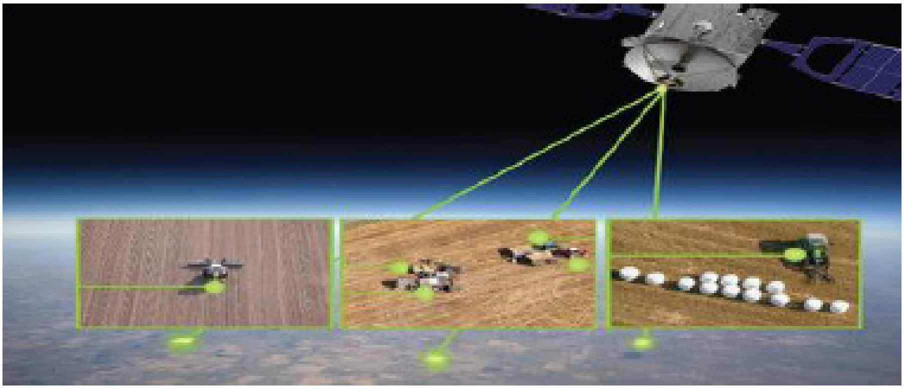
roads, yields, etc. GIS can integrate all kinds of precise agriculture data and connect them with other decision making support tools, as well as presenting them in the form of electronic or printed maps. All those who use GIS in agriculture recognise great potential in this technology's application. Agricultural surfaces monitoring – a geographic database has been created; it was organized through multiple layers, so that the ability of tracking the condition of agricultural production reached an exceptionally large scale. This was one of the first demands that the public sector had for the deliverers of this system, because every year significant means of help and subsidies are set aside for farmers. GIS also enables daily data updates and tracking the state of certain agricultural segments that are of interest to inspectoral supervision (crops, water surfaces, forest surfaces, hunting estates). By using spectral analysis via remote sensing it is possible to identify crop sorts on specific plots and thereby control all parts that are out of inspectoral reach (Manić et al., 2016). Number of users in agricultural production is still miniscule in comparison with other sectors. However, there is lack of formal options for sharing innovations and GIS applications, directly focused on agriculture.

Creating More Efficient Agriculture by Enhancing Yield and Quality

There are several advantage groups of using advanced technologies in agriculture: 1st group - reducing workforce and reducing man's influence on production¸ 2nd group - time saving, money saving and controlled production circumstances. Concerning plant production, there will be an ever greater presence of sensors that are placed on the plant itself, or stabbed in the soil to measure its moisture and the amount of sun rays. Considering the widespread opinion that „one who did not step into a furrow knows nothing about soil", modern technologies confront a whole lot of remote sensing gadgets. They are sensory platforms on robots, drones, strategically placed on towers and similar places. Collected data is processed and transformed into useful information for agricultural producers.

Republic of Serbia is the only non-EU country that receives data from sentinel satellites, launched within the European Space Agency programme. The pictures are of such resolution that the state of crops could be seen, as well as the need for additional irrigation or fertilization in certain areas (Picture 3.). One of the sectors that are of great significance for the Republic of Serbia, which is traditionally perceived as branch of industry with minor digitalisation potential is agriculture. However, digitalisation could bring significant positive changes in this field. A suggested net of different kinds of sensors, placed throughout a certain area, will be capable of generating vast amounts of exceptionally valuable data in real time, which was inaccessible in the past. By introducing digitalisation to agricultural production, agricultural producers are given the chance to secure practical and useful tools for decision making.

Picture 3. Surveillance of agricultural land via satellite[9]



Production could be personalised via identifying the necessary amount of time and amount of every input which is used in production in every field, i.e. maximally optimising production for every producer by reducing production costs. The fourth industrial revolution (digitalisation) concerns the use of various technologies, which enable real and digital world fusion. IT, AI, robotics, the internet, nanotechnology, etc. are just some developed contemporary technologies that have the potential to fundamentally change the world we live in. Various sensors that produce data, placed on plants or animals, in the soil, on drones, robots or satellites, enable reviewing complex agricultural processes. For example, understanding why even the best producers in Serbia on some parts of their plots have yield differences that vary in multiple scores, even though they use all agro technical measures equally. That way, it is possible to give farmers advice on which variety to sow and on which parcel, simultaneously enhancing the yield and reducing risk without additional financial investments. The Serbian institute BioSens is nowadays recognized as one of the world's leading scientific institutions which focus on agriculture. Serbia's Digital agriculture has already come to life through the platform „AgroSens", which has gained 5,000 users throughout a period of just few months. These users have access to various information related to their production plot, as well as the possibility of tracking development or detecting problems via satellite scans, even by using their own mobile phones, all with no compensation. Thanks to BioSens' project „Antares", a scan of the entire Republic of Serbia is made every five days,

9 Available at: www.agroservis.rs/institut-biosens, accessed at: 25th September 2019.

visible by the platform „AgroSens“ and computer and mobile phone applications. Therefore all interested farmers have a review of their parcels on the palms of their hands. The platform „AgroSens“ gives free services, such as the journal of agricultural activities, satellite crop indexes that describe plant growth soil analysis, seed catalogues and chemical preparations catalogues, information on disease and pest occurrences, precise weather forecasts for the area surrounding the plot in a 2 km radius. AgroSens' services currently have about 10,000 users, i.e. 50,000 ha in their system. BioSenshas also created the platform „ApiSens“, intended for apiarists, with a map of the best „pastures“ for melliferous insects. BioSens has opened a digital farm near Bačka Topola, as part of the agricultural enterprise „Krivaja“. Sensors for soil moisture and leaf moisture have been set on more than 2,000 ha. The plant's need for nitrogen is being determined, early-stage diseases are being detected. Drones for mapping the terrain and tracking plant growth are also placed here, as well as the communication system „Lora“, which transports information to servers. Besides that, there are self-propelled tractors with attachments, which are controlled via GPS. The digital farm also includes robots „Sosa“ and „Lala“. At the field, they can determine soil quality and what is best for sowing on certain field. In doing so, they are helped by sentinel satellites. They flawlessly estimate weather or not fruit has reached its maximal amount of sugar.

Use of GPS in Precise Agriculture

GPS satellites cover the entire Earth's surface and are of use for precise location determining, with a precision of a few meters. GPS gadgets help determine the current location of agricultural machines or vehicles. In precise agriculture, instantly determining the position of some spot on the plot is of primary significance, weather that spot resembles the position of an agricultural machine or a spot where soil was sampled. Installed in tractors and combines, GPS receivers give the exact geographic position, as well as the precise time of labour. Altogether with information on current yield levels, amount of liquid used by atomisers and sowing density, this data becomes important for further analysis in the following fazes of cultivation (Gavrić, Sekulić, 2004). The use of GPS in our country is still limited, but wider implementation should be expected. Currently it is mostly used in various terrain scans related to weed growth, water insufficiency caused plant stress, plant colour, growth, etc. Results of these scans are further used for mapping GIS systems. In the future, GPS should contribute to enhancing yields in agriculture without endangering soil quality.

Remote Detection

Remote sensing has a significant role in tracking and estimating yields, because seasonal changes in comparison with the biological crop life cycle can be tracked and estimated. According to Balqies and Samih (2009), agriculture is one of the most significant and most voluminous fields of remote sensing usage. To manage agriculture sustainably, remote sensing, along with other advanced techniques such as GPS and GIS, play a great role in estimating and managing agricultural activities (Shanmugapriya et al., 2019). Via remote sensing and research, it's possible to obtain valuable data which can be further used for estimating plant condition indicators, physiological changes due to stress caused by varying weather conditions (Menon, 2012). In arid and semi-arid periods, rational and timely use of water could be enabled by information obtained by remote sensing (difference in temperature, plant evapotranspiration).Remote research data could be used to calculate drought indexes that combine soil surface temperature data and data on temperature indexes during vegetation and precipitation data obtained from satellites. The remote sensing system can be used for solving water shortage problems on specific parts of agricultural surfaces where the same crop has been sown. This way, an equalized yield can be achieved with rational use of water. Multispectral images scanned by satellites or aeroplanes offer a wide spectrum of information, such as water insufficiency, plant health, plant stress, weed presence, etc. Remote sensing (processing) has an important role, securing constant collecting of data on agricultural crops during development. Two critical limitations for using current satellite sensors in crop management in real time are the lack of pictures with optimal spatial and spectral resolutions and inconvenient weather for reviewing in most plant stress detection applications. Alternatives based on aviator platforms are lacking due to high operatory costs. The elementary requirement for giving useful sensory gadgets in agriculture is the capability of combining high spatial resolution and a swift turnover period. Sensors for remote sensing placed on pilotless aircrafts could enable access for accomplishing critical spatial, spectral and weather resolution requirements (Berni et al., 2009). Remote sensing is used for: detecting soil characteristics (texture, content, moisture), detecting crops (plant presence, yield rate, water insufficiency stress), detecting fertilizer and weed presence. After remote data sensing (commonly pictures), multispectral data is placed into a computer that henceforth calculates the necessary amount of water and chemicals (Hadeel et al., 2011). Remote data processing is expensive. Many companies offer systems for processing which can be installed directly on a tractor in movement. These sensors perform spectral processing on the basis of which plant growth and health can be determined. The advantage of this kind of processing lies in the fact that it is not influenced by light disturbances (devices have their own light), such as clouds or shadows. The advantage is that they can also be used during night time. Also, if implemented correctly, variable rate technology (VRT) is a functional concept and it can be successfully used in agriculture. It has the potential to enhance input efficiency, on-field profitability and environmental management. VRT has to enhance field profitability or ecological management profitability, otherwise farmers should not be using it. VRT usage success depends on the field, crops, geographic area, pests, nutritive substances, soil, management variability and capability (Sawyer, 1994). Economic profit achieved by using satellite positioning and automatic management is not the same for all plant species and applied agro-technical measures. By using new information technology (GPS), carrying out agricultural work at the right time is enabled, just as preventing problem occurrence. Thanks to precise data, it is possible to calculate needed doses of fertilizer, pesticides and water, by which significant savings are achieved.

Precise Agriculture and Irrigation

The most contemporary technology which is rapidly developing and enhancing the development of new concepts in plant production is the concept of precise agriculture (Luecke, Katz, 2003).

For agriculture to be competitive and stable, in circumstances of climate change, imposing irrigation as an obligatory agro-technical measure is ever more present. Besides protecting the environment, precise agriculture must satisfy the needs of energetic and economic efficiency which is expressed through the needs of irrigation. Today, usage of systems whose sprinklers can be turned on/off in accordance with soil moisture is present. The farm owner can supervise the process via internet (web page). By using an application – smart irrigation, water amount can be controlled on the basis of putting in information obtained through remote research concerning water needs, which would cut water loss, considering that majority of the world's countries suffer from water shortages. According to Sadler et al. (2005), precise irrigation is saving 10-15% of water used by conventional irrigation techniques.

Precise Agriculture and Plant Protection

In precise agriculture, an ever greater role is being taken by contemporary technical solutions which are related to the use of chemical protective mediums in plant production. On the basis of data obtained via sensors placed in the soil, the amount of pesticides can be brought to accord with plant needs, which reduces costs, and on a greater scale protects the environment from pollution.

New technology enables forehand regulation of applied amounts of medium, using maps made in advance. In practice, sensory approach is applied for wiping out weeds on agricultural land. One type of sensors that are used works in the infrared part of the spectrum, and is placed on a tractor or on a self-propelled machine used for plant protection. Therefore, during the entire period of the tractor's movement, the crop is being scanned. Since the plant has its own reflection, the sensor scans it and that way detects the plant's state, i.e. its vegetative index. Depending on the plant's colour intensity, it directly communicates with the directory unit and therefore changes the application dose. The downside of these systems is their ever greater complexity and higher price, and they are often unreachable for a wider range of users. Using modern versions of sprinklers requires a higher level of workforce training and periodic checks of the machine-installed electronic equipment's calibration (Jojić, 2019).

Machines and Equipment and Precise Agriculture

Existing machines and equipment must be better connected and controlled on the farmer's estate. With innovations and technical solutions that can be applied, an average of approximately 1 EUR/ha could be saved through operations of cultivating arable land, and 4 EUR/ha for sowing (Jojić, 2019). The saving span depends on applied production technology, i.e. number of operations and operation requirements. By enlarging the machine's grasp width, the machine's utilization becomes great, imprecision and overlapping is enlarged, and the use of satellite coordinating is in those cases economically more profitable. According to some statistics, even up to 16% of crop production costs are related to losses due to weather, material being squandered, and inefficient machine movement on the field. By using technologies of precise agriculture, such losses are reduced to an acceptable level of just 6-7%, i.e. more than double[10]. In agriculture, there is a great pressure to reduce production costs and enhance productivity, so as to lower the total procurement cost, and make products competitive. A great deal of agricultural producers in the Republic of Serbia cannot fulfil requirements concerning quality standards, quantity and continuity in supplying the market. To achieve quality and price competitiveness of agricultural products, it is necessary to implement new knowledge, to be innovative and to have technological progress. By saving inputs it is possible to reduce costs, which allows greater profits. By applying precise agriculture, i.e. precise plant nutrition, it is possible to achieve exact determination of every parcel's content and reach suggestions for enhancing those parts, since not all plots are

10 Available at: www.greensoft.co/rs/medija-centar/clanci/67/informacione-tehnologije-u-poljoprivredi/, accessed at: 15thJanuary 2019.

the same (e.g. on one parcel, certain parts have some problem or some parts give a greater yield, some medium, etc.).The most important factors that influence economic profitability are: the size and shape of the arable surface, type of agricultural production, number and type of applications during the year, type and organisation of machinery, price of GPS systems for coordinating, overlap reduction, and thereby the reduction of input amount/price(material, fuel, etc.)for approximately 5-15%, induction of movement speed during operations by approximately 15%, workday extension i.e. inducing workforce and agricultural mechanisation productivity, possibility of working during night time and with reduced visibility with the same precision as during daylight (especially important for some operations, such as sprinkling), reduced coordinator fatigue (when automatic managing is in the question, the coordinator is focused on the attachment's performance).Money and time saving can be seen in the example of smaller fruit growers that do not live in near proximity to their plots, on which production is conducted. Controlled production conditions are important for both producers, because everybody wants good quality yields and high profits. Table 1. shows cases of savings per hectare, total savings per crop and total savings for all crops in the season 2009/10 (Marković et al., 2013).

Table 1. Showcase of savings per hectare, total savings per crop and total savings for all crops in the season 2009/10.

Crop	Crop surface (ha)	Savings per crop per hectare (EUR)	Total savings per crop (EUR)
Corn	6,573	12.72	82,097
Wheat and barley	6,049	26.37	159,512
Soybean	2,384	7.13	16,450
Sugar beet	1,247	7.93	9,639
Lucerne	2,705	11.82	31,973
Total savings for all crops			301.980

As a final analytical result of potential savings by using satellite positioning on PKB estates, and by controlling tractors and other machines automatically, a sum of 301,980 EUR per season is obtained (Table 1.). The average saving per hectare for the sowing structure in the season of 2009/10 was 15.92 EUR/ha. This is direct saving in inputs and fuel. Productivity enhancements should be kept in mind regardless, as well as possible savings due to possible night time work conduction by using satellite positioning.

For contemporary agriculture to develop in new circumstances, new technologies are of importance, as well as climatic conditions. Climate has a strong impact on crop productivity and on water resource availability or shortage. Sustainable agriculture is based on using technology that maximizes productivity and simultaneously minimizes negative effects on natural (soil, water and biodiversity) and human (rural population and consumers) resources. Targeting the most efficient way of using resources, sustainable agriculture accepts social cohesion.

The sustainable development model includes behavioural change, public awareness, a system of values, political and individual responsibility and introducing new systems and technologies that can reduce the pressure upon the environment and contribute to the readiness of agriculture and our lifestyles for ecological change. Sustainable agricultural production and safe food supplying are becoming a priority in the world. Needs for spatial, aerial and water data usage are swiftly growing. There are ever greater demands for geospatial data, in the field of resources management, spatial planning, economy, environmental protection, etc. The use of advanced technologies, including satellite communication, computer modelling and smart sensor usage is widespread. For achieving goals of common national development, by rationally using natural resources, it is necessary to have access to quality geo-information. Advanced technology enables the fulfilment of such needs.

Conclusion

For inducing production efficiency, productivity and therefore price competitiveness in agriculture, it is necessary to make serious investments in equipment, structures, to use advanced technology and train estate employees.

Aiming revitalisation, but rural area development as well, it is especially necessary to possess technical and technological knowledge and innovations, as well as planning process and estate management support. The use of new technology such as GIS and other geospatial technology enables agricultural producers to recognize and analyse locations suitable for production. Precise agriculture is a field that uses advanced information technology for optimizing investments, reducing loss and maximizing profits. Modern information technology such as GPS, GIS and remote sensing enable: soil mapping, crop development following, estimating the need for irrigation or drainage, as well as calculating the necessity for plant nutrition mediums, damage due to natural calamities. The IT sector in agriculture enables pest protection plan-making, sustainable agriculture and the production of ecologically safe food. The main reasons and advantages of new technology development and utilization in agriculture are proven and unavoidable. Advantages of using modern information technology in agriculture are undoubtable, yet the degree of their implementation in our country is still low-lying, but beneficial for sustainable agriculture.

By applying new information technology (GPS), timely conduction of agricultural work is enabled, as is the prevention of problem occurrences. Thanks to precise data, it is possible to calculate necessary doses of fertilizer, pesticides and water, which allows significant savings. Using IT in agriculture enables yield induction and preservation, as well as greater profits. In precise agriculture, an ever greater role is taken by contemporary technical solutions that are related to the use of protective chemical mediums in plant production. On the basis of data obtained through sensors in soil, it is possible to bring pesticide amounts and plant needs to accord, which reduces costs, and on a greater scale protects the environment from being polluted. The advantages of „smart" agriculture are: saving time and money, controlled conditions of production and workforce reduction. It is proven that without the application of advanced technology in the field of sustainable agriculture, investment optimisation, loss reduction and profit induction cannot be possible, which indicates the mutual connection between advanced technology and sustainable agriculture. The use of GIS in agriculture of the Republic of Serbia was present in the past merely on a draft level, more than on a systematic one. In spite of the poor state of Serbia's agrarian sector, the benefits of implementing GIS in the system of agricultural management would be numerous. On the basis of all indicators, it can be concluded that the degree of advanced technology application and implementation in the Republic of Serbia is still on a low-lying level.

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(UNDER) DEVELOPMENT OF AGRICULTURAL INSURANCE IN SERBIA: CAUSES AND CONSEQUENCES

Gordana Radović[1]

Abstract

The main goal of paper is to present and analyse the current (under) development of agricultural insurance in Serbia. Agricultural insurance should be significantly more prevalent in Serbia given the quality of natural resources, the importance of agriculture for economic development, food security and employment of the population. The author believes that it is necessary to encourage the development of economic protection of agricultural production in Serbia. To this end, it is necessary to influence the development of awareness of agricultural producers and to consider the possibilities for introducing partially compulsory agricultural insurance in Serbia. The paper uses the descriptive method as well as the methods of analysis and synthesis.

Key words: agriculture, insurance, financing, development, Serbia.

Introduction

Agriculture is the oldest productive economic activity. It can be said that it is the most represented, because, at the global level, the largest number of people are engaged in this activity. Agriculture is characterized by biological and socio-economic specifics, which makes it more complex and demanding in terms of insurance than many other activities. Biological specificities of agriculture are: high risks of agricultural production, organic character of the production cycle, slow capital turnover, seasonal character of agricultural production, lack of specialization in production, and low utilization of capacity (Vasiljevic, 1998).

Agriculture insurance is a type of property insurance that combines crop production insurance, livestock insurance and several specific insurance sub-types that cover the dangers that threaten agricultural production or only certain insurance items.

Importance of agricultural insurance is linked to providing of economic security to policyholders - agricultural producers towards the adverse effects and disturbances occurring by the occurrence of an insured event, i.e. the realization of the risk covered

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by insurance. Agricultural insurance „plays a significant role in the framework of measures to protect and improve agricultural production" (Sredojevic et al., 2010).

The importance of agricultural insurance is often discussed in the literature from a risk management perspective. In the literature agricultural insurance defines as "a risk management segment, and its development depends on the cost-benefit ratio at the level of farms or agricultural enterprises, as well as on the potential supply in the insurance market" (Roberts, 2005).

Some authors consider "agricultural insurance, especially crop insurance, exists in many countries as an institutional response to current risks that accompany agricultural production" (Mishra, 1995). Also, state that "there are many forms of risk management in agriculture available to farmers, and one of them will almost certainly be the purchase of an insurance policy in every risk management program" (Chambers, Quiggin, 2004).

Various risk classifications accompanying agricultural production are present in the literature. Some authors consider the risks that accompany agricultural production are: personal, property, production, institutional and financial (Hardaker et al., 1997). Some authors consider include risks accompanying agricultural production: operational, financial and market. The cited authors believe that in the future, neither the risk of environmental and agro-terrorism as a form of terrorist activity should be ignored (Radovic, Pejanovic, 2015). Risks in agriculture can be broadly classified into property and personal. Also, the cited author believes that the risks in agriculture can be divided into three main groups: natural, social and economic (Ray, 2013). Some authors consider that the most significant agricultural risks are: adverse weather conditions, various plant diseases caused by the occurrence of pests, diseases of livestock, as well as variability in prices of raw materials and finished products (Miranda, Vedenov, 2001). Given the abundance of risks associated with agricultural production, it is clear that they should be reduced to the extent possible. To this end, an important instrument is to agricultural insurance.

In order to reduce potential losses, it is desirable to enlarge the cost of agricultural production for the cost of insurance, which results in higher investments required, i.e. the need for larger sources of financing. For this reason, and because of the unresolved problem of agricultural financing, agriculture in Serbia is very rare (Radovic, 2014).

The main goal of paper is to present and analyse the current (under) development of agricultural insurance in Serbia. Agricultural insurance should be significantly more prevalent in Serbia given the quality of natural resources, the significance of agriculture for development of rural areas, food security and employment of the population. The paper uses the descriptive method as well as the methods of analysis and synthesis.

Agricultural Insurance Market Potential

The potential of securing plant production in Serbia can be determined on the basis of data from the Strategy of Agriculture and Rural Development of the Republic of Serbia for the period 2014-2024. According to this document, agricultural land in Serbia spreads over 5 million ha. From that 71% is arable land and 29% is uncultivable land (OGRS, 2014).

Based on the data presented in Table 1. It can be concluded that arable land and gardens make up 65%, orchards 5%, and vineyards only 1% of the total agricultural land in Serbia.

Table 1. Structure of agricultural land in Serbia

Total agricultural land	**5.069.000 ha**
Arable agricultural land (arable land and gardens)	3.298.000 ha
Land under permanent crops from which:	289.000 ha
– orchards	238.000 ha
– vineyards	51.000 ha

Source: Authors' calculations according to OGRS, 2014.

The potential of animal insurance, or livestock production in Serbia, can also be determined on the basis of data from the current national Strategy for Agriculture and Rural Development. According to Strategy, Serbia has a favourable term for the development of livestock breeding. There are, also, significant unused livestock facilities, but livestock production has been declining for three decades. "In last ten years alone, the number of conditional heads per hectare of agricultural land has been reduced from 0.34 to 0.27" (OGRS, 2014).

The potential of animal insurance in Serbia is presented in Table 2. Based on these data, it can be concluded that cattle are the least represented in the structure of livestock.

Table 2. Number of livestock in Serbia

Number of head of cattle	**913.000**
Cows	451.000
milking cows	429.000
Pigs	3.144.000
Sheep	1.616.000
Poultry	23.450.000

Source: Authors' calculations according to OGRS, 2014.

According to statistics, the number of head of these types of livestock has decreased significantly over the last five years, and if this trend continues, livestock insurance will continue to be slightly represented in the portfolios of insurance companies operating in the domestic market. For example, in the period from 2008 to 2013 the number of head of cattle decreased by 14%, cows by 22%, dairy cows by 21% and pigs by 13%. In the observed period, the only increase was recorded in poultry by 36%, as well as a slight increase of 0.7% in the number of sheep (OGRS, 2014).

Risks covered by insurance

The risks of crop and fruits contained by the insurance terms of insurance companies operating in the territory of Serbia are shown in Table 3.

Table 3. Insured risks in plant production in Serbia

Basic insurance	Special insurance
Hail	Spring frost
Fire	Flood
Thunderstruck	Storm
	From loss of seed quality
	Protection of crops and fruits in greenhouse
	Protection of fruit trees and grapevines in the genus and until birth
	Protection of crops and fruits after harvest (vintage)
	Protection of crops and fruits from loss of quality
Supplementary insurance	
Freezing	

Source: Žarković, 2016.

In line with the increasing climate change, in the context of global warming and the increasing occurrence of droughts, there is a growing demand on the agricultural insurance market in Serbia to introduce both this practice and the insurance against this risk. Drought risk insurance has been on the agricultural insurance market in Serbia since 2010, but only to a limited extent. In particular, drought risk insurance is offered by only one insurance company. Other insurers avoid this coverage on the grounds that the risk of drought causes catastrophic damage and that the state would have to include it (Svet osiguranja, 2016). According to some estimates, every drought year in Serbia causes damage in the form of reduced yields of around EUR 500 million (Vasiljevic et al., 2013).

Table 4. Risks covered by livestock insurance in Serbia

Basic insurance	Supplementary insurance
Accident	loss in childbirth
disease with the consequence of death	loss of breeding capacity
forced slaughter	

Source: Žarković, 2016.

According to the information given in Table 4., the most common risks in livestock production are represented on the supply side of the agricultural insurance market in Serbia.

Development of agricultural insurance

Development of agricultural insurance in Serbia can be analysed based on:

1. the number of agricultural insurance policies, that is, the number of crop production and livestock insurance policies;
2. the share of agricultural insurance premiums in the total non-life insurance premiums;
3. the number of registered agricultural households exercising the right to recourse;
4. the share of disbursed funds for agricultural insurance premium payments in the agrarian budget.

Table 5. Number and structure of agricultural policy in Serbia in the period 2006-2018.

Year	Number of crop production insurance policies	Participation of crop production insurance policies in the total number of agricultur. insurance policies (%)	Number of livestock insurance policies	Participation of livestock production insurance policies in the total number of agricult. insurance policies (%)	Total number of agricult. insurance policies
2006.	9.351	80	2.278	20	11.629
2007.	10.305	80	2.582	20	12.887
2008.	15.186	87	2.250	13	17.436
2009.	10.165	85	1.807	15	11.972
2010.	11.172	90	1.212	10	12.384
2011.	11.548	89	1.487	11	13.035

Year	Number of crop production insurance policies	Participation of crop production insurance policies in the total number of agricultur. insurance policies (%)	Number of livestock insurance policies	Participation of livestock production insurance policies in the total number of agricult. insurance policies (%)	Total number of agricult. insurance policies
2012.	14.871	74	5.259	26	20.130
2013.	18.658	82	4.167	18	22.825
2014.	19.768	78	5.466	22	25.234
2015.	27.652	83	5.564	17	33.216
2016.	28.749	84	5.313	16	34.062
2017.	30.346	89	3.642	11	33.988
2018.	39.212	90	4.506	10	43.718
Average particip.	-	84	-	16	-

Source: NBS, 2019.

Table 5. shows the data on the number of agricultural insurance policies in Serbia, and the National Bank of Serbia website was used as a source of data. Based on data presented in Table 5, there could be made next conclusion towards the insurance at national level during the period 2006-2018:

a. the total number of agricultural insurance policies in Serbia has an upward trend, except in 2009. compared to 2008. and in 2017. compared to 2016.;

b. the total number of crop production insurance policies in Serbia has an upward trend, except in 2009. compared to 2008. and in 2017. compared to 2016.;

c. the total number of livestock insurance policies in Serbia does not have an upward trend, but on the contrary;

d. the total number of livestock insurance policies is significantly lower than the number of crop production insurance policies by individual years;

e. the average share of crop production insurance policies in the total number of agricultural insurance policies is 84%;

f. the average share of livestock insurance policies in the total number of agricultural insurance policies is 16%.

Table 6. Share of agricultural insurance premium in non-life insurance premium in Serbia in the period 2006-2018.

Year	Total agricultural insurance premium (000 RSD)	Total non-life insurance premium (000 RSD)	Participation of agricultural insurance premiums in non-life insurance premiums (%)
2006.	1.021.428	34.283.087	2,98
2007.	1.268.080	39.840.510	3,18
2008.	1.616.455	45.839.596	3,53
2009.	1.124.236	45.653.453	2,46
2010.	1.080.053	47.168.218	2,29
2011.	1.238.126	47.321.292	2,62
2012.	1.564.760	49.608.308	3,15
2013.	1.909.174	49.976.051	3,82
2014.	2.044.639	53.399.931	3,83
2015.	2.194.861	61.561.494	3,56
2016.	2.653.992	66.010.278	4,02
2017.	2.970.456	70.336.633	4,22
2018.	3.371.427	76.121.610	4,43
Average particip.	-	-	3,39

Source: NBS, 2019.

In line to data presented in Table 6., it could be seen that only 3.39% is the average share of agricultural insurance premiums in total non-life insurance premiums in the period 2006-2018. As the source of data used in analysis was recognised the NBS database.

Ministry in charge for agriculture, has been regressing the agricultural insurance premium since 2006. Originally, the return was 30%, and since 2008 it has been 40% of the amount of the agricultural insurance premium. The number of agricultural households that have benefited from these subsidies in the previous period, i.e. in the period from 2006 to 2016, is shown in Table 7.

Table 7. Number of agricultural households that used their right to recourse 2006- 2016.

Ear	Number of agricultural households that used insurance premium regression	Amount of disbursed funds in the name insurance premium recourse (in mil. RSD)	Amount of agrarian budget (in mil. RSD)	Participation of recourse for insurance premiums in the agrarian budget (%)
2006.	2.594	12	27.543,9	0,04%
2007.	6.852	35	26.095,8	0,13%
2008.	14.294	120	32.895,4	0,36%
2009.	4.322	62	26.690,4	0,23%
2010.	6.466	77	31.577,9	0,24%
2011.	9.020	171	33.676,0	0,51%
2012.	15.851	267	40.876,7	0,65%
2013.	12.507	335	44.699,5	0,75%
2014.	15.590	455	45.427,2	1,00%
2015.	19.806	476	45.308,2	1,05%
2016.	20.112	580	40.465,7	1,43 %
Average particip.	-	-	-	0,58%

Source: MAFWMRS, 2019.

According to the results of the census of agriculture (SORS, 2013), in Serbia exists 631,552 agricultural households. In line to data from the Table 7, it could be seen that in 2016, the largest number of agricultural households was recorded, in the observed period, which used recourse to agricultural insurance premiums. However, it is only 3.2% of the total number of agricultural households.

Based on the data presented in Table 7., it can be concluded that the average share of disbursed funds for agricultural insurance premiums in the agricultural budget, in the period 2006-2016., it was only 0.58%.

After synthesis of analysed data it can be conclude that the agricultural insurance in Serbia is underdeveloped.

Causes and consequences of underdevelopment of agricultural insurance

The causes of underdevelopment of agricultural insurance in Serbia are numerous. These are: (a) low paying power registered agricultural households; (b) not paying attention to insurance; (c) lack of information on agricultural insurance conditions and recourse for agricultural insurance premiums to farmers; (d) dissatisfaction of agricultural producers with the work of insurance companies when assessing damage when an insured event occurs, etc.

In Serbia, semi-sustainable farms dominate the structure of estates, or 47% of agricultural households use only up to two hectares of agricultural land. For comparison, it is important to note that the average size of agricultural holdings in the EU is around 20 ha. The small size of the households prevents the development of competitive agricultural production and an increase in income. Due to the above, the low solvency of agricultural households is low, and thus the demand on the agricultural insurance market. Also, insufficient association of farmers prevents their organized appearance on this market, as well as the inability to achieve more favourable insurance conditions. Other socio-economic specifics of agriculture in Serbia are disadvantageous for greater application of the economic protection of farmers provided by insurance, and it is necessary that in the coming period a more active role of the state in order to develop the agricultural insurance market in Serbia (Radovic, 2016).

Farmers often cite high insurance prices as the reason for not securing their production. We believe this is not a valid reason. For example, the average price of wheat insurance in Vojvodina for basic risk coverage and insurance amount, i.e. production value of 100,000 RSD, assuming 40% premium recourse is used, is only 1,200 RSD. The average insurance premium for sheep and goats is about 10%, for cows and heifers about 9%, breeding pigs about 8%, and for breeding poultry about 10% of their value is the sum of insurance. The average insurance price for fattening bulls is about 6.5%, for fattening pigs about 4.5%, and for fattening poultry about 8% of their value at the end of fattening (Radovic, 2019).

The consequences of underdevelopment of agricultural insurance are the great economic losses that farmers have and have to bear on their own due to the lack of economic protection of their production. These are most often losses incurred from hail risks, but also from the occurrence of other risks. Often, in occurrence of large-scale damages, such as during the floods, state compensates for losses from its budget.

We believe that in order to develop agricultural insurance, it is necessary to consider the possibilities of implementing a model of partially compulsory agricultural insurance in Serbia.

The idea of the necessity of introducing compulsory insurance of domestic agriculture has existed since before, and this topic has become especially important in recent years, which is especially the result of the great damage caused by catastrophic floods. The total damage caused by the floods in May 2014 amounted to EUR 1.7 billion, and about EUR 50 million was earmarked for the rehabilitation of the state budget. Also, the floods were in March 2016 and on that occasion, 290 million RSD were allocated from the state budget. Certainly, the role of the state should not be equated with the role of insurance companies, that is, instead of ensuring their production, farmers expect the state to declare a natural disaster and pay them damages. In the conditions of underdeveloped agricultural insurance, which has been the case in domestic conditions in recent years, this was a forced solution.

The essential features of the partially compulsory insurance model are (Radovic, 2016):

(a) compulsory insurance for users of a state resource;

(b) passing a law on partially compulsory agricultural insurance;

(c) a legally defined obligation by ensuring that companies place 20% of the premiums collected on financing and developing domestic agriculture;

(d) adoption of agricultural insurance strategy as well as annual plans and programs of work;

(e) drawing up a map of agricultural risks characteristic of the rural area in the Serbia, risk zones and risk coefficients;

(f) compulsory education and training of agricultural entities in the field of insurance, and the certificate of the completed course should be a mandatory document when applying for state subsidies, loans with subsidized interest or lease of state agricultural land;

(g) education courses should be funded by insurance companies and the state and conducted by agricultural professional advisory services and insurers;

(h) establishment of a state verification institution in the field of assessment and compensation of damage in agricultural insurance;

(i) the proposed model of partially compulsory agricultural insurance should function as a public-private partnership.

Conclusion

In Serbia, the objective need for insurance is very high, since both crop and livestock production are exposed to numerous risks. These risks tend to grow in the face of pronounced climate change, such as drought, and increasingly frequent natural disasters, e.g. the flood. The subjective need to insure agriculture, at home, is not sufficiently developed. The reasons for this are twofold, low paying power registered agricultural households and not paying attention to insurance.

Based on the analysis of the data presented in the paper, it can be concluded that agricultural development in Serbia is underdeveloped. The following facts point to this: (a) only 3.39% is the average share of agricultural insurance premiums in total non-life insurance premiums in the period 2006-2018.; (b) only 3.2% of agricultural households exercise the right to recourse to agricultural insurance premiums; (c) average share of disbursed funds for agricultural insurance premium payments in the agrarian budget, in the period 2006-2016., it was only 0.58%.

In Serbia, livestock insurance is extremely underdeveloped. Only 16% is the average share of this insurance policy in the total number of agricultural insurance policies in the period 2006-2018. There are two reasons for this, both the underdevelopment of livestock insurance and the constant decline in livestock. However, livestock insurance only has an obligation character in Serbia when farmers take out a loan from commercial banks to buy livestock.

Therefore, agricultural insurance in Serbia is underdeveloped, although agricultural insurance premiums are subsidized both from the state and from the budget of many local governments. We believe that in order to develop, it is necessary for the state and insurance companies to invest in educating farmers about agricultural insurance. Also, is important information on the conditions under which insurance is available to agricultural operators is also important. Often, lack of information is the reason why farmers do not apply the economic protection of their production. It is necessary to solve the problem of damage assessment when an insured event occurs. Farmers believe that these estimates are often to their detriment, in favour of insurance companies. In order to develop, it is necessary to consider the possibilities for introducing a model of partially compulsory agricultural insurance in Serbia. The proposed model of partially compulsory agricultural insurance should function as a public-private partnership.

The essential features of the partially compulsory insurance model are: compulsory insurance for users of a state resource, passing a law on partially compulsory agricultural insurance and legally defined obligation by ensuring that companies place 20% of the premiums collected on financing and developing domestic agriculture. It is important: adoption of agricultural insurance strategy as well as annual plans and programs of work, drawing up a map of agricultural risks characteristic of the rural area in the Serbia, risk zones and risk coefficients and establishment of a state verification institution in the field of assessment and compensation of damage in agricultural insurance.

It is important and: compulsory education and training of agricultural entities in the field of insurance, and the certificate of the completed course should be a mandatory document when applying for state subsidies, loans with subsidized interest or lease of state agricultural land. Education courses should be funded by insurance companies and the state and conducted by agricultural professional advisory services and insurers.

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ANALYSIS OF HORTICULTURAL SUPPLY CHAINS IN ROMANIA

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Abstract

The paper analyses the vegetables and fruits' supply chains in Romania, in the context of better link producers and consumers, finding solutions to encourage production, supply domestic markets with national products, and reduce imports. The objectives are to identify the strengths, weaknesses, opportunities and threats and to propose measures for overcoming breakdowns and disruptions. Vegetables and fruits have been selected because they have significant importance from both production and consumption approaches. As such, they are considered basic food, as nutritionists recommend that half of human daily diet to contain vegetables and fruits. Furthermore, farmers cultivated them on large areas, because vegetables and fruits return higher income as compared to cereal production. The hypothesis tested is that horticultural supply chains break off in the stage of collecting vegetables and fruits from farmers. This outcome has implications on food consumption, market disequilibria between supply and demand, by the one hand, and imports and exports, by the other.

Key words: horticultural, supply chains, products' collection.

Introduction

Modern lifestyles, hi incomes and consumer experience drive to requirement for wider assortment, better quality, and timely supply of fresh, healthy, and advanced food products. There is a lot of evidence about importance of fruits and vegetables towards the healthy nutrition. So, their sufficient daily consummation leads to prevention of major chronic diseases (Trienekens et al., 2008).

Consumption of fruits and vegetables in EU is far behind by nutritionists' suggested quantities. It's usually caused by slow introduction of food products,

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lack of adequate marketing activities and organizational innovations, etc., which could convince final consumers to purchase and eat more fruits and vegetables (Iliopoulos et al., 2012).

Someone decision to consume fruits and vegetables derive from multiple and complex interactions among socio-demographic, psycho-social and environmental factors (Sabbe et al., 2009).

Fruits are important segment of the global agriculture. They represents adequate source of vitamins, mineral elements, fibre, proteins, sugars, phytochemicals, etc., required for good health (Barimah et al., 2015).

Eating fruits is a segment of vital and health lifestyle. Besides, generally there is low level of knowledge about the optimal quantity of fruit that is required at daily basis, particularly at regions with limited dietary education (Maher et al., 2018).

Expressed oscillations in fruits and other horticultural products export to European countries are framed by food products perishability, unsafe supplies (seasonal variability) and strict and rigid quality standards (Alphonce et al., 2015).

Material and method

In this paper we want to analyse the horticultural sector in Romania. For this, in the first part of the study, quantitative and qualitative indicators will be analysed regarding the supply, the demand on the market, but also the foreign trade of Romania. These indicators will be taken from the national statistical databases (National Institute of Statistics) and will be interpreted with the help of statistical indicators such as the mean, the average annual growth rate and the coefficient of variation.

In the second part of the study will be carried out a quantitative and qualitative analysis of some indicators regarding the financing of this sector (horticultural) through European funds, which belong to pillar 2 of the CAP, respectively the rural development. Thus, these data will be taken from the reports made available through the platform of the National Rural Development Program.

Results and Discussions

Considering the subject addressed in this paper, respectively the one of the horticultural sector, it was considered necessary, in the first part of this study, the analysis of the indicators related to the demand, supply and trade of this branch. Thus, in order to be able to create an overview, the national statistical bases on the two main major components of this sector, namely vegetables and fruits, were analysed.

The areas cultivated with the main vegetables grown in Romania, for the period 2000-2018, for which two indicators were calculated, respectively the average annual growth rate and the coefficient of variation. The total surface area with vegetables shows a slight decreasing tendency during the analysed period, registering an average negative rate of -0.185% per year, and the variation of these areas is 8.6%. Realizing the average of the areas, and weighted to the total surface of vegetables, it can be appreciated that this sector is mainly divided into two types of farms: vegetables grown in the field that have a weight of 59% of the total area, and fresh vegetables from the family gardens, these with a weight of 36%. There are also vegetables from solariums and greenhouses, which account for only 1.3% of the total surface of vegetables.

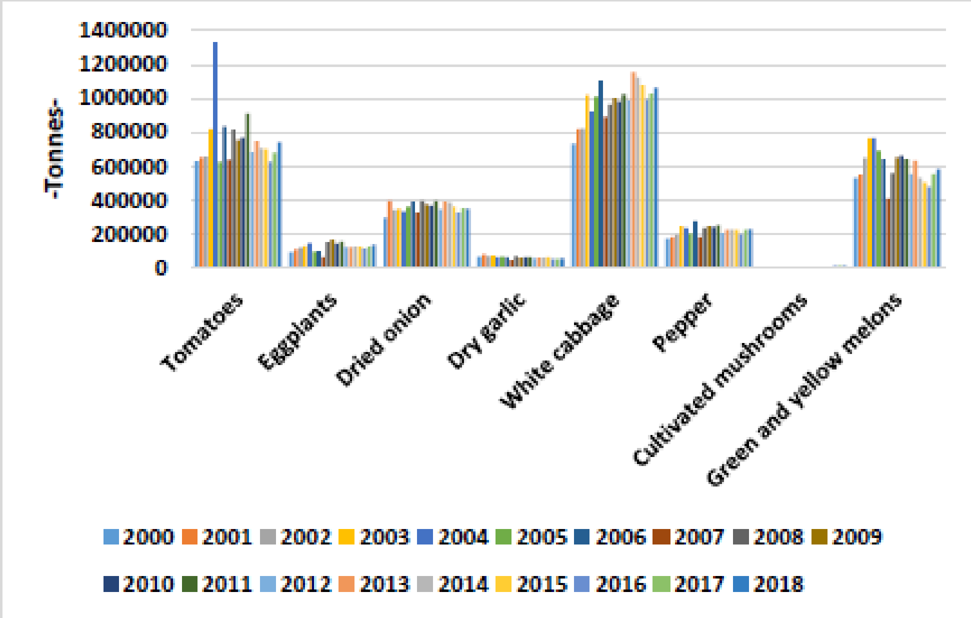
Analysing specifically, according to vegetables, the highest share of the total area analysed has a tomato crop with a weight of 18.9%, at a short distance there is the cabbage culture with a weight of 18.4%, these being followed by the onion culture (13.3%), melons (13%), peppers (7.6%), garlic (4.8%) and eggplants with a surface weight in the total surface of vegetables of 3.5%.

Mainly, during the analysed period, the areas cultivated with vegetables are reduced, these registering a negative annual average rate, except for two cultures, respectively the eggplant culture, which records an average annual rate of 0.22% and the cabbage culture recording this average annual growth of 1%. It is worth noting that the area of vegetables grown in protected areas has the most significant growth during the period, registering a rate of 6.22%, and a very high coefficient of variation of 25%, thus, it can be considered that these increases they were realized suddenly, in a short period of time.

A similar analysis for the second component of the chain, respectively that of the fruits, thus analysing the number of trees by species, for the same period. The total of the trees registered a decrease during the analysed period, on average with about 2.05% per year, registering a coefficient of variation of 14.6%. The same trend is registered for most species of trees, respectively a decreasing one, except for nectarine plantations, which have a positive annual average rate (1.4%), but also the highest coefficient of variation, of 57%, thus, the number of trees varying greatly.

Analysing the structure of the plantations in the total number of trees registered during the whole period analysed, the highest weight is recorded by the plum plantations whose number of trees represents about 46% of the total, followed by the number of apples with 35% of the total, cherries and cherries with 6.7%, pears with 4%, apricots and blackberries with 2.9%, nuts with 2.2% and peaches with 1.7%.

Figure 1. Determining the evolution of total production of main vegetable crops



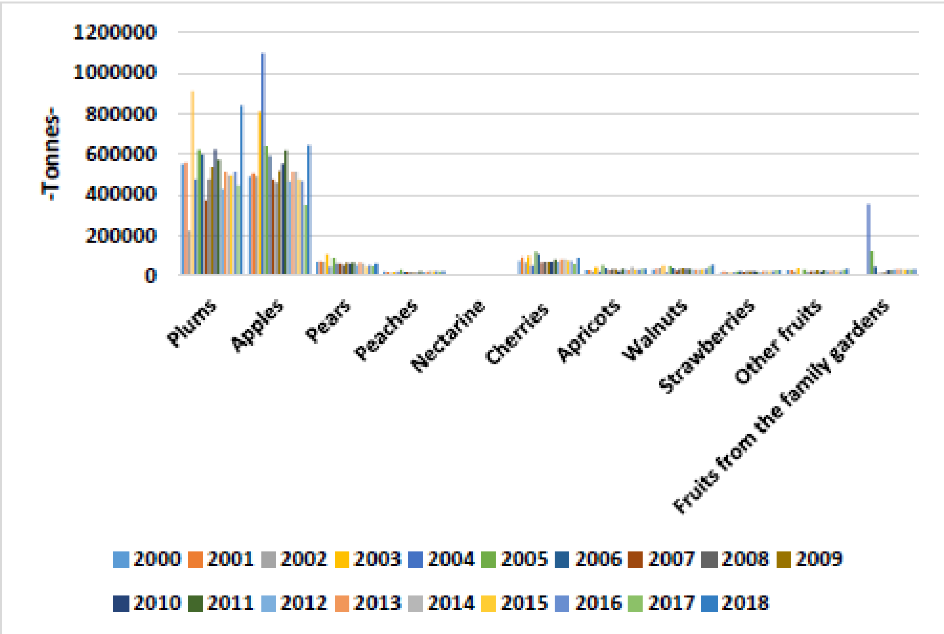
Source: According to data from NIS, 2019.

In Figure 1. are represented graphically, the total production obtained between 2000-2018 for the main vegetable crops. As expected, given the high share of cultivated areas for tomato and cabbage cultivation, they record the highest total yields. Analyzing the main vegetable crop in Romania, respectively that of tomatoes, it can be seen that the total production of tomatoes has averaged over the 19 years of about 754 thousand tons, registering a slight growth trend of 0.9 % per year, different from the annual rate of growth of surfaces, so it can be considered that this culture is intensifying in terms of production. At the same time, the total tomato production registered a coefficient of variation of 21%, higher than for the areas.

The culture of cabbage records the largest quantities, considering the much higher weight of a single vegetable, thus, the average of the total production of cabbage in Romania, during the analyzed period was 985 thousand tons. As can be seen from the figure, the total production is increasing throughout the period, with an average annual rate of 2.1%, and the variation of the total production is 11%. The next crop, depending on the total production recorded is that of green and yellow melons, the average of the total production is around 600 thousand tonnes, registering a slight average annual growth of 0.5%.

The total production of dried onion was on average, during the analysed period, of about 360 thousand tons, but this crop registered the smallest variation of the total production, of only 8% of all the vegetable crops analysed. The trend of total production is increasing, with an average annual growth rate of 0.9%, contrary to the average annual rate of cultivated areas. The fifth crop according to the total production obtained, is that of the pepper crop, which recorded during the analysed period an average total production of 223 thousand tons, being increasing, on average every year by 1.5%. The Romanian fruit producer is facing a problem regarding the distribution of the production because of the small quantities it is hard to enter in the hypermarkets due to the quality and quantity imposed by the big retailers.

Figure 2. Determining the evolution of total production of main fruit crops



Source: According to data from NIS, 2019.

If the total internal production of vegetable would have access on the market, this could cover the consumption needs of the Romanian population (Marin et al., 2017). That means that the Romanian security for these products could be ensuring from internal production.

According to the weight of the cultivated areas, and in the case of total production, the two main apple species are plums and apples. The total production during the analysed period (2000-2018) was, on average, 562 thousand tons. This registered increases over this period, on average, of 1.52% per year, but with a rather large variation, of about 29%.

Regarding the total production of plums, this amounts to the average value of the period of 539 thousand tons, having an increase with a more alert rate, compared to the production of apples, of 2.4% per year.

At a significant distance, if we could compare the quantities produced, three cherries and cherries would be produced in one place, these being an average of 78 thousand tons, registering an average annual growth of 1.2%.

The total production of apricots and blackberries would be in the fourth place with an average of the period of 64 thousand tons, and in the fifth place would be the total production of nuts, this being an average of 36 thousand tons.

However, as the total production is well known, it is also influenced by the climatic factors that put their mark on the yields per hectare, so we continue to propose the analysis of the evolution of the average productions.

A typical feature of most fruit and vegetable products that affect the whole sector (distribution in particular) is their high perishability (they represent high wasting food items); as a result, they have to be consumed soon after harvesting or have to be processed directly into a less perishable form after harvest (Latini et al, 2016).

Table 1. Determination of the evolution of the average production for the main vegetable crops (kg/ha)

Crops	2000	2005	2010	2015	2016	2017	2018	Deviation	C.V. (%)
Tomato	12815	13302	15443	15857	15297	16978	18235	2239	14.2
Dried onion	7990	10198	10908	11561	10725	11729	11568	1196	11.0
Dry garlic	4613	5506	5250	5951	5327	5582	5686	677	12.5
White cabbage	16561	18406	20858	22127	21458	22220	22513	1837	8.8
Pepper	9119	10736	11592	12289	11224	12759	12775	1144	9.9
Green and yellow melons	11488	18602	21055	19456	19347	23675	26433	3521	18.7

Source: According to data from NIS, 2019.

Table 1. presents the average yields per hectare for the main vegetable crops, during the reference period, but also the determination of the deviation from the average and the determination of the variability by the coefficient of variation.

The average production of tomatoes varied between 12.8-22.7 t/ha. However, the average production registered an increasing tendency, the culture developing intensively, each year the average production increasing, on average, by 2%. As mentioned above, the average production is directly influenced by the climatic conditions, which have their mark on the obtained production, the tomato crop registering a rather large deviation of 2,239 kg/ha compared to the average, which determines a 14% variation. The average production in cabbage crops ranged from 16.5 to 24.2 t/ha, the average stabilizing at 20,846 kg/ha. The average annual growth rate of yield per hectare for this crop was 1.72%. During the analysed period the average production of the cabbage crop deviated from the average with 1,837 kg, which determined a coefficient of variation of 8.8%, being the smallest of the analysed crops.

Regarding onion cultivation, this recorded the second highest growth rate of average yield per hectare, being 2.1% per year. On average, during the analysed period the average yield of onion crop was 10.8 t/ha, with a deviation from this average of about 1,200 kg, which resulted in a coefficient of variation of 11%. Garlic culture registered an average yield per hectare of 5,413 kg, and during the analysed period, this yield increased the slowest, with an average growth rate of only 1.17% per year. The standard deviation from the average yield was 677 kg, but compared to the average value the second highest coefficient of variation was registered, of 12.5%.

Regarding the pepper culture, the average production registered average annual increases of 1.9%, and the average yield over the whole period analysed was about 11,600 kg, with a deviation from it of 1,144 kg, causing a variation of 9.9%. The culture of yellow and green melons has the highest growth rate of average production of 4.7% per year, and the average yield was 18.8 t/ha, but with a deviation from this of 3,521 kg, which resulted in the highest coefficient of variation of 18.7%.

Table 2. Determination of the average production evolution for the main fruit crops (kg/tree)

Fruits	2000	2005	2010	2015	2016	2017	2018	Deviation	C.V. (%)
Plums	12	14	13	14	15	13	24	4.1	31.7
Apples	11	17	18	19	19	14	22	3.8	22.0
Pears	17	20	16	13	16	15	19	2.8	16.4
Peaches	6	15	8	19	21	17	20	5.2	39.6
Cherries	9	17	12	14	14	11	17	2.9	22.6
Apricots	8	16	11	12	14	16	17	3.3	27.4
Walnuts	14	20	19	18	18	25	29	5.0	27.9

Source: According to data from NIS, 2019.

The average production of plums in Romania, in the period 2000-2018 was about 12.8 kg/tree, registering an average annual growth of 3.9%. The standard deviation from the average is 4.1 kg, which results in a very high variation represented by a coefficient of variation of 31.7%.

Regarding the second main group of fruit products, respectively apples, the average yield per hectare for this crop was around the average value of 17.5 kg/tree, from this average registering a standard deviation of 3.8 kg, which represents a 22% variation.

Average production of cherries recorded during the analysed period was increasing, on average by 3.6% per year, varying by 2.9 kg compared to the average yield of 12.6 kg/tree, representing a variation of 22.6 %.

The average yield per hectare for apricot planting was on average for the entire period of 12.2 kilograms per tree, increasing by 4.3% each year, and the average production variation was 27.4%.

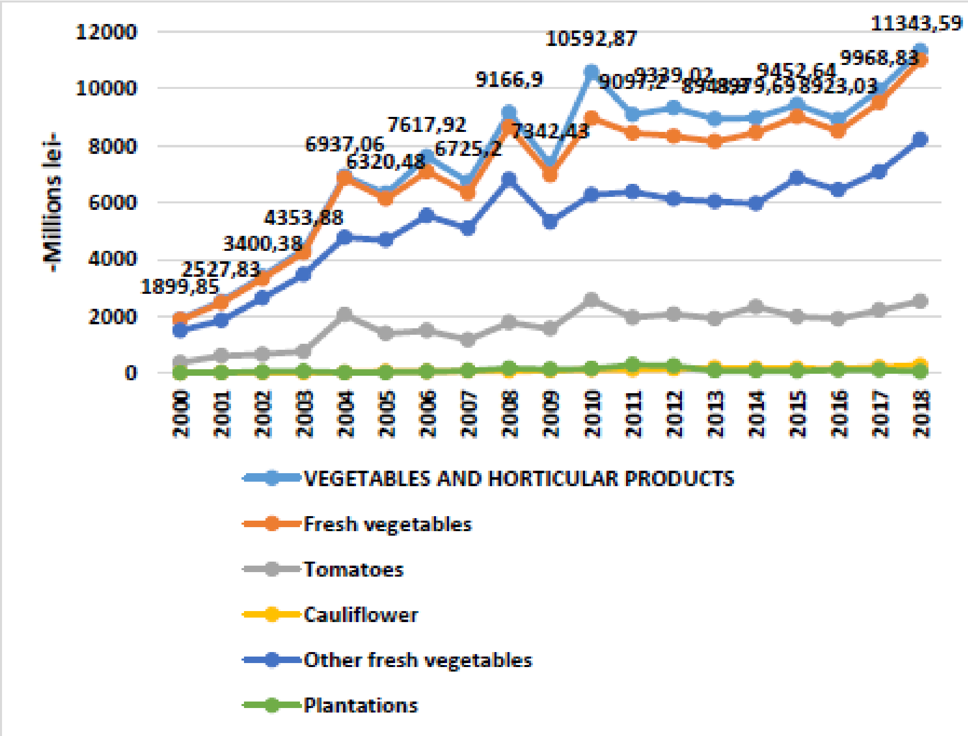
It is worth mentioning also the crops that register the smallest and the largest variations, respectively, thus, the pear plantations register the most stable average yields, the coefficient of variation being the lowest, of 16.4%, and the peach plantations register the most significant changes in yields, over the period, with a coefficient of variation of 39.6%.

Given that the products analysed are specific, each with different characteristics, the previous indicators cannot be compared according to the product, in order to make this comparison, however, it is considered necessary to analyse an indicator by which this could be achieved. Type of analysis, so the value of the production of these products will be analysed below.

The Romanian fruit producer is facing a problem regarding the distribution of the production because of the small quantities it is hard to enter in the hypermarkets due to the quality and quantity imposed by the big retailers (Marin et al., 2018).

In Figure 3. the graph shows the evolution of the value of the production of the main vegetables or categories. Thus, at national level, in the period 2000-2018 the value of vegetables and horticultural products increased on average by 10.4% per year, reaching a value of 11.34 billion RON in the last year. On average, in the 19 years analysed, the value of the production of vegetables and horticultural products was 7.5 billion RON, which represented on average 19.77% of the value of the vegetable production. Of the value of vegetable production, 94% is the value of fresh vegetables, and specified are two vegetables, respectively tomatoes and cauliflower. The value of tomato production shows an increasing trend, with an average annual growth rate of 11.3%, higher than that recorded for the whole category of vegetables. The average value recorded for the whole period analysed is 1.65 billion RON, but it has increased, reaching the value of 2.5 billion RON in the last year.

Figure 3. Determining the evolution of the production value of the main vegetable crops

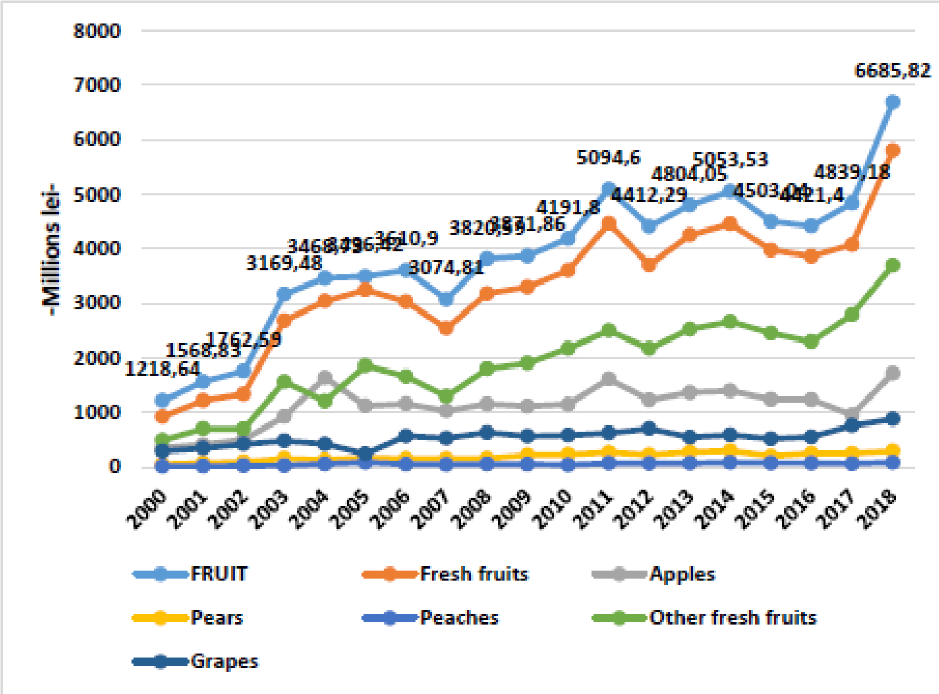


Source: According to data from NIS, 2019.

Regarding the second culture for which the value of the production is specified, respectively the culture of cauliflower, the value of its production also registered increases during the analysed period, registering the highest growth rate of 19.5% per year, reaching, in the year 2018, at the value of 271.3 million RON. This category "vegetables and horticultural products" also includes plantations whose average value was 95 million RON, but with very large fluctuations, of 80%, thus, in 2018, the value of the plantations was only 54 million RON.

Regarding the value of fruit production in Romania, in the period 2000-2018, the average of this interval was 3.85 billion RON, registering annual average increases of 9.9%, and in the last period, the value of total fruit production, reached the level of 6.685 billion RON. On average, over the 19 years, the share of the value of fruit production, in the value of vegetable production was, on average, 10.11%.

Figure 4. Determining the evolution of production value of the main fruit crops

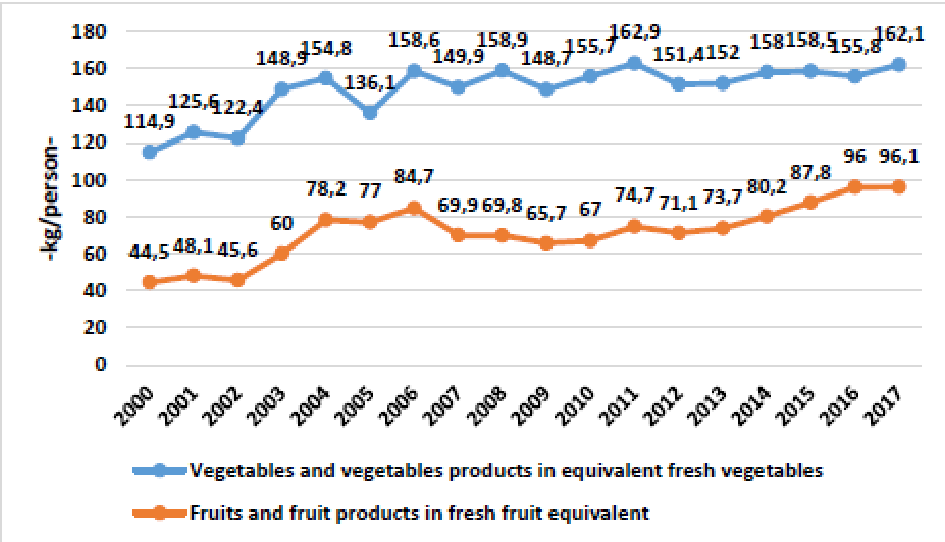


Source: According to data from NIS, 2019.

Of the value of fruit production, about 86% is represented by the value of fresh fruit, and the remaining 14% is the value of grape production. The main category of fruits that recorded a significant production value is that of apples, the average of the period being 1.25 billion RON, representing 29.3% of the value of fruit production. The value of pears production in Romania registered an increasing evolution during the analysed period, registering an average growth rate of 9.5% per year, reaching in the last year the value of 196 million RON. On average, the weight of pears production in total fruit production was 5.11%. Peaches rank third in terms of the value of production, as a single product, with an average production value of 58.9 million RON, increasing in the analysed period, on average, every year by 10.8%, reaching 2018 at the value of 88.2 million RON. The average share of the value of peach production, in the value of fruit production, was 1.53%.

Besides these unique products, there is also the category of other fresh fruits, which includes most of the fruits from Romania, so their value, on average, was 1.92 billion RON, representing about 50% of the value of the fruits on the market. All the indicators analysed above are elements that fall within the scope of the respective production and the scope of the supply of vegetables and fruits on the national market. The analysis of a component of the demand, namely the consumption of vegetables and fruits from Romania, will be presented below.

Figure 5. Determining the evolution of the average annual consumption of vegetables and fruits



Source: According to data from NIS, 2019.

As can be seen from Figure 5, which shows the evolution of the average annual consumption per inhabitant of vegetables and fruits, both categories of agri-food products registered increases during the analysed period. The slight fluctuations of these two indicators can be correlated, both with the market offer, but also with the standard of living, respectively the level of income, which can influence the evolution of consumption.

Consumption of vegetables varied between 2000-2017, with 9.6%, compared to the consumption of fruits, which registered a coefficient of variation of 21.3%, which can be observed also by the average growth rate, that of fruit consumption being higher than that of vegetables, thus, fruit consumption increased more from year to year, on average, compared to that of vegetables, being 4.6% compared to 2.05%. On average, over the entire period analysed, a person consumes about

148.6 kilograms of vegetables per year and 71.7 kg of fruits per year, this consumption increasing to the values recorded last year, of 162.1 kg of vegetables and 96.1 kg of fruit annually. In addition to this analysis of the entire sector, either vegetables or fruits, further analysis is proposed to determine the evolution of consumption by product categories.

The highest consumption is found in tomato and cabbage products, being in the first places and in the case of cultivated areas and the obtained yields, so we can consider that the supply is directly correlated with the demand. On average, cabbage is the most consumed vegetable, during the analysed period, with 40 kg/person/year, and at a short distance there are tomatoes, whose average consumption is around 38 kg/person/year. In the third place, depending on the average quantity consumed in a year by one person, the onion is positioned, its consumption being 19.2 kg/person.

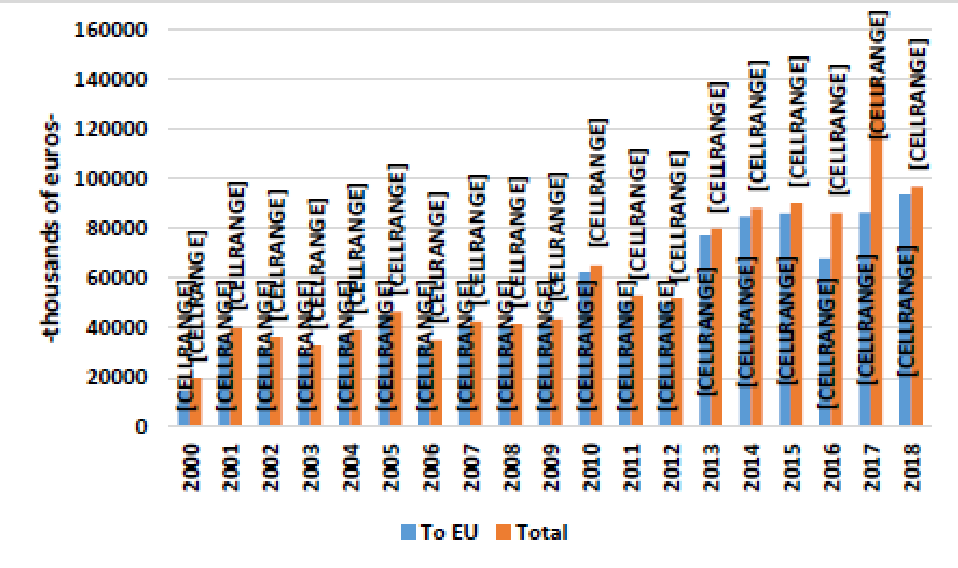
Regarding the general trend of evolution of vegetable consumption, it is found that it is increasing for each analysed product, during the reference period, with average growth rates between 1.06% (tomatoes) and 5% (cucumbers) annually.

As in the case of vegetables, the highest fruit consumption is recorded in the products that are cultivated the most and their production is the highest, except in this case the plums. On average, for the entire period analysed, the consumption of apples is the highest in the category of fruits, being 24.6 kg/person. At a short distance, it is placed on the second place of watermelon with an average consumption of 22.9 kg/person. In the third place, according to the consumers' preferences, depending on the quantity consumed, the grapes have an average consumption of the period of 5.85 kg/person. As stated above, the consumption of plum is not correlated with the area and production of plums analysed previously, because in the statistics and, implicitly in the previous figure, the consumption is expressed in equivalent products fresh fruits, so the actual consumption of fresh plums is on average 4.5 kg/person, the rest of the quantities processed to obtain alcoholic beverages.

Regarding the evolution trend, each product has a consumption trend similar to the general trend of total fruit consumption, respectively an increasing one, with positive growth rates between 0.39% (cherries-cherries) and 10.5% (peaches). It should be mentioned that during 2007-2010, both total and individual fruit consumption on each product analysed decreased compared to the previous period, the reason being specified and previously when it was specified that the consumption level is influenced by the population's income, thus In that period Romania went through an economic crisis, the income of the population being reduced during that period. Analysing both a part of the supply and demand components, it is considered appropriate to analyse the trade with these products, thus, below is presented the analysis of foreign trade, respectively the export and import of vegetables and fruits of Romania with the European Union (EU) and at the level total, from a value point of view.

There has been a consumer trend towards a healthy lifestyle for quite many years. Consumers buy food products more consciously by reading product labels and more often decide in favour of natural foods (Majerska et al., 2019).

Figure 6. Determining the evolution of the value of the vegetable export



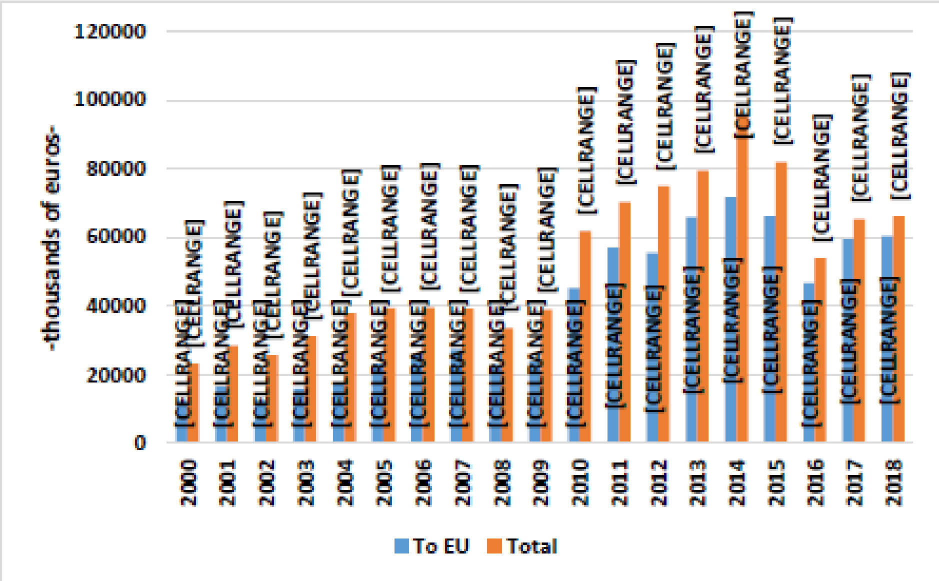
Source: According to data from NIS, 2019.

As can be seen from Figure 6., the value of the export of vegetables increased during the analysed period, from 19.8 million EUR (in 2000) to 97 million EUR in the last analysed year, but the maximum was registered in 2017 when the total value of the export was almost 139 million EUR. This increase can come from two vectors, the increase in value by increasing the price of recovery (inflation), on the one hand, and on the other hand by increasing the quantity of exported products, which is in close correlation with the increase of surfaces and outputs.

On average, during the period analysed, the value of vegetable exports was about 59.5 million EUR, representing only 0.16% of the total value of exports. Of this value, on average, more than 90% (91.2%) is obtained by exporting vegetables to member countries of the EU.

As can be seen, in 2017, when the value of vegetable exports was the highest, the surplus compared to the expected trend is registered in countries outside the EU, where Romania exported 38% of the value of exports.

Figure 7. Determining the evolution of the value of fruit export



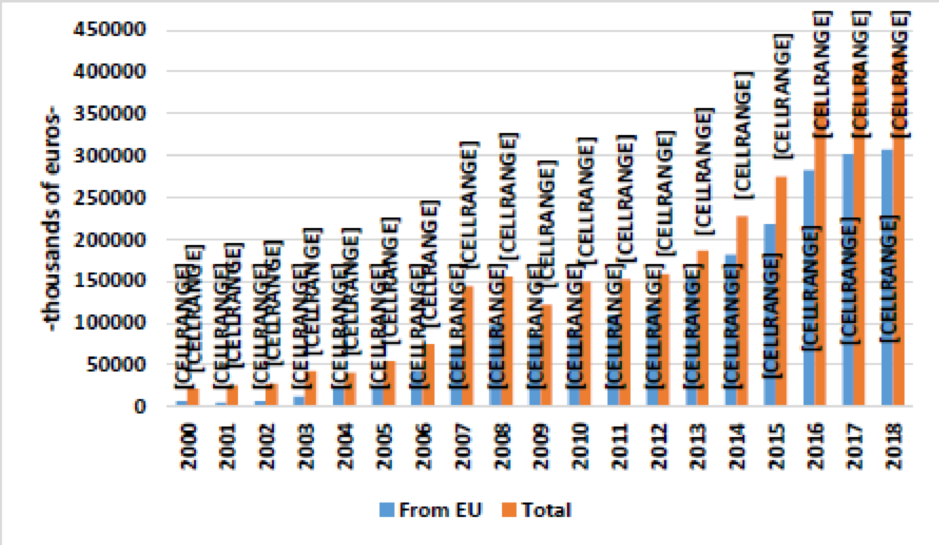
Source: According to data from NIS, 2019.

Figure 7. shows the evolution of the value of fruit export in the period 2000-2018. As can be seen, the value of fruit exports increased during the period analysed, from 23.3 million EUR in the first year to 66.2 million EUR. But this increase has fluctuated. The maximum value exported by Romania was in 2014, when a value of 95.45 million EUR was registered.

On average, over the period analysed, the average value of fruit exports was 51.9 million EUR, representing only 0.14% of the total value of exports. Also from the average value, about 70% (69.5%) is obtained from the fruits exported to the member countries of the EU. However, as can be seen this share of the value of exports from the EU was much lower during the period of pre-accession to the union, the average for the period 2000-2006 was 55%, and the average for the period 2007-2018 was 78%, so can appreciate that the entry into the EU and the elimination of cross-border barriers greatly encouraged the export of fruit from Romania.

A similar analysis was also made for the value of imports of vegetables and fruits, for the reference period.

Figure 8. Determining the evolution of the value of vegetable imports



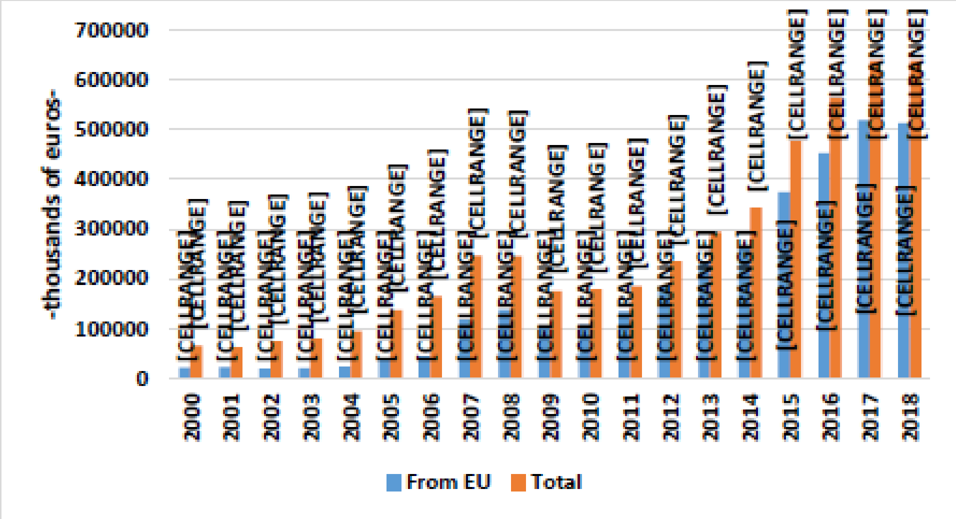
Source: According to data from NIS, 2019.

Taking into account the seasonal character of the production, of this subsidiary, that of the vegetables and fruits, in conjunction with the small surface of the protected spaces in which these two categories of products are cultivated and with the fact that the level of consumption, both that of fruits and that of the vegetables is growing, implicitly, to ensure the supply on the market all the year round, the level of imports increased significantly during the analysed period, also being at a totally different level (higher) than the level of exports.

If in the year 2000 vegetables of about 22 million EUR were imported, in 2018, the value of the imports reached 424 million EUR. This increase is also confirmed by statistical indicators such as the average growth rate which was 17.8% annually, but also by a coefficient of very large variation of almost 80%, which indicates that this data string is not homogeneous, the increases being very high from year to year.

On average, the value of the imports of vegetables was, during the analysed period, of 161 million EUR, representing only 0.35% of the total value of the imports that Romania realizes. Of this average value, 59% represents the value of imports from EU member countries.

Figure 9. Determining the evolution of the value of fruit imports



Source: According to data from NIS, 2019.

Regarding the tendency of the value of fruit imports', it can be appreciated that it is very similar to the imports' of vegetables, registering an ascending tendency with an average rate of growth of 13.6% per year.

On average, for the entire period, the value of the fruit imports that Romania realizes is around the amount of 257 million EUR, which represents about 0.56% of the total imports made by Romania. As you can see the value of fruit imports is higher than that of vegetables, in the last year, fruits worth 639 million EUR were imported. This is mainly due to the higher price for fruits than the volume of imports.

On average, by the value of the fruits that Romania imports, it can be established that about 55% are of intra-Community origin, respectively from member countries of the EU, this being amplified with Romania's accession to it. In the period 2000-2006, the average value of EU imports was 28%, and in 2007-2018, the value of EU imports was 71% as a percentage of total fruit imports.

Financing fruit sector from European Funds

The fruit sector in Romania benefits from non-reimbursable funds through measures from the National Rural Development Program 2014 - 2020. Of a total of about 8 billion EUR, the fruit sector has allocated about 330 million EUR, representing about 4% of the total NPRD.

Table 3. Submitted projects for fruit sector measures, December 2019

Sub-measure	Financial allocation	Submitted projects		Selected projects	
		No.	Value	No.	Value
4.1a "Investments in fruit exploitations"	284.356.109	1.170	669.333.451	559	307.794.250
4.1a "Investments in fruit exploitations " - ITI Delta Dunării	5.000.000	9	4.923.015	8	4.358.466
4.2a "Investments in processing / marketing of fruit products"	34.629.439	73	38.044.629	25	10.234.665
4.2a "Investments in processing / marketing of fruit products" - ITI Delta Dunării	800.000	0	0	0	0
9.1a "Establishment of producer groups in the fruit sector"	5.300.811	3	1.216.011	0	0
Total	**330.086.360**	**1.255**	**713.517.106**	**592**	**322.387.381**

Source: Based on AFRI, 2019.

The fruit sector in Romania is supported through 5 rural development measures. The most of funds, respectively 86.14%, has being intended for investments in fruit farms. According to applicant's guide, financing is made according to farm size, but it will not exceed 50% of the eligible expenses. The program also funds' investments aimed at processing and marketing products in the fruit sector, for which about 35 million EUR are allocated, for which support is 50% of the eligible expenses for small, medium and medium-sized enterprises, and for large enterprises, support is up to 40% of the eligible costs.

Analysing the situation of the submitted projects, until December of the year 2019, we find a high interest of the investors for the fruit sector. In total, 1,255 projects were submitted, for all 5 measures, with an average value of the projects of 568,539 EUR. The total value of the submitted projects is 2.1 times higher than the allocated amount. However, there is a high rejection rate of projects, as from total sum of 1,255 submitted projects only 592 of them are selected or just 47%. Most of the rejected projects are related to investment measures in the fruit farms and those for processing and marketing the products in the fruit sector.

Table 4. Contracted projects for fruit sector measures, December 2019

Sub-measure	Contracted projects						Payments
	Contracted projects (in progress and completed)		Finalized projects		Rejected projects		
	No.	Value	No.	Value	No.	Value	
4.1a	445	229.097.038	46	18.000.729	8	3.806.634	78.927.524
4.1a - ITI Delta Dunării	7	3.822.758	0	0	1	535.708	550.308
4.2a	14	6.945.002	2	1.009.431	4	661.901	2.929.786
4.2a - ITI Delta Dunării	0	0	0	0	0	0	0
9.1a	0	0	0	0	0	0	0
Total	**466**	**239.864.798**	**48**	**19.010.160**	**13**	**5.004.243**	**82.407.618**

Source: Based on AFRI, 2019.

From the total of 592 projects selected, we find that contracts have been signed for 466, with a total value of around 240 million EUR, or 72.66% of the total amount allocated to these measures. By December 2019, about 10% of the projects for which contracts were concluded were completed, with a number of 13 projects terminated. Out of the total of 330 million EUR, payments were made to beneficiaries of 24.9%, representing 82.4 million EUR.

Conclusions

The Romanian vegetable and fruit sector is characterized by the existence of small and medium producers that cultivate on small surfaces, usually at 1-10 ha. One of the biggest problems of this sector is lack of deposits in order to storage the production. In this matter, it is hard for the Romanian producers to sell their production in supermarkets or hypermarkets. In Romanian, there is very big concentration in the selling of these products through this chain.

Because of the small production and of the hard possibilities of negotiation, the Romanian producer is facing a big number of intermediates on this market.

European funds are financing investments in this sector, the financial support being 50% from the eligible costs. As well, the non-reimbursable funds are supporting our producers in the process of association that would increase the possibilities of negotiating of the producers and could create deposits and processing units for their production.

Acknowledgments

This paper was developed through the institutional project entitled ”Necesitate si posibilităti de creare si dezvoltare a centrelor de achizitii, prelucrare, ambalare si livrare a produselor agroalimentare”, financed by Bucharest University of Economic Studies and the project „Excelentă în cercetarea interdisciplinară doctorală si postdoctorală, alternative de carieră prin initiativă antreprenorială (EXCIA)” Cod SMIS 2014+: 125245

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EDUCATION OF LABOR FORCE IN RURAL AREAS IN THE REPUBLIC OF NORTH MACEDONIA AND REPUBLIC OF SERBIA

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Abstract

Basic and professional education of the rural population originates from the need of development of the human capital. This education serves as foundation for increasing of productivity as a necessary condition for development of rural areas, but it also means a change of life in a wider sense of the meaning. Although in recent years we witnessed a significant progress, educational structure in rural areas remains on a lower level than the one in urban areas. For instance, in Serbia 50.79% of the total population aged 15 and above is without any education, incomplete primary education, and complete primary education. In North Macedonia, 42.2% of the members who work in individual agricultural holdings, remain without any education or have uncompleted primary, and primary education. One of the biggest priorities of the rural policy should be advancement of the educational structure of the working age population in rural areas by implementing programs for education of adults, especially for women, and a continuous education of the employed. To discover and highlight the patterns in the educational structure of the working age population, we used the method of analysis of statistical data.

Key words: rural areas, individual farms, education, working age population, gender, employment.

Introduction

Education as an element of human capital increases human productivity and it is considered that investment in education has a greater effect on productivity growth than investment in physical capital (Cvetanović, Despotović, 2014). Through the process of education a person is forming its attitudes, opinions, views of the world, a way of thinking and analysing of situations and data, etc. Education, besides knowledge transfer, is a way of preparing the individual to deal with their future life needs. "Education is the process of transmitting culture

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- including skills, knowledge, attitudes and values, as well as specific patterns of behaviour" (Spindler, 2011:22). Higher education level implies greater knowledge, higher quality of performance of working duties, wider views towards the world, greater security for job retention, better quality of life, greater social inclusion, while lower education level, despite lower living standards and poorer quality of life also leads to social exclusion. "Education can be understood as preparation of the individual for life in the society, as well as for their professional and social functions" (Jakimovski, 2011:73).

According to Becker (1994) investing in education and training increases employee productivity by giving people the knowledge and skills they can use in work performance.

European Commission supports all efforts for education and implementation of practices to stimulate education as one of the key components of sustainable development. A low level of education leads to lower human capital, lower chances of progress and greater poverty (EC, 2006).

The accumulation of knowledge, skills and abilities possessed by the worker, increases productivity and can more effectively use capital and technology. "... new knowledge is transformed into products of practical value" (Romer, 1990:72). Romer believes that the growth rate increases with the increase of knowledge and skills, but does not depend on the total available workforce or the total population.

Population quality and knowledge advancement are key factors in increasing the income and well-being of the population. "The future of the population is not predetermined by space, energy and arable land. It will be determined by the intelligent development of human capabilities" (Shultz, 1982:15).

Higher education level always brings higher incomes, but there are also cases where workers have the same education level and have different jobs and thus have different salaries depending on their job position.

Accordingly, the income will also depend on the level of education and the job position, that is, the worker to whom the education and work correspond will earn more than the worker who has a lower level of education.

The role of education is to create individuals who will be competitive in the global market. In that context, competitive will be the farmer who knows when to plant, how to plant, how to harvest, how to cultivate the land to gain more income, such a farmer will have higher earnings and greater success than the farmer who does not know how to do it. Knowledge in agriculture is measured by the ability of farmers to adapt to market demands. That means application of new technologies, application of production standards, application of new knowledge, new scientific achievements, application of new production techniques, finding new markets for agricultural product placement, using and finding stock markets and stock market sales, following the prices of production and placement on the internet, finding partners online, being familiar with legal changes, etc. Nowadays, such farmers are the result of the education process.

The level of education depends on the environment in which the individual lives. "In urban areas almost 20% of the adult population has tertiary education, while in rural areas the percentage is 15%" (Matthews, 2007:4).

Improving the level of education of people living in rural areas will improve human capital which will positively impact the chances of individual progress.

Individuals with a higher level of education do not earn more just because of the degree they hold, but because of the quality of the work they do. Because of the quality of work, they earn more (Gillies, 2011).

"In Norway, for instance, university graduates enjoy a 26% earnings premium over people who only finished secondary school. In Hungary that figure rises to 117%. According to OECD data, employees with a degree earn 26% more,, (Keeley, 2007:33).

The aim of education is to develop entrepreneurial spirit and thinking, to become a starting point for the creation of new, innovative jobs and intellectual foundation of entrepreneurship (Kiopa, 2015).

People with higher and better education are more advanced in their understandings and ideas, develop the capacity for analysis and judgment, and are resourceful, capable of collaboration and communication.

A higher percentage of society's population with university education, means not only more educated individuals, but also individuals who are more skilled, capable, more creative, more adaptable to new technologies and techniques, and a driving force in society. Education should be tailored to create a skilled workforce that will increase productivity and impact sustainable development.

„A highly educated workforce or a workforce with a good learning base is far better prepared to adapt to new technologies, which will be more innovative and more competitive globally,, (World Economic Forum 2015:5). The education process should enable the acquisition of skills and abilities corresponding to the demands of the labour market and facilitate the process of transitioning the labour force from education to the labour market.

Therefore, education should create individuals who will more easily and more quickly find their place in the new information society and become more easily involved in the labour market.

At a Rural Policy Conference held in Spain in 2007, four ways were proposed to improve the creation of human capital in rural areas, by involving higher education institutions in line with local needs:

1. Improving access to higher education,
2. Improving the balance between demand and supply on the labour market and improving, adapting, to educational programmes,
3. Attracting talent,
4. Upgrading skills and competences of population through adult education.

Educational structure of the rural and agricultural population

The state of education in a village in the Republic of North Macedonia, especially in remote mountainous and hilly areas, is unsatisfactory, both in terms of the functionality of the buildings in which the schools are housed and their equipment with school aids. And from what we know, in the first years (and decades) after the liberation, a significant proportion of teachers in these areas - did not possess the necessary professional qualifications, and therefore, children in these areas were not in equal position with children living in urban areas and suburbs and also in the larger villages, where schools had the necessary accompanying facilities and sufficient teaching aids, and teachers generally possessed the required professional qualifications and pedagogical skills. Decreased natural growth, in addition to migration affect the reduction in the number of children, which has led to the closure of a large number of elementary schools in the villages due to the lack of sufficient pupils.

In the Republic of Serbia and the Republic of North Macedonia, elementary schools in rural settlements are among the most important institutions, and often unique form, or factor for socio-professional mobility of rural population.

Table1. Educational structure of rural population, 15 year and over, by gender in the Republic of Serbia

Parameter	Total		Men		Women	
	2002	2011	2002	2011	2002	2011
Incomplete primary and lower secondary education, primary and lower secondary education	63.85	50.79	56.91	43.97	70.59	57.64
Secondary education	30.35	47.11	36.46	48.40	24.80	35.79
Specialized after secondary		0.61		1.01		0.12
Higher and university education	3.62	6.06	4.13	6.16	3.13	5.97
Unknown	1.98	0.43	1.24	0.38	0.74	0.48
Total	100.00	100,00	100.00	100.00	100.00	100.00

Source: Statistical office of the Republic of Serbia, Census 2002 and 2011, Population 15 and over, by school level.

In the Republic of Serbia, out of the total rural population aged 15 years and over, in 2002 there were 63.85% without school education, incomplete primary and primary education and in 2011, 50.79%. These indicators are very different in both genders. Among the male rural population aged 15 years and over, there were 56.91% with no schooling, incomplete primary and primary education, and 43.97% in 2011. However, among the relevant female population, the share of persons without schooling, non-completed primary and primary education was 70.59% in 2002 and 57.64% in 2011. Reasons for the lower education of women in the village are: family pressure to stay and work on the farm, traditional view that female children do not need higher education, financial reasons, early marriage, etc. (Bogdanov et al., 2011).

Table 2. Household members engaged at individual agricultural holdings, structure by educational attainment in North Macedonia

Parameter	2013	2016
Total	100.00	100,00
Incomplete primary and lower secondary education, primary and lower secondary education	47.17	45.17
Secondary education (agricultural)	3.23	3.87
Secondary education (other)	41.27	42.77
Higher and university education (agricultural)	1.95	0.95
Higher and university education (agricultural)	7.41	7.23

Source: Typology and structure of agricultural holdings, 2013, Statistical Review: Agriculture, 5.4.14., 01/803, pp. 118 and Structure and typology of agricultural holdings, 2016, Statistical Review: Agriculture, 4.4.17., 02/888, pp, 73.

Some results have been achieved in the past period (see Table 2.), but the educational structure of household members working on individual farms in the Republic of North Macedonia is still far beyond the average of those non-agricultural households.

Data in 2016 shows that 45.2% of household members are without education, with incomplete primary education, or with primary education. Share of household members with secondary agricultural education (3.9%) is significantly lower compared to the share of household members with other secondary education (42.8%). Share of household members with college and university agricultural education is about 1%, or much lower than the share of household members with other college and university education (7.2%).

Increasing productivity in agriculture depends largely on increasing the level of education. Highly productive field and livestock production requires adequate professional knowledge and adequate practical application (Bubevski, 1998).

Therefore, the improvement of productivity in agriculture will be achieved by increasing the level of education, which will also affect the improvement of the quality of life, imposing the need to establish a system of non-formal education, which will affect the improvement of the level of education by improving the qualifications and by providing coaching and trainings in the area of agricultural practices.

The relatively low share of the population with college and university education is, inter alia, a result of the migration of highly educated staff. Namely, more educated individuals are more mobile. They seek work that fits their skills, abilities, education and expectations and that will reimburse them for their education costs. But it should also be noted that access to services, primarily education, affects migration, which in turn has had a negative impact on population decline, especially on the young population, which has led to the closure of many schools due to lack of children. Children from villages that are close to urban areas, larger villages, villages that are well connected to the city and have good infrastructure and access to education have the opportunity to go to school and return to the village. While children from mountain villages and underdeveloped areas do not have this opportunity, due to lack of basic infrastructure, underdeveloped road communication, they have no choice, but to permanently migrate with their whole family or to stay at home or look for other activities during the school year. In addition, one of the main obstacles to the education of children from rural areas is the insufficient and low income of families which is more pronounced in mountain villages, namely this situation has a long tradition in the Republic of North Macedonia (Jakimovski, 2009).

Working population in rural areas in Serbia and North Macedonia

The structure of the working population is one of the important features through which one can obtain an idea of the available human resources in the village that can be incorporated in the labour market.

Table 3. Working age population by educational attainment (2017, rural areas)

Parameter	North Macedonia			Serbia		
	Total	**Men**	**Women**	**Total**	**Men**	**Women**
Incomplete primary and lower secondary education, primary and lower secondary education	46,77	38.01	55.97	42.29	37.17	51.37
Secondary education	43.70	52.16	34.81	48.37	55.91	40.86
Higher and university education	9.53	9.83	9.22	7.34	6.92	7.77
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Republic of Macedonia, State Statistical Office, 2018, Statistical Review 2.4.18., 03/894, Population and Social Statistics-Labor Force Survey 2017, pp. 99 and Labor Force Survey 2017 in the Republic of Serbia, Bulletin no. 634, Belgrade, 2018, pp. 28, 51 and 58.

The educational structure of the working population in the villages shows that in the Republic of North Macedonia the highest share of the population has no education or only primary education (46.77%), while in the Republic of Serbia it has secondary education (48.37%).

The share of the working population with college and university education in the village is 9.5% in North Macedonia and 7.3% in Serbia.

By gender, the largest share of the working population with no education and primary education is among women (56% in North Macedonia and 51% in Serbia). Regarding the state of the working population in men, the structure is as follows. The highest share of the working population has a secondary education, 56% in Serbia and 52% in North Macedonia.

There are several reasons for the poor educational structure of the working population. Among the most dominant are: unsatisfactory enrolment of pupils, students, dropouts in secondary education, dominance of traditional values that marginalize the meaning of education (expressed by some ethnic groups), the level of technological development of the economy that still tolerates workers having lower education level, diminished financial power and poor educational coverage of marginalized groups (Jakimovski, 2006:45).

Table 4. Employment rate by educational attainment and gender in rural areas

Parameter	Total		Men		Women	
	North Macedonia	Serbia	North Macedonia	Serbia	North Macedonia	Serbia
Total	43,18	49.40	55.23	59.10	30.51	39.73
Incomplete primary and lower secondary education, primary and lower secondary education	36,34	36.34	41,72	47.53	16.24	28.21
Secondary education	54,65	59.14	61.67	65.90	43.92	49.92
Higher and university education	68,19	64.25	72.31	66.39	65.10	62.29

Source: Republic of Macedonia, State Statistical Office, 2018, Statistical review, 2.4.18., 03/894, Population and Social Statistics-Labor Force Survey 2017, pp. 99, and Republic of Serbia, 2018, Bulletin no. 634, Labor Force Survey 2017, Belgrade, pp. 28, 51 and 58.

In the Republic of Serbia and the Republic of North Macedonia there is a difference in the employment rate in terms of the level of education of the labour force in rural areas. The employment rate in the rural areas is higher by 6.22% in Serbia, compared to North Macedonia. The employment rate of persons without education and primary education is the same in Serbia and North Macedonia. However, Serbia has a higher employment rate in rural areas for persons with secondary education and lower with college and university education and it is vice versa in North Macedonia.

The rate of employed men and women is relatively higher in Serbia, except for persons with college and university higher education, where the employment rate is higher in North Macedonia. "... the risk of employment decreases with an increase in the level of education, thereby increasing the possibility of poverty reduction. Or can say that a higher degree of education entails a higher living standard because the individual with higher salary can afford to enjoy more benefits and pleasures" (Jakimovski, 2019:5).

Conclusion

Even though there is an improvement in the education level of the rural population, it is insufficient and jeopardizes the future development of rural areas. Higher education will allow for easier adjustment and monitoring of changes that will have a positive impact on the development of rural areas. Hence, there is a need to improve the access to education with priority given to mountain villages, underdeveloped areas, villages that are remote from urban areas and do not have good road communication. Improving access to education will greatly affect the improvement of the human capital of the village. Therefore, one of the priorities should be complete eradication of illiteracy and incomplete primary education. Improving the educational structure of the working population in rural areas will affect the improvement of well-being, which will subsequently have a positive impact on the overall development of society. Thereby, public investment, but not less private investment in education, has the greatest impact. Hence, investment in education and lifting the level of education in the first place should be public investment through education policy, in order to provide equal access to education for everyone.

Improving the educational structure of agricultural and rural populations can also be achieved through non-formal education, through the establishment of a system for transfer of knowledge, information and practical experiences, through the organization of vocational lectures, greater number of professional TV and radio programmes, and towards the transfer of knowledge on the application of new technologies, work organization, economics, management, for which this research has shown that there is a need and interest.

Improving the educational structure of the working population in rural areas through the introduction of adult education programmes, continuing education of employees (training, coaching etc. on the workplace), as well as education of the unemployed or their retraining for easier and faster inclusion in the labour market. To promote education in village, decentralization of education is needed. In these schools the priority would be to educate rural children in terms of improving the quality of life in the village (Nenadic, 1997).

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WOMEN, FARMING AND AGRICULTURAL INNOVATION[1]

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Abstract

Even though often underappreciated, women`s role in family farming is quite significant for the overall farm`s reproduction. On the other side, farm women often lack vocational education for farming which potentially undermines effects of their economic performance. Thus, farm women`s participation in diffusion of agricultural innovation is of great importance. The main research question concerns characteristics of participation of farm women in diffusion of innovation. Problem is analysed based on data collected in a survey on the random sample of 319 farm women living in 14 villages in Vojvodina. The main findings help to identify obstacles for farm women to participate in agricultural knowledge and innovation network. The issue is presented from the perspective of the rural gender regime.

Key words: farm women, farming, agricultural innovation, extension service, rural gender regime.

Introduction

Rural women participate in all three dimensions of the reproduction of rural way of life. When speaking of their participation in economic reproduction of rurality, rural women secure a livelihood by off-farm income and/or they take part in farming. Women have always been an important labour force in agriculture, especially on family farms. However, in traditional rural communities or rural communities in (semi)peripherial societies, their role in family farming is usually unspoken which leads to under-recognition of their contribution to the family incomes (Whatmore, 1991; Babović, Vuković, 2008). Being treated as helping labour force in (family) agriculture, farm women often don't acquire neither professional education nor necessary information and skills for contemporary farming. Lesser knowledge and skills constrain farm women to be more productive and competitive. This ad-

1 The paper is a part of the research on the project III 46006, financed by the Ministry of education, science and technological development of the Republic of Serbia.

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ditionally undermines social/public recognition of their economic contribution and reproduces farm women's lower social position and social chances. Consequently, rural vitality also weakens.

Female labour force makes 43% of total labour force on family farms in Serbia and 39% of total labour force on family farms in Vojvodina (SORS, 2012). Thus, the issue of their education for modern farming is highly relevant for the rural development. Even though most of the family farms in Vojvodina/Serbia struggle under turbulent and uncertain rural restructuring (Čikić, 2018), the value of their potential contribution to farm economy rises. As contemporary farming is based on continuous application of innovative technologies and practices (Rogers, 2010), it is important to analyse relation between farm women, farming and agricultural innovation. Three key research questions arise: a) are farm women active in farming, b) whether they are interested in gaining agricultural knowledge or not and c) how they acquire agricultural knowledge. The aim is to identify barriers for enhanced participation of farm women in agricultural knowledge and innovation networks.

Farming and innovation from the rural gender regime perspective

In the last century and a half, agriculture underwent significant changes usually referred to as modernization. Nevertheless, modernization of agriculture refers not only to farming, but also to modernization of rural way of life and modernization of peasantry. Specifically, modernization on family farms comprises of complex set of long-term structural and functional changes aiming to harmonize farm production with the environmental, technical, technological, economic, legal and social systems in which farm exists. Those changes do not apply only to the production sphere or family farm itself, but also to the rural family and rural community. The very core of the modernization is scientification as a process of implementation of scientific knowledge in farming practice. Thus, innovations play central role in contemporary farming and crucially distinguishes modern from traditional agriculture. By agricultural innovations we refer not only to different technical and technological modification in production, but also innovative practices of organizing, marketing and managing production. Consequently, in contemporary farming, one form of capital stands out – it is human capital (Huffman, 2001). Its significance derives from the characteristics of contemporary economies referred to as cognitive capitalism (Vercellone, 2005). Contemporary rural economies (both agriculture and non-agricultural sectors) are no exception. They are market-orientated and highly competitive. Market position and potential business success crucially depend on entrepreneurial skills, but also use of relevant information and skills based on up-to-date scientific knowledge. In order to be competitive and viable, modern farmer is forced to educate and acquire new technologies continually, to modify labour organization, to develop marketing strategies, etc. The aim of embracing diverse improvements is to enhance productivity and to be competitive on highly demanding market. Also, as agriculture significantly relies on natural resources, the goal of applying innovations is to make farming sustainable in a long term.

Educational capital comprises of various knowledge and skills individuals and groups are familiarized with which enables minimizing cost and maximizing desired benefits. It also implies ability to acquire additional knowledge/information and develop skills. Educational capital facilitates combining other forms of capitals more efficiently in order to improve individual`s/group`s social chances. As a result, educational capital impacts individual`s/group`s ability to satisfy needs and improve and/or obtain certain quality of life.

Various scholars interpret differently individual/group ability to possess and acquire educational capital (Lipton, 1962; Bernstein, 1962; Nemanjić, Spasić, 2006). For our research, the most important is feminist perspective - according to it (Stromquist, 1987; Acker, 1987), gender[4] is a major factor which shapes educational achievement, thus scope and scale of educational capital. Feminist perspective establishes gender to be essential for creating inequalities in education process. Gender inequalities in education are numerous, e.g. gendered language, different educational outcomes for boys and girls, gender stereotypes, undermined position of gender issues in curricula, gender differences in subject choice, lower position of women in educational systems, etc.

Furthermore, it is important to stress out that ability to develop educational capital is also influenced by the position in spatial structure as it reflects relations between (educational) centre and periphery, as well as differences in spatial disposition of educational facilities (e.g. in rural/urban areas). Position of individuals/groups in spatial structure outlines their access to educational institutions of different levels and types (e.g. remote villages often do not have primary school; rural children have to attend secondary school in nearby towns/cities). Lack of educational institutions in rural/remote areas increases school drop-out rates as well as decline educational options. Consequently, features of spatial structure shape human capital as an element of social chances, but also regional developmental potentials.

4 Other socio-demographic characteristics, such as age, race and/or ethnicity has been analysed in the context of educational attainment and success.

In order to improve educational capital, individuals participate in various knowledge and information networks which consist of diverse intertwined sources (ranging from formal to informal, organized to unorganized, general to specialized) which facilitates knowledge and information creation and diffusion. In our research, such relevant knowledge and information network relates to farming. For rural/farm women, ability to obtain educational capital is shaped by characteristic of rural gender regime. It is shaped by two major dimensions of rural/farm women`s social roles and status: gender and spatiality. Gender regime refers to "relatively structured relations between men and women, masculinity and femininity, in institutional and non-institutional setting, both at the level of discourse and practice. Gender relations are visible in different gender roles, different identities and different gender representations, including different gender performance" (Blagojević, 2002). Steen (2011) defines gender regime as a "set of norms and rules that determines, according to gender, 'who can have what and do what' in a certain organization". Gender regimes are historically, structurally and culturally founded. They are relative, but not universal. Also, gender regimes are not petrified, but open to changes, according to the modifications in the social structure.

Rural gender regime is a result of the attributes of rurality which define gender relations (Morell, Bock, 2008). Inspired by Lewis (1992), we can speak of three types of rural gender regimes - patriarchal, mixed and equal[5]. In contemporary Serbian society, all three types of rural gender regimes are evident, with greater presence of traditional and mixed type. Both types are quite rigid in terms of gender super/subordination, at the expense of rural/farm women. That imposes poorer social chances of rural/farm women. Also, among rural/farm population, fatalistic orientation prevails, which supports keeping the status quo in gender regime. Traditional and mixed rural gender regimes imply `glass ceiling` phenomenon among rural/farm women, which causes scarce means to improve social chances. In such rural gender regimes, privatization of women and their capitals is at the high level. As Whatmore (1991) explained, ideology of wifehood and motherhood prevails, which makes contribution of farm women to economic and social reproduction socially under-recognized, but also expected. Application of rural gender regime perspective enables us to identify crucial barriers for farm women to be engaged in agricultural knowledge and information networks.

5 First is patriarchal rural gender regime with exclusive male breadwinner model and patriarchal farms, households and resource base. Second is partially modified rural gender regime with prevailing male breadwinner model. In such, farm women take part in breadwinning only in the case of male absenteeism. Third is mixed rural gender regime, with both male and female breadwinners, equal in participation in decision-making and access to the resources.

Relevant literature emphasises the need of more gender sensitive agricultural knowledge and information networks (Jiggins et al., 1997; Benson, Jafry, 2013). That means that all the stakeholders within the network have to be able to distinguish different gender roles and according positions within the economic reproduction of family farms. They also have to be able to address gender-specific needs of knowledge and skills and to facilitate gender-determined participation in various forms of education.

To answer the main research questions, we have analysed the experiences and attitudes of farm women in Vojvodina towards farming, but also their knowledge and skills relevant for the contemporary farming. Our analysis is based on main hypothesis that in spite of insufficient educational capital for modern agriculture, farm women in Vojvodina rarely participate in knowledge and information network regarding agriculture.

Research method and data sources

Relations between rural women, farming and diffusion of innovation is analysed based on empirical data collected in a survey. Face-to-face survey is applied on a random sample of 503 rural women living in 14 villages in Vojvodina[6] (two in each of the seven districts). However, due to the research problem, we took into account only data regarding women living on family farms. Subsample of farm women consists of 319 respondents or 63.4% of the total sample (Table 1.).

6 Vojvodina is interesting research area due to significant role of agriculture (food industry, in general) in its economy. Every fifth household in Vojvodina has a family farm (SORS, 2012). Unfortunately, agriculture is facing several vital development obstacles - e.g. relatively small UAA per family farm, unfavourable farmers` age structure, insufficient farmers` educational and financial capital, unfavourable agricultural machinery structure, etc. (Bogdanov, 2007; Šljukić, Šljukić, 2012; Čikić, 2018). On the other hand, in the current *Strategy of agriculture and rural development of the Republic of Serbia for the 2014-2024* (2014), agriculture has been identified as one of the strategic (economic) development drivers. Rural areas of Vojvodina struggle rural depopulation (Spalević, 2009), rural unemployment and poverty (Cvejić et al., 2010), lack of public institutions. Development of rural economy in Vojvodina requires (further) modernization of (family) farming, but also diversification (Bogdanov, 2007). Social chances of rural population are considered lower than of urban one (Cvejić et al., 2010). Previous researches confirmed differentiation of social chances within rural population (mostly by age, sex, type of household income, etc.), (Cvejić et al., 2010; Šljukić, Šljukić, 2012) which make important distinction line when speaking of risk of social exclusion.

Table 1. Total sample and subsample of rural women living on family farms – main characteristics

Parameter	*Total sample*	*Farm women subsample*	*Non-farm women subsample*
Age			
20-29 years	15.7	13.8	19.0
30-39 years	16.1	13.5	20.7
40-49 years	18.7	20.7	15.2
50-59 years	16.5	19.1	12.0
60+ years	33.0	32.9	33.2
Education			
No education	1.6	1.3	2.2
Primary education	28.0	31.7	21.7
Secondary education	50.5	49.5	52.2
Tertiary education	19.9	17.6	23.9
Employment status			
Employed	29.8	27.0	34.8
Unemployed	37.2	43.3	26.6
Pupil, student	5.6	5.3	6.0
Pensioner	27.4	24.5	32.6
Marriage status			
Single	13.9	12.9	15.8
Married	61.8	65.2	56.0
Divorced	3.6	2.2	6.0
Widow	20.7	19.7	22.3
Ownership status			
House/farmland owner	29.3	29.6	29.3
House/farmland co-owner	29.4	33.4	18.5
No ownership of any kind	41.3	37.0	52.2
Estimated livelihoods			
Very good	4.0	4.4	3.3
Good	61.4	65.4	54.3
Poor	27.3	24.8	31.5
Very poor	7.4	5.3	10.9
Number of household members			
One / single household	10.6	6.9	16.9
Two	16.9	18.1	20.2
Three	17.9	16.3	20.8
Four	25.7	25.1	24.0
Five or more	28.9	33.6	17.9
Municipal development			
I category	28.4	24.8	34.8
II category	42.9	46.4	37.0
III category	28.6	28.8	28.3

Source: research data

As in total sample, in a subsample of farm women middle-aged respondents prevail. Although there are few variations in all relevant features, subsample of farm women significantly differs from the subsample of non-farm women by four main characteristics: a) employment status, b) number of household members, c) budget structure and d) estimation of the livelihoods. Hence, less farm women are formally employed (t=4.825, p=.000), whether they are currently unemployed or never been employed at all. This implies that farm women are more often economically dependent than non-farm women. As expected, household budget of farm women is more often based only on agricultural or mixed income. However, 6.3% farm women tend to estimate their livelihoods better than women who are not living on farms (t=-3.015, p=.003). Also, households of farm women and non-farm women significantly differ in number of household members (t=4.825, p=.000), as farm women`s households have larger average number of members (3.9 compared to 3.1 in non-farm households). There is no significant difference in subsamples` characteristics according to the educational structure, marriage and ownership status and municipal development.

Research results and discussion

Data shows that 59.2% of farm women are active in farming. Those who are not taking part in family agriculture stated various reasons for it such as: illness and/or old age (27%), lack of time (12.5%) or social custom of women being excluded from farming (7.7%). According to those respondents, other household's members are engage in agriculture - those are mainly male members (e.g. husband, father, son, brother).

Even though majority of farm women are active in farming, frequency of their engagement in agricultural activities varies - 41.8% of all active farm women take part in farming activities every day. Those are mainly women older than 50 years (60%), with secondary education (56%), living in three member's households and unemployed (56%). Farm women who take part in farming on every day basis spend on average four hours working on a farm. Second major group consists of women active in farming only when needed (38.1%) - those women are active in farming only in high season (e.g. when seed planting or harvesting). Other women stated that they rarely take part in farming activities.

Four major groups of women active in farming are identified, according to their perception of adequacy of their knowledge and skills for farming. First group consists of women claimed to have sufficient knowledge and skills for farming. This is the largest of all the groups and it includes 46% of all active farm women.

Those women are usually active in farming every day (54.7% in the first group) and have secondary education (47.7%). In addition, 10.5% of those women have agricultural education. One third of the women in the first group have never been employed. Interestingly, farm women who claimed to have sufficient knowledge and skills for farming are mostly elderly ones - 38.4% are over 60 years old. Also, slightly more than ⅓ of the women in the first group (34.9%) live on farms with exclusive production for the household consumption.

Second group consists of women who claimed to have partially sufficient knowledge and skills (33%). As previous, those women are mainly active in farming on every day basis (41.9% of all women in the second group) and have secondary education (51.6%). However, most of them are middle aged (50-59 years; 33.9%) and currently unemployed, but with previous job experience (29.0%). Only 6.5% of the women in this group have agricultural education. One third of women in the second group said to produce equally for the market and household consumption. Third group makes of women who claim not to have adequate knowledge and skills for farming. This is the smallest group as consists of only 1/10 of all active farm women. Nevertheless, those women are the most different one as they are predominantly young (⅓ of all the women in the third group is between 20 and 29 years of age), with the highest share of women with tertiary education (31.6%) and employed ones (36.8%) which makes them active in farming only in high season (63.2%). No woman in the third group has agricultural education. Fourth group entails indecisive farm women, unable to evaluate adequacy of their knowledge and skills for farming (11% of active farm women). Analysis shows significant difference in perception of knowledge and skills for farming according to education (χ^2=8.627, p=.035) and age (χ2=16.135, p=.001). In the first case, level of farm women`s education decrease with the decrease in their perception of adequacy of knowledge and skills for farming - thus, women with the lowest education level are the most certain to have sufficient knowledge and skills for farming. Such result is paradoxical, but could be explained when have in mind production orientation of their farms and share of women with agricultural education. Non-commercial/subsistence production does not require implementation of agricultural innovation which makes existing knowledge and skills suitable for small scale farming. In the second case, even though only one tenth of women in the first group have agricultural education, it puts them in advance comparing to other farm women. On the other hand, women who claimed not to have adequate knowledge and skills also have higher levels education and have no agricultural education at all.

Their off-farm employment and partial activity in farming with significant share of market orientated farms make present knowledge and skills inadequate, especially for contemporary, highly competitive farming.

Regardless to their perception of knowledge adequacy, farm women claimed to gain knowledge and skills mainly from their parents (54.2%). Every fifth farm woman mainly has learnt about agriculture from her husband while 16% of the respondents active in farming said to be self-taught. Only 3.2% of farm women active in farming said to gain most of their knowledge and skills through formal education, mainly in secondary schools (63.2%).

Even though there is no statistically significant difference, we have observed that respondents differ according to their main demographic characteristics, farm`s features and perception of adequacy of knowledge and skills for farming (Box 1. and Table 2.). Farm women who are formally educated in agriculture are the most satisfied with their knowledge and skills for farming. They are on average 40 years old. Every third woman in this group has university degree. Half of them were previously employed. Self-taught farm women are the most indecisive, thus at least sure about the adequacy of their knowledge and skills. Women who have been taught about agriculture from their parents are principally satisfied with the adequacy of knowledge and skills for farming.

Table 2. Perception of adequacy of knowledge and skills for farming, according to the principal source of agricultural knowledge

Principal sources of agricultural knowledge	Perception of adequacy of knowledge and skills for farming (%)				
	Sufficient knowledge and skills	Partially sufficient knowledge and skills	No adequate knowledge and skills	Indecisive	Total
Parents	49.0	31.4	8.8	10.8	100.0
Husband	38.9	44.4	8.3	8.3	100.0
Others	37.5	37.5	25.0	0.0	100.0
Formal education	66.7	33.3	0.0	0.0	100.0
Self-thought	41.4	27.6	13.8	17.2	100.0

Source: research data

Box 1. Main demographic characteristics of farm women and farm features, according to the principal source of agricultural knowledge

Principal sources of agricultural knowledge	Demographic characteristics of farm women and farm features
Parents	42.7 years old; ½ have less than three years of high school; ¼ are employed, ¼ are retired; 38% produce only for household consumption; 47% active only in high season
Husband	48.1years old; ½ have less than three years of high school; 30% never or previously been employed; 1/3 produce mainly for the market; 44% active every day (2-4 hours)
Others	35.4 years old; ½ have less than three years of high school; ½ previously been employed; 38% produce both for the market and household consumption; 38% active every day (2-4 hours)
Formal education	40.0 years old; ½ have less than two years of university; ½ previously been employed; 2/3 produce both for the market and household consumption; ½ active rarely
Self-thought	50.9 years old; ½ have primary education; 38% retired; 1/3 produce mainly for the market; 2/3 active every day (less than 2 hours)

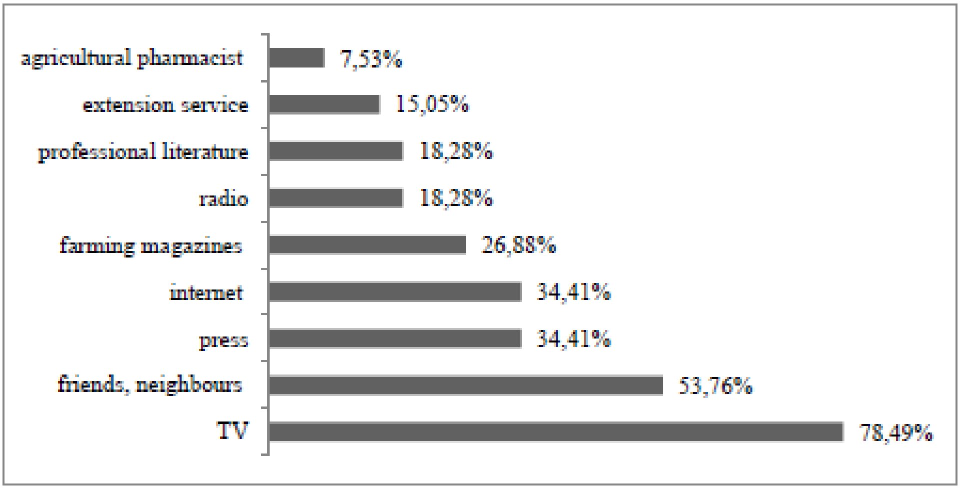
Source: research data

Further analysis shows that women active in farming are currently only partially interested in innovation in agriculture - only 47.6% of them regularly inform on the latest improvements in farming practice. 19 out of 188 farm women who take active role in farming claimed to be the only one who informs on innovation in agriculture on their farm. Women who are not informing on innovation in agriculture stated several reasons for it. Majority of them justify their lack of interest by limited scope of production ("*I`m satisfied with the current knowledge and skills due to production requirements*" - 45% of farm women not informing on agricultural innovation). One quarter of farm women are not interested in innovation because someone else is informing – it is dominantly male member of the household (husband, son, father, son-in-law). Every fifth respondent simply stated she is not interested in improving knowledge and skills in farming for no particular reason. Some farm women said that it`s a "*men's job*" indicating that farming is primary masculine activity, as well as education on it. Several farm women claimed not to be interested in informing on agriculture because: a) they are satisfied with their current knowledge and skills compared to the scope of their engagement in farming or b) they are simply not interested to change the way they are working. Small share of farm women expressed they are forced not to inform on agricultural innovation since they do not have access to adequate sources of information ("*There is no one to learn from*").

As expected, television is the most commonly used source of agricultural innovation among farm women nowadays (Figure 1.). Results show that respondents also choose informal sources of information (e.g. taking to friends, neighbours). Even though both channels of diffusion of agricultural innovation have certain advantages[7], they are often burdened with unsystematic perspective, mediocrity, inadequacy, selectivity of information (van den Ban, Hawkins, 1996). Every third farm woman gains information on agriculture from the Internet which indicates low level of electronic literacy.

Three quarter of farm women who inform on farming innovation use multiple sources of information, combing on average three different channels (e.g., TV, informal channels, press/agricultural magazines). Interestingly, farm women who claimed not to have knowledge and skills for farming are the ones who are the less interested in gaining information on agricultural innovation. Such can indicate routinisation and tentative nature of their farming practice.

Figure 1. Use of different sources of agricultural innovation among farm women in Vojvodina



Source: research data

Every sixth respondent who informs on innovation cooperates with the extension agents. Agricultural extension service has very important role in achieving goals identified within the current *Strategy of agriculture and rural development*

7 E.g. large target group in the case of television; high level of trust, closeness and ability to see effects of the implementation of innovation for yourself in the case of friends and neighbours.

of Serbia 2014-2024 (GRS, 2014)[8]. For the last decade, AESV pays more attention to the rural women's contribution to the economic and social reproduction of the rurality (Čikić, Petrović, 2014). Extension agents have intensified cooperation with rural women, not only regarding improvement of farming (e.g., organic production), but also various aspects of rural development (e.g., rural tourism development, women's associations). However, previous research has showed AESV cooperation to be insufficient, especially in terms of scope of family farms (Janković et al., 2016). Therefore, contribution of AESV to agricultural modernization has been lower than expected.

Farm women who have cooperated with the AESV were mainly focused on gaining information on the production issues (e.g. soil analysis, application of plant protection products, seed/variety selection, import of cattle, cattle breeding) and economic topics (e.g., government subsidies, farm registration, administration). Cooperation was usually initiated by the extension agents, mainly females. Such manner of establishing cooperation has both positive and negative aspects - positive in terms of introducing extension service to farm women and enhancing their motivation to cooperate and negative in terms of not providing solutions for the problems in adequate moment. Only ⅓ of the farm women that have an experience in collaborating with the AESV have proactive role in diffusion of innovation in agriculture as they stated to address the extension agents first in order to get an advice. Farm women are generally satisfied with the cooperation with the AESV as they argue extension agents' advices were useful. However, several respondents stated to have negative experience in cooperating with the extension agent as they provided farm women with the useless or incorrect information, information were not provided when needed or agents were simply not interested to cooperate with the woman.

Conclusion

Research results provided answers to the main research questions:

a. majority of farm women are active in farming, yet mostly in high season or rarely; three major groups of women are evident according to frequency of their engagement in agricultural activities – a) women who take part in farm-

8 There is a century long tradition of facilitating diffusion of agricultural innovation through the practice of extension service (Petrović, Janković, 2010). Currently, Agricultural Extension Service of Vojvodina (further: AESV) comprises of 13 regional units and 85 extension agents under the jurisdiction of Secretary of agriculture, water management and forestry of the Autonomous province of Vojvodina. Unfortunately, AESV faces different internal (lack of financial resources, insufficient staff and management issues) and external issues (unfavourable characteristics of agricultural and rural structure), (Petrović, Janković, 2010).

ing on every day basis, b) women active in farming only in high season and c) farm women that rarely take part in farming activities;

b. even though they take part in farming, farm women are partially interested in gaining agricultural knowledge and developing skills; interestingly, women who perceived to have no knowledge in agriculture are the less interested in gain it which they justify by their limited participation in farming and non-commercial production; the smallest share of farm women has formal education in agriculture which indicates that farming is not their first choice of occupation; also, lack of formal education in agriculture designates farming is still perceived as male profession;

c. participation of farm women in agricultural knowledge and innovation networks are limited to television and informal channels of diffusion, which indicates not only their limited interest, but also their restrained resources for accessing other channels of diffusion of innovation (e.g. Internet, extension service).

By applying rural gender regime perspective, we can identify several barriers for farm women to be engaged in agricultural knowledge and innovation networks. First, rural gender regimes, especially in societies of (semi) periphery, are often traditional and/or mixed ones. That implies specific, patriarchal structure of gender roles and statuses. In traditional/mixed rural gender regimes, role of women is mainly associated with biological reproduction, nursing and care for other family members. Even though they frequently participate in family farming (Whatmore, 1991; Gasson, 1992), farm women are often invisible labour force. Their role in economic reproduction of family farms is understood, but not appreciated adequately. Therefore, education of women in agriculture is not comprehended as necessary. Second, rural and agricultural modernization, but also development of non-rural, 'soft' industries influenced migrations of farm women out of farming and rural areas. Consequently, farming is still perceived as a male occupation (Brandt, 1995). Such common belief has two major consequences. First, it leads to the under-recognition of farm women`s contribution to farming by their husbands, fathers, brothers and (rural) community in general. Second, it shapes lack of recognition of their economic role among farm women themselves.

We can speak of objective/exogenous and subjective/internal restrictions. First group includes limitations imposed by others, e.g., family/household members, local rural community, extension workers, various stakeholders in agricultural knowledge and information network, etc. Those restrictions imply to a certain social stigma of the farm women`s efforts to improve their educational capital. They also entail evident or hidden rejections to cooperate with the farm women by other stakeholders within the agricultural knowledge and information network. Sometimes, limitations can be quite harsh and manifest as explicit ban for farm women to use new knowledge or technologies and gain different skills. Objective/exogenous obstacles also imply prohibition for the farm women to contact with other stakeholders within agricultural knowledge and information network. Moreover, legal and customary rights could decrease farm women' capacity to have and to manage resources important for their education and knowledge application. Second group of restrictions are subjective/internal ones as they are imposed by farm women themselves. They derived from the farm women`s self-perception of their own roles and positions within the rurality reproduction which are directly shaped by the characteristics of the rural gender regime.

In addition, farm women`s capacity and interest for participating in agricultural knowledge and innovation networks are closely connected to their social chances, shaped by the features of the rural gender regime. As previous researches have showed (Babović, Vuković, 2008), farm women in contemporary Serbian society often have lower social chances[9] then farm man. Lower social chances make farm women more socially vulnerable. Under such circumstances, their capacity to participate in agricultural knowledge and innovation networks weakens.

Some experiences shows that women`s participation in agricultural knowledge and innovation networks strongly depends on their position on a farm (Černič Istenič, Charatsari, 2017). Accordingly, recognition of multiple roles of women in achieving sustainability in farming and rural vitality could lead to an improvement of their status within the family, household, farm and rural community in general. Also, advancement in gender analysis in agriculture and rural development could enable developing gender-sensitive farming/rural development policies. Changes in institutions, attitudes, practices and relations - or changes in rural gender regimes - could enhance farm women`s visibility and create more barriers-free atmosphere for their participation in agricultural knowledge and innovation networks. Greater engagement of farm/rural women in diffusion of agricultural/rural innovation improves their educational capital for practicing modern farming and, thus, contributing livelihood, but rural vitality.

9 Social chances are formed not only on personal characteristics, role and position, but also on main elements of family capital. Thus, farm women social chances are formed by their age, education level, characteristics of employment, ownership status, parenting, times spent in housekeeping, structure of the family budget, perceived living standard, farm size, market orientation, etc.

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RURAL DEVELOPMENTS IN BULGARIA: INNOVATIVE APPROACHES AND REGIONAL DIFFERENCES[1]

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Abstract

The report presents the features of rural innovation and assesses the impact of the Rural Development Program (2007-2013) on their innovative development. Particular attention is paid to diversification of the economy and the process of improving the quality of life of rural people, as well as the differences between regions in the implementation of innovative approaches and projects. To this end, the results and achieved indicators under the measures of Axis 3 of the Rural Development Program in the six planning regions of our country (NUTS-2) were evaluated. Emphasis is placed on job creation, supported micro-enterprises, innovative solutions and improved infrastructure for living and business in rural areas. Conclusion and recommendations are drawn for dynamizing the innovative development of rural areas. Some analyzes and estimates were made towards the official data of the compenent Ministry incharge for Agriculture in Bulgaria.

Key words: rural innovation, rural development, innovative approaches.

Introduction

In recent decades, rural development in Bulgaria has been motivated and defined by EU policy. In the period of accession to the Union and during the last 11 years of full membership, a number of innovative approaches for the development of our country were appliedin order to stimulate the local communities and to finance projects for diversification of the rural economy and for improving the quality of life of rural inhabitants. The results, benefits and difficulties of their implementation are analyzed in a number of publications with different focuses - on the opportunities and benefits for cooperation (Doitchinova, Zaimova, 2015), on the problems of creating public-

1 The research leading to these results has received funding from the Bulgarian Science Fund - project “Sustainable multifunctional rural areas: rethinking agricultural models and systems with increased requirements and limited resources” (2017-2020).

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private partnerships and the implementation of local development strategies (Doitchinova, Stoyanova, 2014), on their contribution to sustainable rural development (Doitchinova et al., 2016; Miteva, Kanchev, 2019), etc.

Despite the common problems in rural areas, there are many significant regional differences in the country. According to the estimates of the Institute for Market Economics (IME, 2019), the differences between the implemented projects and the utilized European funds differ 168 times between Kostinbrod municipality (5,402 BGN per capita) and Sozopol (5,172 BGN[4]) to 32 BGN - Kovachevtsi municipality, 62 BGN - the municipality of Dulovo and BGN 116 - the municipality of Dobrich. Most municipalities in the country have less than 1,000 leva from projects per capita. This group accounts for 60.75% of the 265 municipalities in Bulgaria. Between BGN 1,000 and 2,000 BGN were used in another 26.4% of the municipalities, with over BGN 4,000 being a total of seven municipalities (2.65%).

Within this framework, our research interest addresses the causes of regional disparities in the activation of local communities and the implementation of rural strategies. The purpose of the report is to clarify the role and features of rural innovation and to assess the impact of the Rural Development Program (2007-2013) on their innovative development. Emphasis is placed on diversification of the economy and the improvement of quality of life of rural residents. The assessment and conclusions in this article are based on information from the Ministry of Agriculture, Food and Forestry about planned and spent funds for the measures under Axis 3 of the program (measures 311, 312, 313, 321 and 322).

The first stage of the analysis includes the initial allocation of funds by development priorities, the changes made during the period of implementation of the Rural Development Program, as well as the degree of achievement of indicators by respective measures (number of projects, number of created jobs, increased total added value from non-agricultural businesses, etc.). To evaluate the development of tourism activities are implemented such indicators as number of supported new tourism activities, number of one-day visitors, number of overnights, etc.

The second stage of the analysis aims at assessing the regional disparities in the project activity of business organizations, the non-governmental sector and municipal authorities, directed to diversification of the economy and improvement of the quality of life of rural residents.

4 1 BGN = 0,5113 EUR.

Rural innovations and innovative approaches

The new rural paradigm envisages the sustainable development and transition of rural areas from suppliers of agricultural products to suppliers of different goods and services based on ecosystem services, especially agri-system services. On this basis, innovative rural development depends on the activities and forms of cooperation and sharing of the local community, as well as the introduction of new economic, social and environmental practices and the preservation of local identity.

Development implies a change that, according to some authors (Copus et al., 2011), “is an extremely complex and nuanced phenomenon”. Insight in these changes is often inaccurate, leading to the creation of anachronistic stereotypes (such as lack of initiative, creativity and innovation or a “culture of dependency”) with a negative impact on (political) recondirations of them. At the same time, a number of successful examples have led many authors to argue that rural territories dispose with considerable possibilities to create innovative alternatives (Di Iacovo, Colosimo, 2012).

Some researchers (Corrado, Dematteis, 2013) argue that a number of areas have the emerging capacity to apply an innovative “territory” approach, and there are new methods for advancing the resources that will lead to specific comprehension of life quality. Others believe that innovative activities are carried out by combining material and intangible conditions, based on “reevaluating (revalorization of) local natural resources and lifestyles, improving accessibility levels and new opportunities through access to information sources. These indications are seen as a relevant cognitive, social and economic source for new entrepreneurship.

The New Rural Paradigm (OECD, 2006) according to some authors (Atterton, Rowe, 2012) has rightly shifted the focus of rural policy from supporting sectors (by providing subsidies) to an integrated, area-focused investment approach. The challenge is “to better understand how the various components of the local economy interact and how local capabilities can be supported”. On this basis, increasing the competitiveness of rural territories is sought by identification of novel economic functions and advancement of conditions for agriculture.

New approaches to the contemporary model for sustainable rural development combine short supply chains, quality products, the concepts of multifunctionality and new forms of marketing in the process of relocalization

(Copus et al., 2011). In addition, by supporting the swing from agri-based development to more integrated, land-based approach, it emphasizes “the potential to combine the environmental, social and economic development of rural areas in an innovative way” (Horlings, Marsden, 2014).

Actual approach to regional development is based towards the new “understanding of the role of innovation in economic development, and in particular its relation to geography” (McCann, Ortega Argilés, 2013). In fact, from a single sector and science-based acting, politics were evolved in more multidimensional approach to policy, addressing the institutions, territorial and connection development. It is traditionally believed that innovation occurs mainly in urban areas where science is produced, in surrounding that push the transfer of technology into the business (Dargan, Shucksmith, 2008). Authors state that as a consequence, “innovation is seen as foreign to rural experience”, or “Innovative economic development (in rural areas) is more likely to be linked to social and cultural innovation”. The authors describes their work by referring the LEADER approach that favors small pilot projects, and emphasizes territorial approach to rural development as the most innovative element. On this basis, it is emphasized that, as a result, “innovation occurring in rural areas is not well integrated into standard approaches for defining and measuring innovation” (Dargan, Shucksmith, 2008). In addition, previous rural specialization policies have meant the introduction of modern technologies for the agricultural sector, or recently it have shown that innovation in agricultural sector in rural territories mostly come from diversification of activities that are not linked to agriculture, while combining various technologies, or implementating of organizational and marketing activities and strategy approach (OECD, 2006; OECD, 2014).

It is for these reasons, mainly in rural innovation research, that the understanding of their nature is broadened, and the emphasis is placed on what is new in the area. Some authors (Mahroum et al., 2007) define innovation as “the application of something new (change) in the economic or social life in rural areas”. Innovation adds economic or social value to rural life, increasing the incomes and quality of life of rural people. Regardless of their place of origin and their nature, innovations are combined into a broader innovation system.

This extension of innovation goes beyond science and practice, as Morgan (2013b) points out, incorporating various “innovative narratives”: science and technology, environmental, social and transitional processes. This is indeed “a great challenge for traditional regional stakeholders who tend to define innovation narrowly as industrial innovation" (Morgan, 2013a), meanwhile it is essential for rural theritories characterized by huge demographic change, usually combined with actual environmental challenges.

Rural areas "lack the density of business and business networks", but at the same time have endogenous (and often neglected) natural, cultural and other resources that can be mobilized for development. The combination of assets is critical to reaching the critical mass to maintain more competitive and successful development paths. In fact, promotion of "more cross-sectoral support for the development of the value chain in specific places" (McCann, Ortega Argilés, 2013) contains many opportunities for innovation in rural areas. Other dimension is the mobilization of stakeholders for the use of local resources, which is encouraged by policy. Some authors (Barca et al., 2011) argue that "most of the knowledge needed to make full use of growth potential on the spot (…) is not readily available" and have be generated within the processes that include internal and external stakeholders. Mentioned approach has the added advantage in avoiding the risks of opportunistic behavior by beneficiaries due to inherent information asymmetry. This problem is fundamental in the context of rural areas as it often lacks a strong research university and mobilization of knowledge resources is of paramount importance (Harmaakorpi, Tura, 2012; Unicreds, 2012).

The perception of tradition as a resource for innovative activities is often shared as a "vision" of the desired model of development, as a commonly used "collective wisdom" leading individual behavior. From the aspect of rural economy, links that connects agriculture and rural economy are poorly understood, although they have strategic impact on development of certain territory (Saraceno, 2010). In fact, as the same author states, "the future of rural areas [should] no longer be perceived in terms of agricultural modernization, but rather in terms of wider diversification and modernization, including agriculture" (idem) . In this regard, some authors (Foray et al., 2011; Foray, Goenaga, 2013) argue that new profitable activities cannot develop unless upstream and downstream investments are made at the same time. This requires coordination of policy interventions, local development strategies and local community projects. In this context, the implementation of the LEADER approach in rural areas implies the creation of an innovative system, using cooperation as a key factor in defining and implementing regional development policy. Above all, it is necessary to examine not just a eventual multiplier effects, but also the likelihood of provoking a structural evolution in the regional economy through cross-sectoral activities. There is need to obtain a strong consensus on identifying potential niches with high growth potential, mutually reinforcing their links with other activities, and building capacity to cope with processes of elaborating strategies and policies. The next step is to forge external links, while seeking for recognizable scientific and professional knowledge which has to be combined with local actors, as well as in building a firm foundation for harnessing growth potential based on assets. The authors (McCann, Ortega Argilés, 2013) have argued that "the impacts of new technologies today are highly dependent on local institutional and management systems and the nature of engagement between different actors."

Assessment of the benefits of implementing the measures under Axis 3 of the Rural Development Program

While developing the Rural Development Program (RDP), the funds are balanced among the first three axes of the program, with priority being given to improving the competitiveness of agriculture, but with the last (sixteenth in a row) change of the budget of the program, more than one third of the expenditures are directed to Axis 3 (37.88%).

Table 1. Distribution of total public expenditure among the axes (%)

Axis	Initial budget allocation of the RDP	Final budget allocation of the RDP	Allocation of incurred costs
1	37,58%	29,96%	30,10%
2	25,01%	24,21%	24,39%
3	25,11%	37,88%	37,53%
4	3,84%	1,72%	1,72%
TOTAL	91,54%	93,77%	93,74%
Technical assistance	3,42%	1,26%	1,24%
Supplements to direct payments	5,04%	4,97%	5,02%
Total budget	100,00%	100,00%	100,00%

Source: MAFF, 2015.

The increase in the expenditures over the program period reached 29.8%, and in real terms the budget was increased by almost EUR 269.856 million. The overall increase in axis funding is a result of the increase of the budget under two measures - Measure 321 by 105.7% and Measure 322 by 23.4%.

Within the scope of Axis 3, five measures were implemented in Bulgaria - three with beneficiaries from the business and non-governmental sector and two targeted at municipalities. These measures are aimed at diversifying the economy and improving the quality of life of rural people. Measure 311 aims to stimulate and diversify rural economic activities through the development of non-agricultural activities. The implementation of Measure 312 promotes the development of entrepreneurship in rural areas, promotes growth and job creation in non-agricultural micro-enterprises in rural areas, and supports the development of integrated rural tourism. Measure 313 targets income growth and employment creation in rural areas through the development of integrated rural tourism, the diversification and improvement of tourist infrastructure, attractions and facilities for visitors to rural areas.

Despite the significant reduction in the initially allocated budget under the three measures - from 47% (for measure 311) to 14% (measure 312), the planned indicators have not been reached. For measure 311, the number of aid recipients reached only 15% of the target (3,049) and 36% for the number of created jobs (Table 2.).

Table 2. Implementation of the objectives of measures 311, 312 and 313 on the basis of a reduced budget

Indicator	Measure 311	Measure 312	Measure 313
Number of aid recipients	15%	18,5%	
Total investment in million euros	76%	90%	84%
Total number of created jobs	36%	39%	
Newly established micro-enterprises		29%	
Other micro-enterprises		12%	
Increased total added value from non-agricultural businesses		335%	
Number of supported new tourism activities			28%
Number of one-day visitors			26 622%
Number of overnights			7 679%

Source: MAFF, 2016.

Measure 312 does not meet the target values of indicators for "number of aid recipients", "newly created micro-enterprises", "other micro-enterprises" and "number of created jobs". The target for the number of beneficiaries of the aid was achieved at 18%, with more beneficiaries being newly established micro-enterprises than older ones. The results with respect to the investment indicator of the measure show that the target is almost reached - 90% of the target.

One of the main reasons for these results are the significant differences between the planned and actual average investment in a project. For example, for measure 311, the projected average investment for a project is EUR 49,000 and the actual one is EUR 250,000 or 5.1 times higher.

The total number of created job places under measure 312 is 2,247, which represents 39% of the target. The reason is that the sectors where most projects have been implemented do not imply job creation. In the tourism sector, a large number of projects are for the creation of guest houses, which are a family business, and the projects in the renewable energy production sector sector are not linked with the creation of new jobs.

The RDP has an indicator for the result "Increasing non-agricultural gross added value in assisted (micro-) enterprises in million EUR" with a target value of EUR 20 million. The indicator is also implemented in the 16th latest version of the program. In the data provided by the State Fund Agriculture, the amount of gross added value in the implementation of the measure amounts to EUR 67,49 million.

Although with only about a quarter of the planned number of new tourism supported activities, 84% of the implementation of the planned volume of investment support for the beneficiaries by measure was actually achieved, which in turn helps all other set specific result indicators to be exceeded, incl. the number of tourists is increased on the basis of one-day visits and overnights. At the same time, almost twice of the planned jobs in the provision of tourist services were created.

The implementation of the measure establishes a balanced approach to the intervention according to the focus of the investment support in improved tourism infrastructure, created tourist attractions and encouraging the development of accompanying services.

Investments in renewable energy sources contribute to increasing the share of renewable energy in gross final energy consumption. The investment interest is in the production of solar energy. At national level, the share of photovoltaic power plants (PVP) between 5 kWp and 200 kWp supported under the RDP is 55.46% of the total for the country. Of the total number of companies with photovoltaic power plants, 21.26% are supported under the RDP, and the installed capacity is 2.61% of the total volume for the country.

The largest number of projects under measures 311 and 312 were implemented in the tourism sector - over 65% (Table 3.) and 61% (Table 4.) respectively of the implemented projects, followed by investments in renewable energy sources sector with 22% and 29% respectively. The higher number of projects in the tourism sector compared to other type of projects is due to the interest of rural businesses to develop this sector. Overall, the observed impacts are positive, but there is no significant effect on their implementation.

Regarding the territorial implementation of the measure, the majority of the implemented projects are in the most developed region of Bulgaria - Southwestern, and the least developed Northwestern region is not significantly supported in that respect.

Table 3. Structure of projects under measure 311 by sector

Project targeting	Number of projects	Structure (%)	Total investment value (EUR million)	Structure (%)
Tourism	294	65	73.4	65
Craft	25	6	6.1	5
Retail trade	14	3	3.6	3
Electricity from renewable energy sources	101	22	25.3	22
Other	16	4	4.4	4
Total	450	100	112.67	100

Source: MAFF, 2015.

Table 4. Structure of projects under measure 312 by sector

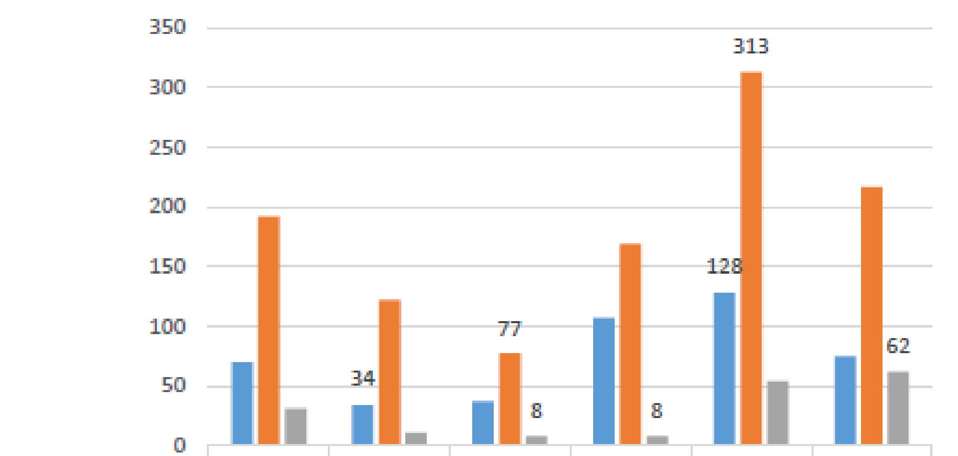
Project targeting	Number of projects	Structure (%)	Total investment value (EUR million)	Structure (%)
Tourism	448	61	96.3	58
Craft	7	1	1.4	1
Retail trade	42	6	7.9	5
Electricity from renewable energy sources	218	29	54.5	33
Other	28	3	4.8	3
Total	739	100	164.9	100

Source: MAFF, 2013.

In the Southwestern region are executed 28.38% of the projects under measure 311 and 28.71% of those under measure 312 (Figure 1.). In the South Central region, 35.63% of the projects under measure 313 have been implemented. At the same time, few projects have been implemented in the North East and North Central regions.

The challenges facing rural areas, incl. poor infrastructure, bad quality of the provided public services, depopulation and limited economic capacity of the population are prerequisites for inclusion of measures 321 and 322. A significant share of the total amount of public funds provided by the RDP during the past programming period is aimed at improving the state of infrastructure and access to services, is assessed by aid beneficiaries as a significant contribution to improving the quality of life, precisely because of the visible, physically measurable nature of the investment support.

Figure 1. Distribution of projects by measures 311,312 and 313 by regions of the country



	N-W	NC	NE	SE	SW	SC
Measure 311	70	34	37	107	128	75
Measure 312	192	122	77	169	313	217
Measure 313	31	11	8	8	54	62

Source: MAFF, 2015.

Measure 321 aims to support the quality of life of the rural population by improving road infrastructure, improving water and sewerage infrastructure, improving rural population's access to cultural, sporting and leisure and recreational services, and improving access to social services, in particular for children and vulnerable groups. Due to the high interest in this measure, the estimated initial budget of EUR 412.5 million was increased several times and reached EUR 761.39 million (85% increase). An almost complete utilization of this financial resource of 98% was achieved.

Measure 322 aims to improve the attractiveness of the living environment in rural settlements through the physical renewal of rural settlements, the enhancement of recreation opportunities, and to increase their attractiveness by building/restoring publicly accessible green areas, their vertical layout, squares, street lighting, pedestrian areas.

As a result, this measure aims to accelerate the processes of development of local economies and limits the rapid depopulation of rural areas. The measure has an initial budget of EUR 167 million, which due to strong interest in the measure has been increased by 23% to EUR 205 million. As with the previous measure 321, the increased budget of measure 322 was used at 98%.

The good financial implementation of the measure also leads to the achievement of the set indicators (except for the number of supported activities). The total volume of investments is 143% for measure 321 and 119% for measure 322, while the population benefiting from the improved services is 176% and 113% respectively.

The analysis of the implementation of the specific indicators of the measure shows the most significant effect in terms of improving the condition of the municipal road network (434%), as well as in the number of built / renovated buildings / facilities for sports services (increased from 180 to 314). Contrary to this trend, the comparison of target and final values, measured when closing the program, related to the achieved results under the measure for constructed / renovated buildings and facilities for the provision of cultural (from 240 to 119) and social services (from 420 to 59), as well as ICT service development projects (from 360 to 98) shows a significant difference between what was completed and planned. In terms of the identified needs in the programming process in relation to the stated needs for investment in the development and improvement of the water supply and sewage sector in the territory of the rural municipalities in Bulgaria, the achieved results meet 100% of the set goals.

The successful implementation of the measure is due both to the proper programming and reporting of the errors accumulated in the implementation of the previous SAPARD Program and to the adopted amendments to the rules on the terms and conditions for granting financial assistance under measures 321 and 322 of the

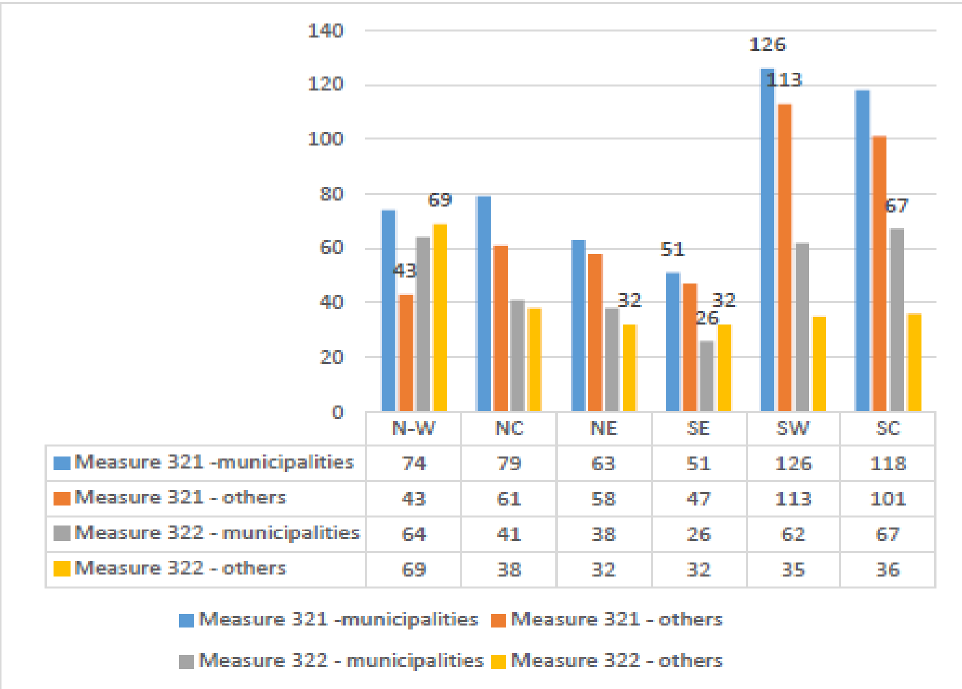
RDP, including an increase of the advance payments from 20% to 50% of the approved subsidy.

Information on completed projects (Figure 2.) shows significant regional differences. Similar to business projects, most municipal projects were implemented in the Southwest and SouthCentral regions. Leader by number of projects under measure 321 is the Southwest region, followed by South Central region, and for measure 322 - South Central and Northwestern regions. Lowest was the activity of the municipal authorities in the Northeastern and Southeastern regions.

Significant differences in the project activity of the municipalities are related to the higher administrative capacity of the municipal services in the two southern regions and the greater accessibility of consultants and designers, since in the regions are located a large part of the Bulgarian universities and most of the research institutes.

Another reason is the presence of a large number of small municipalities in the northern regions with limited administrative staff, which does not allow them to compete effectively for European funding.

Figure 2. Distribution of projects under the measures 321 and 322 by country regions



	N-W	NC	NE	SE	SW	SC
Measure 321 -municipalities	74	79	63	51	126	118
Measure 321 - others	43	61	58	47	113	101
Measure 322 - municipalities	64	41	38	26	62	67
Measure 322 - others	69	38	32	32	35	36

Source: MAFF, 2015.

Conclusion

Although the indicators of many of the RDP measures (2007-2013) were not reached and many changes were made in the course of its implementation, the program contributed to:

- diversification of local economies.
- improve the quality of the environment and the standard of living.
- improve the infrastructure and accessibility of rural areas, enabling the transfer of knowledge and the promotion of innovation.
- encourage small businesses from the made technological advancements and the availability of high-speed broadband.
- new interactions between local and global have allowed isolated communities to develop international networks.

All this has led to an increase in the internal synergies of innovative development, to new relationships between local people, business structures and public authorities, which allows the absorption of new technologies and the emergence of potential new markets.

The completion of the implementation of the RDP (2007-2013) only at the end of 2015 came together with the launch of the New RDP 2014-2020. Its overall budget amounted to EUR 2,917 billion, included contribution from the European Agricultural Fund for Rural Development to the amount of EUR 2,366 billion and national co-financing - EUR 551,131 million. In line with the EU Rural Development Policy Goals, the RDP 2014-2020 has three objectives with six priorities. The program is structured around 5 thematic priorities, 1 horizontal and 16 priority areas for rural development policy. In line with the above priorities, the budget and implementation indicators have been allocated to a total of 17 measures and one thematic sub-program for the development of small farms.

Unlike the initial and final versions of the first RDP, in the current program, priority is given to the environmental aspect of development - the second objective: conservation of ecosystems and sustainable management, use of natural resources in agriculture, forestry and food industry, prevention of climate change and adjusting to them. It accounts for 48.5% of the budget (Table 5.).

Table 5. Budget structure of the Rural Development Program (2014-2020)

Goals of the Rural Development Program	Structure
First goal: Increasing competitiveness and balanced development of agriculture and forestry and processing industry	22,1 %
Second goal: Ecosystems protection and sustainable management, use of natural resources in agriculture, forestry and food industry, climate change prevention and adaptation	48,5 %
Third goal: Socio-economic development of rural areas providing new jobs, poverty reduction, social inclusion and better quality of life	27,9 %

Source: MAFF, 2013.

On second place with 27.9% is the socio-economic development of rural areas, providing new jobs, poverty reduction, social inclusion and better quality of life. Priority 1 of the Program is to stimulate knowledge transfer and innovation in agriculture and forestry and rural areas. It is horizontal in type and is linked to all three axes without being allocated a separate budget.

Structure shown in new Rural Development Programme (2014-2020) demonstrates the change in focus of rural support - towards environmental aspects and use of natural resources in agriculture, forestry and food Industry.

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THE LEGAL NATURE AND THE ECONOMIC OBJECTIVE OF THE COOPERATION[1]

Ljiljana Rajnović[2]

Abstract

In this paper author presents the legal nature of cooperatives, the importance of association of individual economic entities in cooperatives, the importance of the continuity of business of these entities, especially those whose activities are related to agriculture in Serbia, since according to official data, more than half of the population in Serbia directly or indirectly subsist on agriculture.

One of the characteristics of modern markets is that classical competition is increasingly giving way to cooperation that can significantly improve the competitiveness of businesses. Of course, this does not mean that any cooperation contributes to improving competitiveness, but only that which is established between "compatible" business partners.

Cooperatives are associations of individuals who cooperate with the aim of achieving economic, social and cultural benefits for the cooperative and its members. Their cooperation is achieved on generally accepted principles. In researching the history of cooperatives, the author has come to the realization that various types of cooperatives in the developed world, a very widespread modality of cooperation between micro-business entities and are an important component of private sector development.

Key words: cooperative, legal nature of cooperative, goals of cooperative, economic interest of cooperative, competition.

About the cooperative

A cooperative is a voluntarily organized legal form of conducting an economic activity, as an open and independent economic entity, managed by members of the cooperative who founded it or subsequently joined it. The members of the cooperative shall establish a cooperative to plan, realize, promote and protect their

1 The work is part of the research on project no. 46006: "Sustainable agriculture and rural development in the function of achieving the goals of the Republic of Serbia within the Danube Region", financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

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individual and common property, economic, social, educational, cultural and other needs and interests through their work and other activities or using its services, on the basis of commonality and mutual assistance, for which the cooperative was founded (OGRS, 112/15).

Cooperatives originate from tribal communities, and the first organized cooperatives emerged in the seventeenth and eighteenth centuries in the UK and the USA.

The first forms of association of individuals, the first social alliances created to undertake joint ventures in a particular activity, originated in the Middle Ages, e.g. "Burial cooperatives" that allowed all members to have a proper burial, or cooperatives for the construction of flood defence systems, as this was an occurrence that affected many entities in the affected area.

This was the case in other activities as well. In mining (e.g. in Goslar), the miners merged into the original unions. In the Alpine region, immigrants joined alpine cooperatives to regulate the collective use of pasture land and restrict the sale of common property. All these phenomena, such as the understanding of the need for voluntary association to achieve a specific goal, with the possibility of even the need to join new members formed the basis for current cooperatives.

The founder of the first co-operative movement is Robert Owen. In 1799, he established the first cooperative at his cotton factory in New Lanark (Scottish experiment on humane working and living conditions) with the above objectives. Based on this cooperative, other cooperatives in other activities began to be established in view of the needs of business entities. The first cooperative that established the principles for the others was the Rochdale Society of Equitable Pioneers, the so-called "Rochdale Society of Equitable Pioneers", Rochdal Principles. Specifically, 28 workers from the local textile industry established a trading cooperative in Rochdale, England, in 1844. It was thought that its greater market power would obtain lower prices of goods and services, and the cooperative model was based on the principles of the democratic decisions of the members and on principle of fair remuneration (Walton, 1997).

Friedrich Wilhelm Raiffeisen in Weyerbusch founded the first charity organization for the needs of the rural population, in Germany, in 1847. At the same time, Hermann Schulze-Delitzsch started the Rohstoffassoziation Cooperative in Delitzsch, which, in accordance with the principles of self-help, self-management and self-responsibility, aided businessmen in need, first carpenters and later anyone who needed help regardless of the activity they performed. Around the same time, the first cooperatives in the retail sector emerged, such as in 1850 the "Lebensmittelassociation" cooperative of craftsmen and workers in Eilenburg, which is considered to be the first consumer cooperative.

Hermann Schulze-Delitzsch based his cooperative on "shared responsibility", the principle of subsidiarity, which places personal responsibility above state action, allowing cooperatives to build community through shared interests and values. In this way, cooperatives create innovative solutions to social problems, enable employment, help the elderly and start urban revitalization and renewable energy projects (UNESCO, 2019).

In these cooperatives, everyone was able to participate, and members of the cooperative could acquire shares in the cooperative and participate in determining the operations of this form of legal entity. The state provided low-interest loans to farmers, craftsmen and entrepreneurs, and today about a quarter of the German population is a member of a cooperative that includes 90% of all bakers and butchers, and 75% of all traders, beside farmers and craftsmen. That is why UNESCO has protected the lively German practice of organizing and resolving common interests in cooperatives as an intangible World Heritage Site in 2016 (ICA, 2019). Today, in the contemporary world, at least 700 million members worldwide participate in cooperative activities organized by the International Co-operative Alliance. In European countries, there are numerous and varied forms of government support for the cooperative sector of the economy. The policies of the states are generally favoured by cooperatives, and provide numerous benefits such as access to affordable sources of finance, tax breaks, partial exemptions from antitrust enforcement, technical assistance, etc. (Royer, 2014).

Cooperatives were very prevalent in the former socialist countries, especially in the area of agriculture (agricultural cooperatives). In Serbia, interest in cooperatives has stagnated, so, in the last few years the state would begin to favour this type of cooperation for the sake of developing the countryside, the environment and the state.

It is considered that cooperatives in Serbia have a good future, as long as there are "small" producers, providers or users of agricultural cooperative services, there will also be a need for association in cooperatives. Currently, it is important for Serbia to organize farmers into cooperatives at local level, for one or more surrounding villages, so that farmers can jointly appear on market. Through joint appearance, they will have stronger economic power and at the same time more effectively oppose competition (Bugarin et al., 2012).

It is believed, in Serbia, that state support for the cooperative sector can be essential for the formation of new cooperatives, their success, as well as the recovery of neglected cooperatives. In doing so, the state must not compromise their autonomy. In this sense, state support through partially exempting tax treatment or support for employment in cooperatives is implemented in countries with developed cooperative sectors.

Taking into account the large number of small holdings in Serbia and the weak market position of individual farmers, some form of association is necessary, since cooperatives have significant advantages over other forms of association, because in addition to their economic role they have a developed social role and can be a factor of development the rural environment in which they operate. The current state of agricultural cooperatives in our country is the result of the joint action of a number of factors, and therefore several different elements are needed for their development, and especially the support of state.

State support has only recently shifted from declarative to significant. But the formation, development and survival of cooperatives depend primarily on the interest of its members. Farmers' determination to cooperate with the cooperative and its development, as well as economic participation in the cooperative's work, are key elements for the survival of cooperative sector in Serbia, and it is therefore extremely important for these cooperatives to share their experiences with farmers interested in joining through agricultural cooperatives.

Methodology

In researching of this topic of this article were used foreign and domestic professional textbooks, scientific articles and monographs, empirical data available for processing and analysis using statistical and other various methods, the internet as well as many years of personal research and gained practical experience of the author. The following methods were used in researching the topic selected and in gathering relevant information:

- Analytical-empirical method - where the breakdown of complex terms in the field of cooperatives into their simpler parts and elements, in addition to the historical method, can determine causally - a consequential link, showing the positive motives for organizing in the cooperative as well as possible good results.

- Descriptive method, showing the status of cooperatives in developed countries, suggests that observed cases within the economy can be taken as a typical case, which indicates the achievement of satisfactory results of cooperatives, with respect to their special organization, which is a guarantee of socially responsible operations and satisfaction of economic interests.
- The comparative method shows that association in cooperatives can be a better model of organization when applying a result-based approach.
- The synthesis method was eventually used to summarize conclusions at the Serbian level, with recommendations for association in cooperatives and their role in creating an effective environment for the community in which they operate and beyond.

The legal nature of cooperatives

Cooperatives are associations of natural persons (entrepreneurs) who cooperate in order to achieve economic, social and cultural benefits. Their cooperation relies on the values of self-help, self-responsibility, democracy, equality, equity, and solidarity. Traditionally their founders or cooperative members are accepting several ethical values, as are honesty, openness, social responsibility and mutual care (ICA, 2015).

Unlike clusters, which represent a "critical mass of unusual competitive success in one business area in one geographical area" (Porter, 1998), which implies cooperation between economic entities in different industries, cooperatives represent cooperation between economic entities in the same or similar activity.

A member of a cooperative can be only a person (individual person, entrepreneur) who directly participates in the work of the cooperative, operates through the cooperative or uses its services or otherwise directly participates in the achievement of the goals for which the cooperative was founded. The cooperative member is not responsible for the cooperative's obligations with its personal property. Responsibility of the cooperative members is framed by the value of the value of by them contributed capital. Thus, the maximum risk of members is limited to this extent.

Legal form and cooperative management

Cooperatives operate as legal entities, the form of which depends on their purpose and the possibilities provided by national regulation. Regardless of the legal form and type of ownership, the founders of a cooperative are individual persons who bring certain property into it and have management rights, which do not depend on the size of the property entered. The input of assets in a cooperative is made on the basis of self-contributions by members, which make up their ownership stakes, whereby it is possible for individual members to have greater stakes and greater participation in management.

Under current law governing cooperative matters, in Serbia as in most other countries, members enter assets in the form of cooperative deposits or pay membership fees, and management rights do not depend on the size of the deposits, but the principle of "one member, one vote" applies. Management of a cooperative can be done either through self-management, which is based on the delegate principle, or through professional management, which is based on well-known principles of corporate governance.

A cooperative must be registered under the law in every country, or respective state cooperative laws. On registration, it becomes and independent entity of its own, distain it from its members (OGRS, 2015). It can enter into contracts on its own. A registered cooperative society enjoys certain privileges and sometimes exemptions granted by the state. It is exempt from payment of income tax, stamp duty, registration fees, etc. (Rajguru, 2019).

Cooperative societies are governed by provisions of relevant laws and are subject to state supervision and control as any legal entity. One of the reasons is the amount of grants received by the societies from the government. In Serbia, the cooperatives are under significant support in Serbia, starting from the republic level to the city level in carrying out its predominant activity, too. Significant support in Serbia is reflected in the encouragement of the co-operative by measures of economic, agrarian and housing policy, as well as other development policies, including the granting of appropriate facilities and benefits, which are stipulated by special regulations, as well as the possibility of establishing special funds for the development of this form of legal entity from by local self-government units or autonomous provinces or by providing budgetary resources to local self-government units, autonomous provinces and republics.

Cooperatives, as well as companies, are subject to the same rules on institutes of individualization, and especially on activity, headquarters, business name, business books, giro account. The name of the cooperatives must have the form label "cooperative".

The objective of cooperative society is not profit, but mutual gain, based on mutual trust. The society mainly deals with its members. The transactions of the society are above board "the moral element in its aims is as important as the material" (Rajguru, 2019).

Cooperatives, by their legal nature, are partnerships, which are significantly different from equity companies, limited liability companies and joint stock companies. In cooperatives, the organization and decision-making model is entirely based on the democratic principle. Any of cooperative members has the right to vote at the assembly, giving suggestions and opinions on plans and programs that are the subject of decision-making at the cooperative assembly. Co-operation, as one of the essential principles of the cooperative, recommends self-determination and individual responsibility of each member. These are essential features of the cooperative, through which the entrepreneurial function of each member is realized.

Therefore, every member of the cooperative is equal in decision making. The amount of money invested in a cooperative does not affect the amount of voting rights. Voting in the assembly of the cooperative is done "by heads" and not by "capital", i.e. investment in the cooperative. The particular principle of voting in cooperatives differs substantially from that of voting in limited liability companies whose largest owners of capital have the greatest decision-making rights.

Cooperative principles[3]

Cooperatives are people - centred enterprises owned, controlled and managed by and for their members to achieve their mutual interests, whether the members are the customers, employees, users or residents. Cooperatives are democratically managed by the "one member, one vote" rule.

They represent legal entities whose core business is based on the well-known principles of equity, equality and social justice. With such operations, cooperatives around the world give people the opportunity to work together to establish viable legal entities that create long-term businesses and prosperity throughout the environment in which they operate. Since cooperatives base their business on recognized values, not just profit, cooperatives respect the principles accepted at the international level and work together to build a better life and world through mutual cooperation.

3 The Statement on the Cooperative Identity – the Values and Principles of the cooperative movement (ICA, 2018).

Cooperatives allow members to lead their economic activity and, as they are not possessed by shareholders, all economic and social gains arising from their activity stay available just for their members. So, derived profits are reinvested in cooperative activities or returned to members (ICA, 2019).

The International Co-operative Alliance (ICA) is the international supporter of the Statement on the Cooperative Identity – the Values and Principles of the cooperative movement.

During 1995, the ICA adopted an amended, in accordance with the needs of practice, Statement of Cooperative Identity defining the notion of cooperatives, the identifiable values of cooperatives, and the seven principles upon which a cooperative should operate. In addition, for ease of application, ICA provides educational, detailed guidance on how to apply these principles in the day-to-day operations of cooperatives.

Based on described principles, cooperatives operate on the following valuation: self-help among members, self-responsibility, democracy in decision making, equality all members, regardless of the funds invested and contribution to the cooperative, equity, and mutual solidarity.

Given the long and successful business of cooperatives in the developed world, in the past and today, members of the cooperative have traditionally believed in the cooperative's values created, honesty, socially responsible psyche, and therefore concern for others (ICA, 2015).

1. Voluntary and Open Membership

Cooperatives are voluntary organisations that focus on people, individuals value, not property values, give access to all people who have the above values, that use cooperatives' services, or that are willing to accept the rules, right and obligations of membership in the cooperative with full equality of members and without any discrimination, gender, social, racial, political or religious (Cracogna et al., 2013). Any person, irrespective of his caste and creed, can join a co-operative society of his free will and can leave it at any time after obtaining a proper notification to the society.

The voluntary character of the co-operative association has two major implications: a) none will be denied the right and opportunity to become its member, and b) the co-operative society will not compel anybody to become a member. Exception will, of course, have to be made in case of people whose professional interests differ from those of the society, e.g., a private trader competing with a consumer co-operative (ICA, 2015).

The openness and humanistic nature of organizing a cooperative is reflected in the possibility of free access of each new member, if he is willing to accept the rights and obligations required by the cooperative rules.

2. Democratic Member Control

Cooperatives are democratic legal entities administered by members and at the same time actively involved in setting the organization, goals of the cooperative and in making decisions. Persons who are elected representatives of the cooperative and appointed to the organs of the cooperative are responsible for their actions to the membership. The rule is that members have equal voting rights (one member, one vote), and even with cooperatives organized at other levels, the democratic member control is respected.

3. Member Economic Participation

This principle implies an obligation on the members of the cooperative to contribute equally to the maintenance of the capital of the cooperative and to democracy-based control. Most often, a part of the capital managed by a cooperative is joint ownership. It is common for members of a co-operative to receive limited compensation, if earned, for the capital they have invested in the co-operative to become members.

The realized profit of the cooperative is most often allocated for the following activities: a) forming reserves that can be used to develop the cooperative in the future as well as for the survival of the cooperative in the event of external or internal crises; b) payments to members of this legal entity in proportion to their business and contribution to the cooperative; and c) financing of other activities of the cooperative in line to adopted acts of the cooperative (OGRS, 112/15).

4. Autonomy of cooperative and Independence

Focused to the principle of autonomy, cooperatives serve as self-help to affiliate members, who at the same time control the cooperative. In a situation where cooperatives operate with other businesses, including public sector, or receive external capital, they are also acting under the conditions that provide the democratic control of members and maintain the autonomy of cooperation.

5. Education, Training, and Information

One of the significant activities of the cooperative is to provide training and training to its members, representatives of the cooperative they elect, directors and employees so that their knowledge can influence the increase of economic efficiency and modernization of their cooperative. At the same time, they are spreading good information about the benefits of mutual business by joining cooperatives.

6. Mutual Cooperation between Cooperatives

The greatest contribution of cooperatives to their members and to the strengthening of the cooperative movement is achieved when cooperatives operate together through local, national, regional and international and legal entities, in principle, more participants can give greater opportunities.

7. The principle of Community support

The community in which the cooperative operates has a significant impact on the business of the cooperative, as well as any other economic entity, which is why the cooperative must take into account the interests and condition of the community within its own developed policy. This results in the apparently well-regulated socially responsible behaviour of each cooperative and its governing structure, which also results from the fact that its business is constantly intertwined with various social processes.

The importance of cooperative principles is often emphasized in science and theory as the basis on which cooperatives differ from other economic entities, and in particular from capital companies, joint stock companies and limited liability companies operating on completely different bases. In recent decades, there has been considerable evidence that cooperative principles have a significant positive impact on the financial performance of cooperatives (Rixon, 2003). Therefore, the acceptance and preservation of cooperative principles is important not only as an element of the diversity of cooperatives, but also because they contribute to the survival and development of cooperatives in the market (Zakić, Nikolić, 2018).

Cooperatives as economic entities with an economic objective

In economic life, there are various forms of cooperation, which can be manifested in different ways: a) From classic collaborations (e.g. cooperatives, development parks, clusters, incubators, contract based deals, etc.), through b) Joint appearance in the market (e.g. consortia, joint ventures, strategic alliances, contract manufacturing, franchising, licensing, Piggy-Back, etc.), up to c) Full integration of business systems (e.g. holdings, concerns, conglomerates, Keiretsu systems, etc.).

Cooperatives are one of the most effective models of self-organization for individuals and entrepreneurs. Although in accordance with the rules of the ICA, cooperatives cultivate community values that typically go beyond pure business. The ICA emphasizes the importance of self-help, self-responsibility, democracy, equality and solidarity as core values. In the tradition of their founders, members of the cooperative have confidence in the ethical values of honesty, openness, social responsibility and the interests of others. The author of this article believes that the motives for association in a cooperative are very significant and certainly economic (ICA, 2019).

Regardless of all the specifics that arise from the cooperative principles, they basically have a commercial character, the character of an economic entity, because they are obliged to operate economically, socially responsible, to be competitive economic entities.

Cooperatives are a very widespread modality of cooperation between microbusiness entities in developed economies, first of all Europe, but also in other countries of the world and represent a very important component of the sustainability and development of the private sector, which in some countries, such as. Spain, for many years, was the initiator of the entire economic development of the country and the region.

As noted, one of the characteristics of modern markets is that classical competition is increasingly giving way to cooperation between business entities in the country and intercontinental (the term "co-opting" is often used, lately). In fact, both theory and practice have proven that cooperation between business entities can enhance their competitiveness, very significantly. This is not to say that any cooperation contributes to improving competitiveness, but certainly one that is established between "compatible" businesses.

Synergy effects are cited as the strongest argument for cooperation between market players. Synergy represents the ability of business entities to produce, by joint action (direct synergy), a value greater than the sum of the values they would have produced if they had not joined. Therefore, as united economic entities, they are more valuable than as a sum of individuals. In other words, synergy is a phenomenon in which the cumulative effect is much more significant than the sum of the individual effects, and can be represented as follows:

$$\text{EFFECT }(A+B+C) > \text{EFFECT }(A) + \text{EFFECT }(B) + \text{EFFECT }(C)$$

Achieving synergy effects is very important for entrepreneurs, who, as a rule, do not have great market power and therefore the power to achieve the goals that the cooperative associates can achieve.

Businesses that cooperate have a better market position, exchange knowledge faster, grow faster, operate more efficiently, achieve greater profitability, are more flexible and create a better reputation in the market. What is characteristic is that the cooperation brings positive results for both "big" players (companies, corporations, public enterprises), but also "small" players (small and medium-sized enterprises, entrepreneurs, associations).

The benefits of joining cooperatives are great. Cooperatives are established in almost all areas of business, most often agricultural, retail, craft, construction, communal, financial, labour, consumer, student, youth, student, health, sports, volunteer, social, employment cooperatives and other forms of cooperatives. In addition, association in the form of cooperatives continues to form associations (Cracogna, 2013) of cooperatives, cooperative unions, and even political cooperatives.

What is common to all types of cooperatives is: pooling resources that encompass knowledge, assets, capital and finance; collaboration between members in order to strengthen their competences; strengthening the bargaining position towards the outside world: suppliers, customers, financial institutions and government bodies; better access to funding sources; better position to the procurement market; and better position to the sales market.

The essential objective of an agricultural cooperative is to ensure the long and successful operation of the cooperative itself, in order to achieve, through the positive effects of the cooperative, the interests of the cooperative members, the wider community and the long-term business that can provide the interests of future generations, not just the members who founded it. For this purpose, the cooperative does not share all the profits made to its members, but uses it for long-term investments to secure its future and that of its members. That is why it is said that „cooperative capitalism" is capitalism with a human face (La Cooperation Agricole, 2019).

The objective of an agricultural cooperative is to capture agricultural activity, including the promotion of production, processing and marketing and the division of business between farmers who are members of the cooperative and other economic entities.

Modernly speaking, agricultural cooperatives are business entities that have a desirable and prosperous business that can fully respect the ongoing economic, social issues of individuals and the wider community, including environmental issues that are current at all times. The cooperative is like a model of organizing work, based on "cooperative capitalism". It combines the freedom of decision-making and business, solidarity of members and the strong connection of the cooperative with the region in which it operates, placing farmers at the center of management and growth strategies of their entity (La Cooperation Agricole, 2019).

Based on these specifics, it can be said that cooperatives are legal entities with specific organization, management and ability to create and maintain a successful and long-lasting business.

The agricultural cooperative is organized by the farmers in order to carry out their own business and to improve the business and economic efficiency of all persons interested in the business of the cooperative.

Obviously, association with cooperatives has many advantages, which mainly consist of the following: a) risk dispersion of each member; b) with a small investment, members of the cooperative can acquire new knowledge, fund the necessary services of external experts, share the cost of sales, advertising, use equipment od cooperative, have better access to external sources of funding; and c) as united, according to the rules of synergy, cooperatives have stronger economic power, a better negotiating position and the ability to create a recognizable brand in the territory in which they conduct their business and in the wider community.

Cooperative property

The cooperative's property is in the cooperative's ownership.

The cooperative shall acquire assets from the cooperative's deposits or membership fees, the proceeds of the cooperative's own business, and the funds acquired in other way. The property of the cooperative consists of the right of ownership of movable and immovable assets, monetary assets, securities and other property rights acquired by the cooperative through registered activities or other activity and represents assets in cooperative property.

The cooperative manages uses and disposes of its assets, in accordance with the law, the contract of incorporation, or the cooperative rules. In the case of the sale of immovable property in a cooperative property, the proceeds from the sale of that property cannot be distributed to cooperatives and employees, that is, they cannot be paid to cooperatives or employees by virtue of their membership in a cooperative, role or employment rights. The cooperative operates on its own behalf and for its own account, on its own behalf and for the account of the cooperatives, or in the interests of the cooperatives, based on the founding agreement or internal norm of cooperative.

The cooperative uses the own assets for its operations, and can use the services of cooperatives and assets owned by cooperatives and other legal and individual persons based on a specially concluded contract, in accordance with the law and the internal rules of association.

Conclusion

Association in the form of cooperatives is an underutilized potential of Serbia. The potential for association in cooperatives is very high, in the fields of agricultural production, retail, as well as in the field of processing and development of high technologies. Entrepreneurs who understand the potential of the association have the opportunity to significantly improve their position in the domestic and international markets. That is why the message to all entrepreneurs is to find an area in which they can cooperate, establish cooperation and improve their position in the market and at the same time the economic position of the region and the state as a whole, because agriculture is a very important operations in the domestic market, which is given priority in the strategic plans for the development of agriculture in our country.

Serbia is an agricultural country. The location of our villages offers great opportunities for cooperation. According to a survey of the Statistical Office of the Republic of Serbia, generally in Serbia, the potential of the cooperative sector is very large and untapped. Cooperatives are a great opportunity for young people first and foremost. The future is certainly associating and obtaining products with greater added value. Vojvodina as a whole is extremely favourable for the business of cooperatives, where there are most of them. There are many examples of successful organization and operation of cooperatives. A large number of cooperatives, especially in Vojvodina, survived the financial crisis well. Serbia’s agricultural development strategy favours business through cooperatives, and Serbia has fertile land, knowledge, experience, and expert people.

Continued work on the education of cooperatives and co-operatives is also needed to further implement standards in agriculture, apply new knowledge and precision agriculture while constantly propagating these activities in various ways. It is believed that through strong cooperatives, Serbia can have developed villages and an economically strong state.

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APPLICATION OF BIOPHYSICAL METHODS IN SUSTAINABLE SOYBEAN PRODUCTION

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Abstract

In agricultural production the last two decades to intensify research in order to satisfy the principles of sustainable systems of food production, in the new climate change. The aim of the study is to determine the possibility of applying a low frequency pulsed electromagnetic field (PEMF) to soybean seeds under unpredictable agrometeorological conditions. Using these methods can activate plant growth, in particular, it can accelerate germination and increase root mass as plants are able to vegetate at a higher energy level. The studies were conducted in 2014-2015 and it can be concluded that under conditions of seed treatment with PEMP frequency of 17 Hz for 30 minutes, the yield components and the yield height are increased. In drought conditions in 2015, the increase in yield were statistically significantly higher (9.41%) compared to the variant without seed treatment, while in 2014 this increase was 2.96% when the optimal agrometeorological conditions were.

Key words: soybean, electro-magnetic waves, yield.

Introduction

More frequent natural disasters pose a serious problem on a global scale, to humanity and the environment. Research to date clearly indicates that global warming has been sampled by an anthropogenic factor. The fact was publicly stated by the Intergovernmental Panel on Climate Change (IPCC)[3] in 2001.

The increase of the global economy and population has been brought to climate change, as a result of the emission of greenhouse gases in the atmosphere, which can take place more quickly, as compared to natural cycles that neutralize them (Figure 1.). The carbon dioxide, together with methane, nitrogen oxides and water vapour leads to a warming of the atmosphere by the greenhouse

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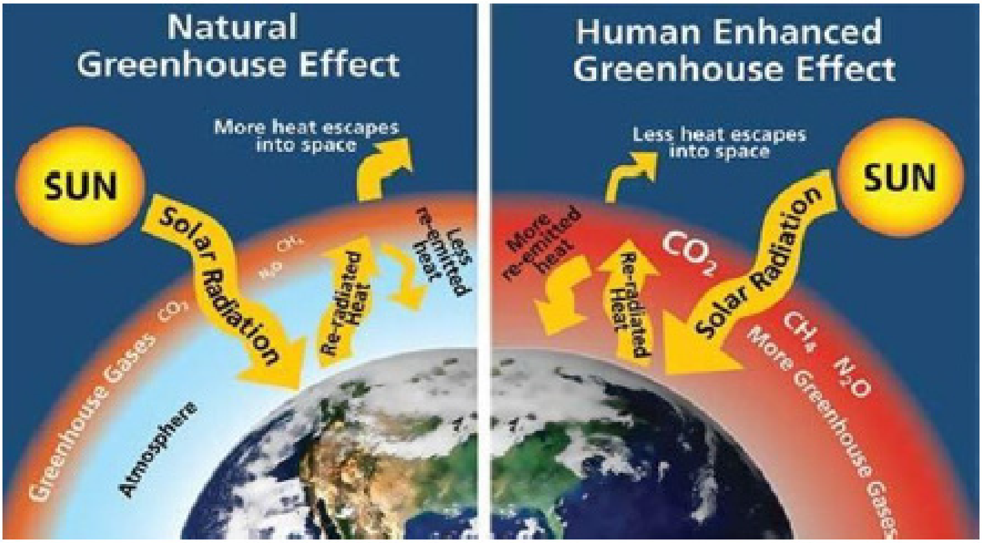
3 More about IPCC activities could be seen at: www.ipcc.ch

effect, which is its natural characteristic. If the greenhouse effect were absent, the mean temperature of the Earth's atmosphere would be below -17°C, instead of the current average of 15°C.

Figure 1. Greenhouse effect

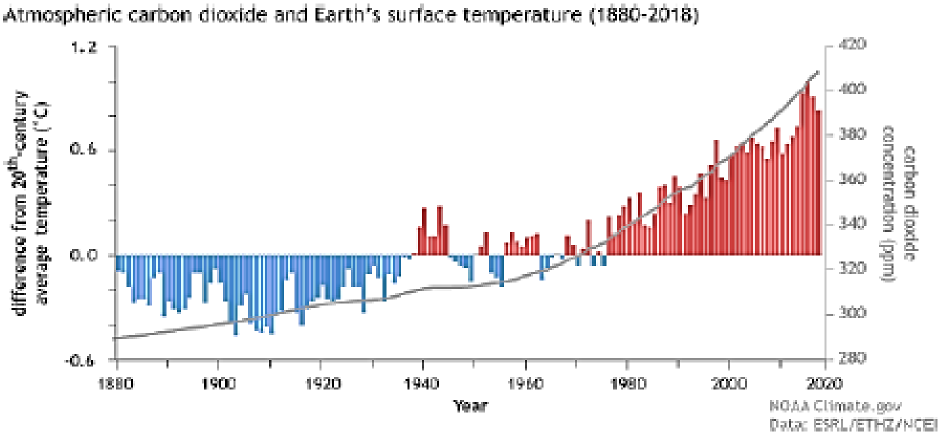


Source: https://socratic.org/questions/what-is-the-role-of-greenhouse-gases-in-global-warming

Cvijanovic et al. (2018a) report that the total percentage of all polluting gases, carbon dioxide accounts for 61%. The current level of carbon dioxide in the atmosphere is 53.5% higher than it was before the Industrial Revolution (Graph 1.). In addition to the most dangerous carbon dioxide, synthetic gases, chlorofluorocarbons and halons (CFCs) are increasingly present. Also, deforestation to increase agricultural land, as well as the combustion of fossil fuels (coal, oil and gas), lead to climate change. To reduce CO_2 emissions, in order to limit Earth's warming to 0.1°C per decade, the use of fossil fuels should be replaced by renewable energy such as hydropower, solar, wind, and the like.

The first published results on the projection of the effects of increasing carbon dioxide in the atmosphere that would increase the global temperature of the Earth's surface to 5.5°C for 3,000 years were presented in 1896 by the Swedish chemist Svante August Arrhenius. Further, in 1950, physicist Gilbert Plass confirmed these claims, adding that the onset of industrialization would accelerate this process.

Graph 1. Increase in CO_2 concentration (ppm) in the atmosphere, followed by an increase in average temperature (°C)

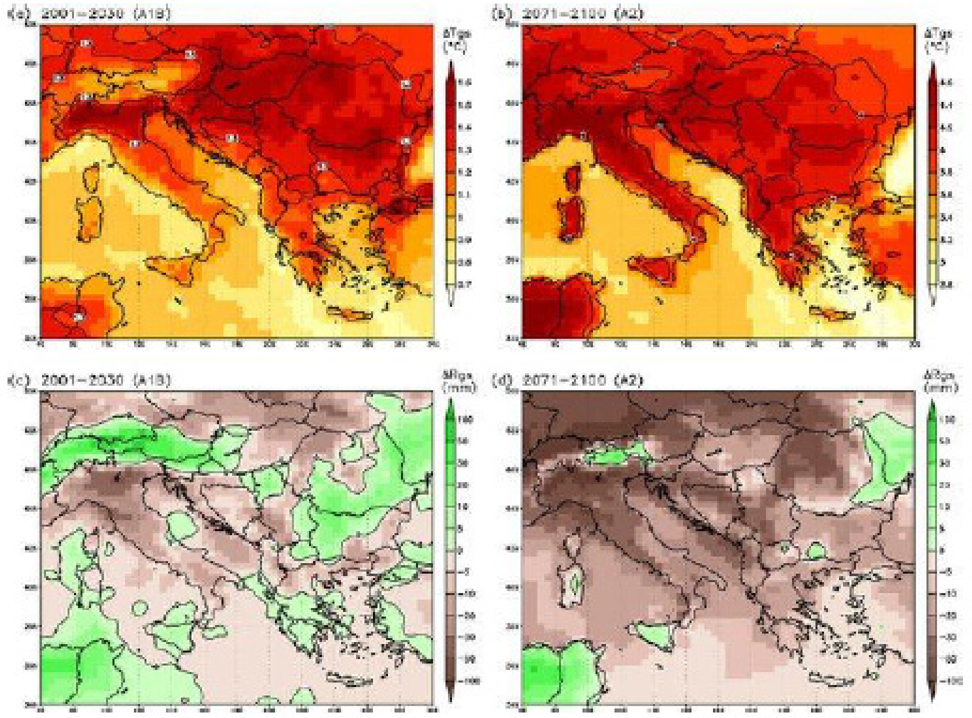


Source: www.climate.gov

The establishment of the IIPCC by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) in 1988. confirmed the importance of potential climate change. There is a need, with daily monitoring of values and knowledge of the projection of meteorological elements and phenomena, to form studies on the future state of the climate, as well as its impact on agricultural production. In recent times, the World Scientific Community reports that by 1995. the temperature of the air has increased by 0.5°C and that by 2100. there will be an increase to a maximum of 3.5°C. However, as early as 2001. the increase forecast had climbed to 5.8°C. Increases in temperatures are usually accompanied by a lack of precipitation and an uneven precipitation pattern. According to Iglesias and Garrote (2015) in the southern continental agricultural region of Europe, including Serbia, the increase in temperature and drought in summer will adversely affect many crops. According to Cvijanovic et al. (2018a), the dry years were 2003, 2007, 2012, 2013, 2015, 2017, and according to the Seasonal Bulletin for Serbia, the Republican Hydro-Meteorological Institute of Serbia will be 2019. Some research[4] has shown that in the last 12 years there have been 4 autumn droughts, which are suitable for winter crops, meadows and pastures, while summer droughts have been 8, indicating on the regular occurrence of droughts of varying intensity. For most perennial crops, the greatest damage is caused by successive autumn and spring droughts.

4 More about research could be seen at: www.hidmet.gov.rs/podaci/agro/SPI

Figure 2. Changes in mean annual temperatures (above) and mean annual precipitation (below) for the two periods (2001-2030 and 2071-2100)



Source: Ruml et al., 2012.

In view of the above forecasts and the dangers that may arise, the Special Report on the Impact of Global Warming by 1.5°C from 2018, which responds to the call of the IPCC, defines measures and indicates the threat of climate change, sustainable development and attempts to eradicate poverty (Figure 2.).

Pimms et al. (2014) stated that contemporary populations of many plant and animal species face drastic changes in environmental conditions that result from daily human activities. The importance of looking at the overall adverse effects of climate change leads to challenges to finding ways to regulate greenhouse gas emissions on the one hand, and how to adapt to future climate change in order to reduce negative impacts on the other, to meet the needs of food with environmental improvements and good economic effect. For this reason, agricultural development needs to be well linked to rural and regional development. The agricultural strategy and adaptation plan should include agricultural production, infrastructural connectivity and sociological development, availability of knowledge and technology.

It is increasingly striving for sustainable agricultural production, that is, environmentally friendly techniques, while preserving biodiversity while increasing crop yields. By correcting certain agro-technical measures, basic environmental elements, such as water, air and soil, can be preserved. One of the problems of crop production in the period of intense rainfall and later high temperatures is the intensive growth of weeds. In order to protect the environment, new methods are reducing the use of pesticides. Diprose et al. (1978) used a current of 8.4 kV voltage to suppress ambrosia in a sugar beet crop. Thus according to Stankovic et al. (2016) found that suppression of ambrosia in the fields after wheat harvest can be successfully done by a voltage of 25 kV and an exposure time of 1.5 seconds. Based on the research, they found that 63% of ambrosia plants were destroyed two days after treatment, and after 5 days the effect was 100%.

Organic agriculture consists of: fertilization, tillage and crop rotation. Also, Dozet and Cvijanovic (2018) conclude that it is necessary to introduce organic sources of plant nutrients in basic tillage. One of the significant measures is the introduction of legumes into the production system, the advantage of which is that they have the specificity of a symbiotic relationship with the beneficial groups of microorganisms.

According to Cvijanovic et al. (2018b), in order to achieve high yields and produce healthy food in sustainable systems, biophysical methods can be used. Biophysics is of great importance for agricultural production and is considered the future of the 21st century.

The aim of the study is to determine the possibility of applying a low frequency pulsed electromagnetic field (PEMP) to soybean seeds under unpredictable agrometeorological conditions. Soybean seeds were treated with PEMP before sowing, and at the end of the vegetative period yield was determined with 14% moisture under different agro-meteorological conditions (2014 -2015).

Climate change and agriculture

Agricultural production and climate are in synergy with each other. Agriculture is additionally a significant factor in the overall balance of adverse sectoral impacts on climate change. Therefore, food production can become an immediate danger to humanity. The "National Communication on Climate Change" strategy, published in 2017, has publicly stated that agricultural production is most sensitive to changes that are complex and imply community engagement.

Humans and animals have the ability to adapt quickly to the resulting climate change, while in plants this reaction is very slow. Plants need long-term adaptation, leading to the loss of some native and newer species, with the emergence of new diseases and pests. The forecasted climate changes (increase in temperature, air and water shortages) result in plant stress, reduced growth, shortened ripening period, poor nutrient uptake, diminished fruit and grain quality, reduced yields, difficult application of many measures in crop production, etc. In addition, some natural disasters, such as extremely low temperatures during the dormancy of particularly fruit species, high rainfall, causing mudslides, stormy winds, extreme city effects result in reduced yields and can lead to permanent destruction of fruit species. In addition to these types of yield reductions, there are high risks of new (foreign, arriving from other continents) pests, diseases and weeds. Invasive species usually increase their abundance and, consequently, their harmfulness over favourable conditions (Petrović Obradović et al., 2010).

At the level of global food markets overall impact of water shortages due to climate change becomes extremely important. Given the adverse effects that occur due to global climate change, the price of harness produced in developed countries is rising. As demand is high, food security levels deteriorate. In the Mediterranean region, due to the increased incidence of droughts, the yields of cereals and other food crops will decline significantly in the near future. In coastal areas, large areas of fertile land can be lost due to river flooding and saltwater intrusion. Rainfall is just one of the factors that affect productivity and sustainability.

In the last ten years, many new pests and diseases have been registered in Serbia, which have adapted to the new climatic conditions. Due to climate change, many indigenous populations and old varieties have been threatened in Serbia, which have been adapted to certain areas (cabbage „futoški“, peppers „somborka“, beans „gradištanac“), (Prodanović et al., 2015). The risk of drought will be particularly pronounced in shallow and sandy terrains, and especially in areas where sowing will not be able to take place in the optimum time. In addition to the drought, excess water during the growing season will be a problem for crop growth, especially in the plains lands, valleys and river valleys, and such lands are over 50% in Serbia. Climate change is not only a problem with one-year uses, but also with perennial uses such as fruit growing. In future climates, not only apples, but pears, cherries, it is necessary to provide 26% of water by the end of the century. The drought is projected to begin as early as May on shallower lands and early June on fertile ones, leading to reduced yields and economic losses.

An increase in mean air temperature during the winter months can lead to the development of winter crops and to the expansion of grape and fruit production, while long droughts and disturbance of the rainfall regime during the summer months, especially in spring crops, reduce the yield of almost all crops (Angelini et al., 2011). Also, warmer winters and a decrease in the number of frosty days that occur in February and March cause the flowering phase to occur earlier, as well as the ripening phase due to higher temperatures from April to June. This change is insignificant by 2030, but for the period up to 2100, the vegetation cycle is thought to shift earlier by 20 days. In this case, soybean production would take place in a shorter vegetative period.

Biophysical methods - use of pulsed electromagnetic field (PEMF)

In order to achieve the production of sufficient quantities of food while preserving the environment, in the resulting climate change, more and more research is focused on finding new technologies or adapting existing ones. One of the models is organic production as well as methods of other fields such as information technology and physical treatments of seeds or plants.

Physical treatments are the oldest known treatments for seed treatment, which have been neglected by the development of chemical products. Physical methods are divided into methods with hot water, steam, hot air, etc. Also used are lasers, ultraviolet waves, magnetic induction, electromagnetic waves, etc. Their action is based on a change in the flow of some physiological and biochemical processes in the seed, leading to increased vigors and improved growth and development in the sprouting phase (Carbonell et al., 2000).

It is well known that agricultural production today requires ten times more energy than in the last century, and there is a growing need for scientific researchers to look for alternatives to increase the efficiency and efficient use of plant energy. Aladjadjiyan (2007) explains that all living processes depend on the exchange of energy between cells and the environment. She points out that the application of chemical measures is done by the direct introduction of suspensions into the cell. However, in the physical treatment, the energy introduced into the cells creates the conditions for molecular transformations and as a result, the necessary substances are created for the cells, and this is the basic concept of "quantum agriculture". According to El-Yazied et al. (2016) biophysical methods are based on the fact that physical methods can increase energy for internal energy transformations, which further increase the electro-potential of the membrane.

The essence of biophysical stimulation, with low-frequency non-ionizing frequencies, on seeds and plants is realized through the increase of energy balance, faster exchange of matter and the process of plant growth (Zhao et al., 2012). Most scientists agree that the cell membrane is the primary site at which these interactions occur. Studies of seed stimulation with low-frequency pulsed electromagnetic fields have yielded positive effects in many morphological and productive traits, especially in adverse climatic conditions (Cvijanovic, 2017). The treatment of the seed prior to sowing stimulates the activity of proteins and enzymes (Atak et al., 2014), as well as a significant increase in the fresh weight of tissue, the level of assimilation pigments, as well as the ratio of chlorophyll, the average level of the nucleic acid, the increase in average length of the plants (Rashmi et al., 2014). These methods do not sample the physiological changes that are under the control of genetic regulation. Therefore, according to the research of Ghodbane et al. (2013), using these methods at the appropriate frequencies and timing of exposure will not lead to genetic changes in either seeds or plants. The results depend on the trait of the seed, the type of plants, the frequencies and the duration of the seed stimulation, as the effect on the plants can be transformed from positive to negative or stress factor. Recent research is based on examining genetic transformations that affect all stages of development (Sztafrowski et al., 2017).

The application of these treatments is considered to be an environmentally friendly, inexpensive and non-invasive technique with proven beneficial effects on seed germination, which has a positive effect on early-stage plant development and crop yields in different climates.

The electromagnetic radiation used in agriculture can be roughly divided into natural and artificial. Natural radiation comes from sources that cannot be influenced by humans, such as the sun. Artificial-technical radiation is manufactured by humans and this group includes radiation used by different devices. In many studies, exposure to electrical, magnetic, and electromagnetic waves gave positive and negative effects. The importance of electromagnetic field use is reflected in many studies conducted on seeds, annuals and perennials, microorganisms, soil and irrigation water.

If different frequencies are observed in the studies of Djukic et al. (2017) show that the germination of soybean seeds was best influenced by a frequency of 16 Hz with a exposure time of 30 minutes, while for yield the best effect was achieved by applying a PEMP strength of 24 Hz and an exposure time of 30 minutes. Milosev et al. (2001) found that for barley, the best germination was achieved in the 72 Hz frequency variant for 90 minutes and the best yield was in the 15 Hz variant and 90 minutes.

Prihatini et al. (2017) exposed tobacco plants with field strengths of 6 and 12 mT, 50 Hz frequencies for 0.5, 1, 2, and 4 hours, respectively. Exposure to seeds with 12 mT for one hour increased plant growth (shoot height); since 6 mT exposure for one hour increased chlorophyll a, chlorophyll b and total chlorophyll content.

The results of the study have shown that different frequencies can have a stimulating but also an inhibitory effect. This can be seen in research showing that one wavelength has a positive effect on the germination of hybrids, root length, etc., and in the case of another hybrid, they can act repressively (Dicu, Pirsan, 2014).

From the research results, Djukic et al. (2017) concluded that the conditions of manufacture of soy in the field conditions, the influence of the stimulation of seed germination with PEMF increases to 8% and the yield to 21%. The same authors found that, under different agro-ecological conditions, the best effect on soybean yields was on seed exposure to waves of 24 Hz for 30 minutes. The value of the correlation coefficient ranged from 0.86 to 0.96 which means that with increasing exposure time at this frequency the yield increased significantly (from 382.2 to 472.5 kg). By extending the exposure time, a negative dependence was found ($r^2 = -0.28$). Similar results were obtained by Ortiz et al. (2015) in maize and found that the application of electromagnetic waves represents advances in improving seed vigor, seedling growth, and reducing seed dormancy. Growth rates of seedlings of beans, maize and peas examined by Sabu et al. (2018) were faster than the control group. They concluded that the effect of seed stimulation acting as a bio-stimulant accelerates germination leading to faster and accelerated plant growth, thus reducing the time of growth period leading to faster yields. One-time stimulation of winter wheat seeds by a pulsing electromagnetic field has a significant influence on the increase of various synthesis processes in the plant, as evidenced by the more intensive development of the above-ground part of the plant, the root system, as well as a positive influence on the height of wheat yield (Bilalis et al., 2012).

Kumar et al. (2015), in examining the effect of PEMF in wheat and barley, obtained significant results in increasing grain yield and protein. Crnobarac et al. (2002) showed an increase in soybean yields of 5 to 25%, with higher amounts of oil and protein, as well as an increase in sunflower yields of 13.2 to 17.3%. Marinković and Borcean (2009) concluded with a long-term analysis of the influence of electromagnetic waves of extremely low frequencies (range 0-100 Hz) for plant stimulation to obtain ecologically healthy products, increase morphological characteristics, yields and better quality products.

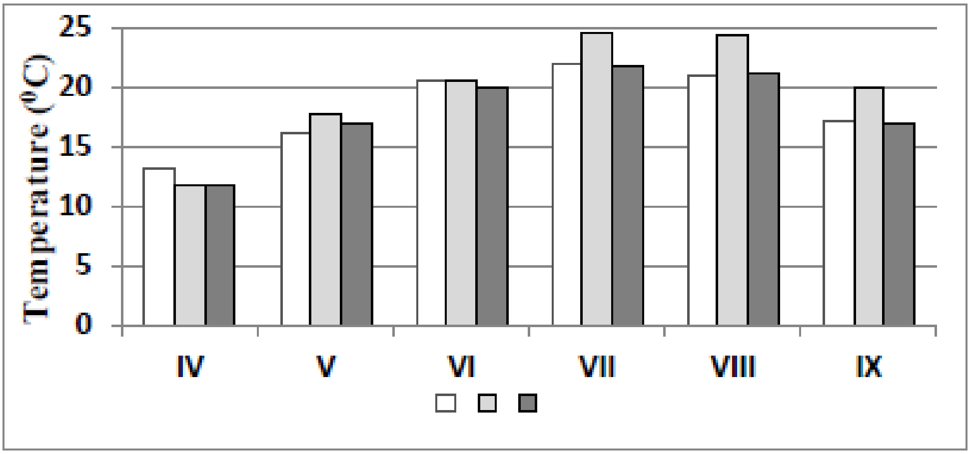
Effect of stimulation of soybean seeds with PEMF in different years of soybean production

In addition to corn and wheat, soybeans are ranked third in importance, since they are used in both human and animal nutrition and industry. The chemical composition of soybeans is 25%-50% protein, 14%-27% oil, 19%-30% nitrogen-free substances and minerals 6%-7%. Also, one of the essential features of soy is the quality of proteins that can replace animal protein in the diet. Its importance is also reflected in the agro-technical sense, since it lives in symbiosis with nodule bacteria, which allows the introduction of soybeans in the crop in organic production.

In order to achieve high and stable soybean yields, it is necessary to select suitable varieties for particular growing regions, use quality seed with adequate agro-technical measures that should be adapted to climate change. Soybean yields depend on sufficient soil moisture, especially in the generative period (flowering phase, pods and grain formation, grain filling phase). According to Cvijanovic (2018), if drought occurs and prolongs to the developing stages after the flowering phase, the yields are significantly reduced, because soybeans are a plant that is formed in climatic conditions with rainy and warm summers. In order to avoid the negative effects of autumn and spring drought, it is necessary to apply the knowledge of PEMF application, the aim of the study was to stimulate soybean seeds with a PEMF frequency of 15 Hz with 30 min exposure.

Seed stimulation with a pulsing electromagnetic field was performed immediately before sowing using a pulse generator and a strip applicator. Standard agro-technical measures for soybean production are done on time. The harvest was at the stage of technological maturity and the yield was calculated at 14% moisture. In order to determine the impact of different agro-climatic parameters on soybean yield, the data of mean daily temperatures and rainfall in the 2014 and 2015 vegetation over the multi-annual period from 1964 to 2015 were analysed (Graph 2.).

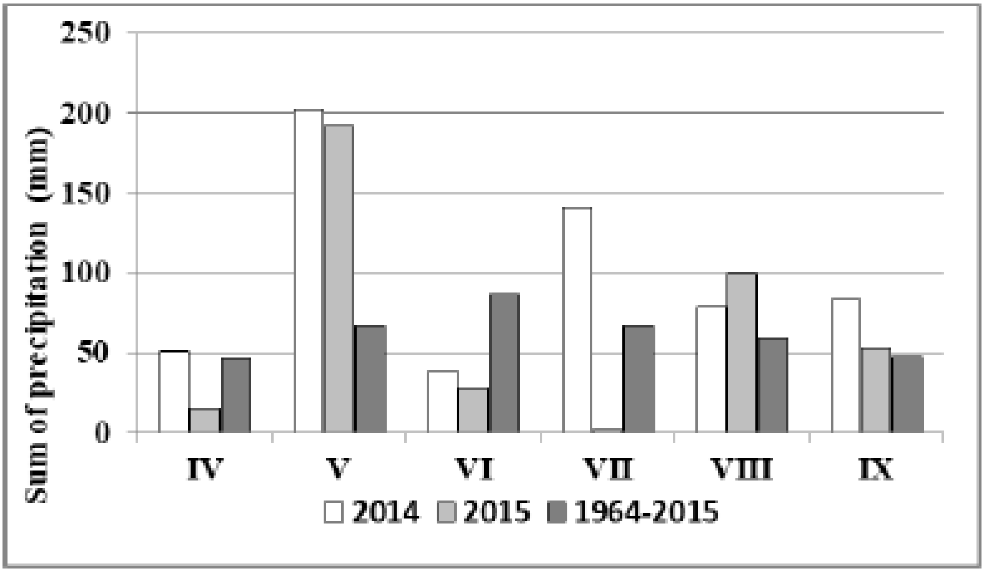
Graph 2. Average temperature values (ºC)



Source: Meteorological Station, Rismki Šančevi, Novi Sad, Serbia.

The mean annual temperature for the vegetation period (1964-2015) was 18.1°C. The warmest month was July 21.7°C. In 2014, deviations were negligible at + 0.2°C, while the largest deviations were recorded in 2015 at + 1.7°C.

Graph 3. Average precipitation (mm)



Source: Meteorological Station, Rismki Šančevi, Novi Sad, Serbia.

In the vegetation period, the total rainfall in 2014 was 595.6 mm, almost double the perennial average (375.1 mm). In 2015, the sum of precipitation during the growing season amounted to 389.0 mm, which is 14 mm higher than the perennial average (Graph 3.). The impact of small variations in air temperature and water availability can have significant effects on harvesting, harvesting and product quality (Sadras, Moran, 2013).

Considering the fact that besides the amount of precipitation, the favourable precipitation schedule is extremely important, it can be concluded that the rainfall in 2014 was distributed according to the needs for soybean production, similar to the perennial averages, and it is considered that 2014 according to the examined climatic factors represents the year with the optimum climate conditions. In contrast, the distribution of rainfall in 2015 during the vegetation period was conducted irregularly for the production of soybeans. In the early stages of soybean development, when it needed water to sprout and germinate, rainfall was low. Similar situations occurred in the later months, June - July, compared to the multi - annual average, which can ultimately be concluded that 2015 was a dry year.

Table 1. Soybean yield ($kg.ha^{-1}$) in the studied years of production

Parameter	Without PEMF	With PEMF	Average
2014	4,984.51	5,302.28	5,143.39
2015	1,961.99	2,174.59	2,068.29
Average	3,473.25	3,738.44	-

Parameter	A^{**}	B^{**}	AxB^{nz}
F test	2,276.68	19.76	1.48
L.S.D. (0.05)	91.49	80.47	124.68
L.S.D. (0.01)	132.64	101.43	193.00

The total average value of soybean yields in 2014 (5,143.39 $kg.ha^{-1}$) was 40.12% higher than in 2015 (2,068.29 $kg.ha^{-1}$), (Table 1.). The table concludes that the impact of seed stimulation with PEMF had a positive effect on soybean yield in both years studied, although the yield in 2015 was extremely low given the drought characteristics observed.

The same conclusions were reached by Corodan et al. (2015) in Romania, Timisoara, that very low rainfall was recorded between 2014 and 2015, and that there was a dry period, with a lack of precipitation of 188.9 mm. In these studies, the effect of 7 low frequency electromagnetic waves between 0-50 Hz on maize and sunflower yield was examined. Data analysis yielded yields between 4130 and 6360 $kg.ha^{-1}$ in all stimulation and hybrid versions. Compared to control, the yield increase was up to 438 kg.

Many research results show that in years with higher precipitation during the vegetation period, the effect of these measures is higher, but significantly increase the germination and yield was achieved at lower amounts.

Conclusion

Agriculture is an inseparable part of the environment and all anomalies that occur in nature have a negative impact on the stability of agricultural production. All areas of agricultural production are affected and will be affected in the coming period by climate change. The biggest negative impact is in plant production due to the length of the vegetation period of the plants, the increased number of dry days, stormy unpredictable warm winds and the increased number of warm nights.

In order to mitigate the negative impact, certain adaptation and adaptation measures must be implemented. It is necessary as strategic measures to implement the construction of irrigation systems, introduction and cultivation of drought-resistant varieties and hybrids, construction of multifunctional reservoirs for water supply, extension of areas under winter crops, correcting the application of agro-technical measures, implementation of measures for preserving soil fertility, increase the number of researches on the creation of resistant varieties and hybrids of different plant species, increase the number of researches and their application (IT, biophysics, etc.).

As the risks of global climate change become increasingly apparent, there is a genuine need to focus on actions that would reduce greenhouse gas emissions and minimize the negative impact of climate change.

Impacts of human factors impose the need to seek new safe methods to increase agricultural production. The growing need for organic agricultural products has led to the need for reasonable use of chemicals in plant production as well as appropriate supplements. A new trend in health food production is based on the inclusion of physical factors in combination with biological inputs with environmental requirements. The effects of the application of biophysical and electromagnetic measures on living beings and in nature in general is an area that scientists are paying increasing attention to, with a view to introducing mandatory production measures.

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THE BLOCKCHAIN TECHNOLOGY IN AGRICULTURE

Marija Jeremić[1], *Tatjana Brankov*[2]

Abstract[3]

Transactions in the food supply chain are very risky and very complex. Namely, in agriculture transactions rely on a great number of participants which is way a consumer, as a last participant, has very little information about where the food that he buys come from and how it is produced. That is, consumers often complain about lack of transparency about the products they buy and consume. In developed countries food supply chain has been digitalized in some extent (drone, artificial intelligence, Internet of things, etc.), and it is considered that blockchain technology could be used and has potential to solve the problem of the food supply chain efficiency and transparency. Also, this technology has the ability to simplify and to integrate the food chain, to improve food security and safety and to create efficiency gains for each participant of the food supply chain. Having in mind the previously said, the main objective of the paper is the theoretical analysis of the use of digital technologies, in particular the use of blockchain technology, in the agricultural sector.

Key words: agriculture, blockchain, technology, supply chain.

Introduction

The world is facing a great number of challenges that have a significant impact on the way how food is produced. The most important challenge that food system is facing is increasing number of people on the planet. Namely, according to FAO projection, the world population is going to reach more than 9 billion by mid-century (FAO, 2017). Likewise, the question of scarcity of natural resources, changing consumer preferences, climate changes and loss of biodiversity is gain-

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3 Paper is part of the research on the project Sustainable Agriculture and Rural Development in terms of the Republic of Serbia strategic goals implementation within Danube region, no. III 46006, funded by the Ministry of Education and Science of the Republic of Serbia.

ing in importance as well. These changed circumstances in food system require a different approach to food production, and digitalization of agriculture can be one of the possible solutions.

Digitalization is based on the use of technology for transfer of large amount of information. Those technologies are numerous and some of them are: Internet of things (IoT), blockchain, drones, artificial intelligence etc. The blockchain is one of the most analysed technologies which have applications in many sectors, including the sector of agriculture. Digitalization of agriculture will change each segment of food supply chain. The benefits of digitalization of agriculture are numerous and some of them are productivity and efficiency growth. Digitalized agriculture will create a system that is more productive and predictable that will lead to greater food security and to greater profitability (IBRD, WB, 2017).

However, there are certain risks in the context of digitalization of agriculture and blockchain technology. More specifically, the digitalization of agricultural sector needs to be carefully implemented in order to prevent widening the gap between countries that can afford it and those who cannot. Namely, in developing and less developed countries the bad informatics infrastructure, poor digital literacy and poor legal framework cause these areas further delayed in digitalization process (FAO, 2019a).

According to FAO (2019a) in order to properly develop digital agriculture it is necessary to satisfy two groups of conditions:

1. Basic conditions that include infrastructure and connectivity, affordability, educational attainment and institutional support[4], and
2. Enablers who refers to "the use of internet and mobile and social network among farmers and agricultural extension officers, digital skill among the rural population and a culture which encourages digital agri-preneurship and innovation".

Having in mind the previously said, the main objective of the paper is the theoretical analysis of the use of digital technologies, in particular blockchain technology in the agricultural sector. In accordance with a stated goal, the methodology of the work involves theoretical research which means it involves the use

4 One of the main challenges when it comes to agriculture digitalization is the absence of internet networks in rural areas. Also, unlike developed countries, developing and underdeveloped countries are significantly behind in terms of the use of modern technology and digital literacy.

of qualitative research methods. In this paper, qualitative methods relate to the method of analysis, the synthesis method and descriptive method.

The paper consists of the following section: first, a brief background was given about trends in the sector of agriculture, followed by definition and literature review about the blockchain technology. Afterwards the benefits, risks and challenges of using the blockchain technology in the agricultural sector were analysed. In the last section of the paper the final conclusions were given.

The blockchain technology in the agriculture

Trends in agricultural sector

Agricultural sector is very important sector in all countries around the world because it represents significant source of employment, especially for low and middle income countries. For the majority of low and middle income countries agriculture is major generator of rural population income, and leading force of economic growth (Tripoli, Schmidhuer, 2018). Agricultural sector and others actors of food supply chain are closely connected because agricultural products are used as inputs for other actors of the supply chain.

The complexity and food supply chain length have created long distance between consumers and agricultural sector. Also, food supply chain become more capital intensive and vertically integrated because of which it is very difficult for consumers to get valid information about food origin.

Even though agricultural producers, and the other actors of food supply chain, are respecting strict standards different kind of food problems can appear and sometimes it takes a quite long time to identify the source of problem (CHAIRE AgroTIC, 2017; Tripoli, Schmidhuer, 2018).

Food scandals and increase of different kind of health problems induced by food (such as obesity, etc.) have weakened consumers' confidence in agribusiness sector. Consumers are becoming more concerned about food safety and they are claiming more information about food origin. Namely, consumers are complaining on the lack of transparency concerning the food products and way how they are produced (CHAIRE AgroTIC, 2017; Ge et al., 2017).

Innovation in agricultural production is one way to overcome these problems and to make agriculture an attractive business. The use of ICT[5] in agriculture started last few decades, and is one of the ways in which the problems facing agriculture

5 Information and Communication Technology.

can be solved (FAO, 2019b). One of the technologies that have attracted the most attention is certainly blockchain technology.

The blockchain technology could be a good solution because it records every step in food production along the food supply chain and can very fast identify the part of the chain that caused problem (CHAIRE AgroTIC, 2017).

Defining the blockchain technology

The blockchain technology is a revolutionary tool that will change our lives considerably. Namely, blockchain technology emerged in 2008, when Satoshi Nakamoto[6] published the whitepaper *Bitcoin: A Peer to Peer Electronic Cash System* that marked out a "system for electronic transactions without relying on trust" (Nakamoto, 2008). On that way "a "purely peer-to-peer version of electronic cash" known as Bitcoin was introduced to public. Cryptocurrency Bitcoin, based on blockchain is "the first example of widespread decentralised digital currency which provides a solution to the problem of trust in a currency system" (Aste et al., 2017).

A blockchain is a collection of data added in a sequence of blocks, which holds an immutable time-stamped series record of data. The main components of blockchain technologies are: "cryptographic hash functions, transactions, asymmetric-key cryptography, addresses, ledgers and blocks" (see more in Yaga et al., 2019). A hash function is a mathematical algorithm that takes an input and transforms it into a hash value. An interaction between parties, such as a transfer of the cryptocurrency between users is called transaction.

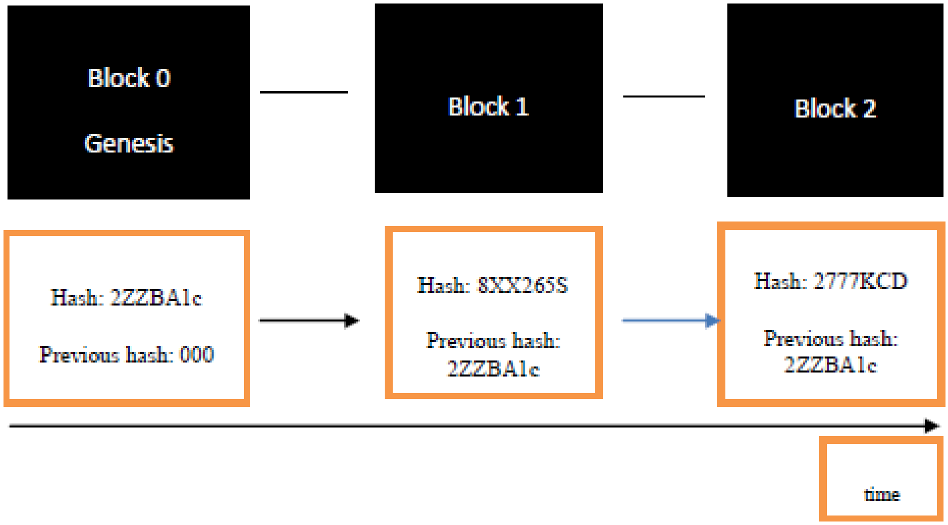
Blockchain uses a public key cryptography also referred as asymmetric-key cryptography. There are two keys - a public (used to derive addresses) and a private one (used to digitally sign transaction) - that enable a trust relationship between users in an untrusted environment. Differently from private key addresses are public and may act as the public-facing identifier. A collection of transaction is called a lager. As Yaga et al. (2018) pointed out "transactions are added to the blockchain when a publishing node publishes a block". The block data contains a list of validated and authentic transactions previously cryptographically signed. The blocks are linked in chronological order one by one[7] and thus form a chain, going back to the genesis block- the first block[8]. Next Figure (Figure 1.) illustrates an example of a blockchain.

6 His true identity is still unknown.

7 Previous block is called parent block.

8 Genesis block has no parent block.

Figure 1. An example of a blockchain



Source: Adopted from Agbo et al., 2019.

To add a new block to the blockchain, all nodes must come to some kind of consensus, such as "Proof of Work consensus model, Proof of Stake, Round Robin, Proof of Authority, Proof of Elapsed Time" (Yaga et al., 2019). Model selection is related to the level of trust that exists between network participants.

Key characteristics of blockchain are: "decentralization, persistency, anonymity and auditability" (Nakamoto, 2008). In effect, the blockchain decentralized nature means that there is no single authority that makes decisions on behalf of all the parties. Contrary, it is an open platform just like internet, in line with markets. Both – blockchain and market- are rule designed systems and evolved spontaneous orders (Davidson et al., 2016). Transactions in a blockchain are persistent because of their "spread across the network, where each node maintains and controls its records" without possibility of repudiation of the evidence (Viriyasitavat, Hoonsopon, 2019). In general, a system achieves a certain amount of anonymity, although due to the intrinsic constraint cannot guarantee the perfect privacy. Auditability of this technology means that each transaction can be traced to previous one because they are "validated and recorded with a timestamp" (Zheng et al., 2018).

However, there are different types of blockchain: "blockchain, consortium blockchain and private blockchain" (Zheng et al., 2018). One of the main differences among them lay in the possibility of change. Public blockchain is nearly impossible to tamper, while the other two types could be tampered. Efficiency of the public one is low, while the efficiency of consortium and private blockchain is very high. Moreover, public blockchain is not centralized, consortium one is partially centralized, while the private blockchain is centralized.

Beyond cryptocurrencies, blockchain has possible impact to every industry including manufacturing and education even it can be used as a means for decentralizing political power. For example, in their work Pilkington et al. (2017) explore the capabilities of blockchain technology to alleviate poverty and corruption in the Republic of Moldova. The authors pointed out the importance of transparency of blockchain-based information for prevention of corruption. However, the impact of blockchain on markets or industries is much more studied than impact on democracy issues.

The most commonly discussed is impact on the financial markets. A Delphi study indicates that the technology "allows the offering of new services and renders some of the current ones obsolete" (Holotiuk et al., 2017). Vernon (2016) pointed out that blockchain will transform financial services through transformation of asset management, insurance, supply chain, international payment and compliance. Yermack (2017) identified transparency, liquidity and lower cost as benefits of the technology. Blockhain can also be used in logistics or public services. The largest ship operator in the world Maersks in cooperation with IT University of Copenhagen test ways blockchain technology can improve their operations (Allison, 2016). Olnes (2016) in his research shows that blockchain "could be a promising technology for validating many types of persistent documents in public sector". For example, it can bring substantial efficiencies to the value added tax (VAT) collection (Ainsworth, Shact, 2016).

Blockchain as radical innovation can be successfully introduced within companies to generate business value if an adequate process is developed (Beck, Muller Bloch, 2016). Thanks to its potential to ensure supply chain traceability and transparency blockchain is very suitable for consumer-electronic industry (Lee, Pilkington, 2017), it can be utilized to establish a "secured, trusted and decentralized autonomous" centralized intelligent transportation systems (Yuan, Wang, 2016) or machine-to machine electricity market in the context of the chemical industry (Sikorski et al., 2017). In addition, it can improve electronic medical records (Azaria et al., 2016).

Blockchain technology can also be applied in any phases of agri-food supply chain in production, processing, distribution, and retailing or in consumption, in many ways, among other to for ensuring food security and safety, to support small farmers, to waste reduction and environmental awareness, to supervise the supply chain, to restore consumer confidence etc. Regarding food security the technology can be used as a means of providing safe, transparent delivery of international aid. Examples include “digital food coupons having been distributed to Palestinian refugees in the Jordan’s Azraq camp, via an Ethereum-based blockchain, where the coupons could be redeemed via biometric data. At the moment, project is helping 100,000 refugees” (Kamilaris et al., 2019).

Certainly, food safety is one of the burning issues due to unrestricted use of pesticides and food additives, or heavy metal contamination (Lin et al., 2018). According to World Health Organization (WHO), on an annual basis contaminated food caused many deaths and illness - 420,000,600 million- respectively (WHO, 2019). Walmart and Kroger are among the first companies which include the technology to reduce the time to track goods.

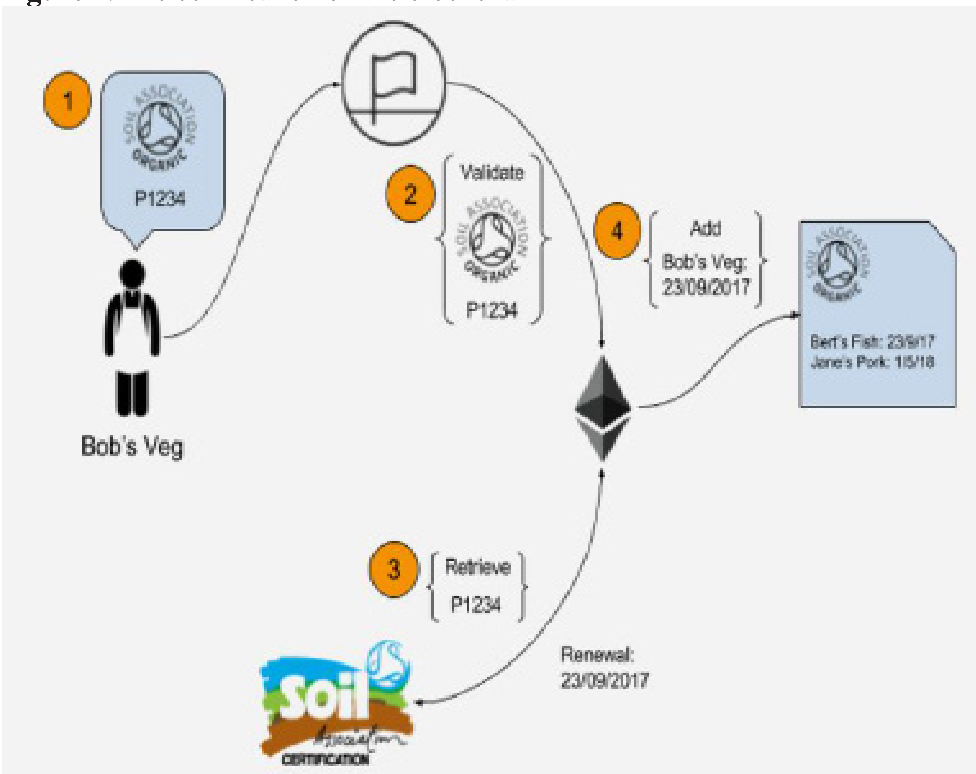
The special focus was given on Chinese pork and Mexican mangoes (Kamath, 2018). The results of the pilot studies shows that with blockchain information about the fruit path from farm to supermarket was available in just a few seconds. The “maintenance of the cold chain in the distribution logistics of spoilable food products” can benefit from “the integration of blockchain with Internet of Things (IoT) for real-time monitoring of physical data and tracing based on the hazard analysis and critical control points system (HACCP)” (Kamilaris et al., 2019).

Another implementation could be in agricultural trade to secure exchange between “actor two by two: between the farmer and his cooperative, between the cooperative and the transformer, or between the transformer and the dealer” (Papa, 2017). By means of blockchain, “food companies can mitigate food fraud by quickly identifying and linking outbreaks back to their specific sources” (Kamilaris et al., 2019). There are numerous examples of blockchain initiative for this purpose: Cargill Inc. is using the technology to let shoppers trace their turkeys from the farm to the store, Carrefour to trace origin of many fresh and processed products, Ireland Craft Beers to let shoppers know beer’s ingredients and brewing methods, etc. (Bunge, 2017; Carrefour, 2019; Ireland Craft Beers, 2019).

Small farmer’s cooperatives could benefit from blockchain through increasing of the traceability of goods or trust among them; through easier access to global markets or faster disputes and conflicts resolution. The technology can be also used in waste management purposes, e.g. to convert waste into reusable material. (Steenmans, Taylor, 2018). Potential area of application may include certification.

The social enterprise Provenance in the UK has been a leader in proposing the application of blockchain to agricultural supply chains (mostly concerning the recording of certification) to improve the efficiency and credibility of certifications. The procedures is as follows: A brand provides their license number to Provenance, e.g. P1234, Provenance pass the license number to a contract, their contract calls the Soil Association's license checker (partner association, the largest organic certifier in the UK), if the certificate is valid, they store the brand's identity (Figure 2.). As a successful example of the technology application in the supply chain can be specified 2016 AgriDigital company sale of grain (ICT4Ag, 2017).

Figure 2. The certification on the blockchain



Source: Provenance, 2019.

Benefits and challenges of blockchain technology

Digital technologies will significantly change the way people are doing business. The same case is with agricultural sector. Namely, according to FAO (2019a), digital technologies are changing the dynamics of the agri-food sector, and it will cause a significant shift in food production in the coming period. The potential benefits that can be gained from the use of digital technologies, such as blokchain technology, are considerable. However, some challenges and risks also need to be considered.

Namely, according to Kamilaris et al. (2019), one of the most important advantages of the blockchain technology is to secure safe transaction between participants, which is especially important in the food supply chain because of the large number of participants. Likewise, blockchain technology also has the possibility to manage social responsibility, to lower the cost of transaction and to make easier the management of food supply chain, to facilitate a fair price relationship along supply chain and help develop trading system that has a good reputation. When it comes to sector of agriculture these authors provided a good review of advantages and risks of using blockchain technology in agriculture. Kalamaris et al. (2019) also stated that opportunities and potential benefits of the use of blockchain technology in agriculture cover many issues including financial, environmental and trade issues, as well as questions of consumer awareness and product's quality. In the same time, there are many challenges and barriers that can inhibit the adoption of blockchain technology, such as: absence of proper regulations, big gap between developed and developing countries, high cost of the equipment, lack of knowledge and proper trainings.

Despite the potential opportunities of the blockchain technology, there are many risks too, and most on-going initiatives are in infantile stage. As Kim and Kang (2017) pointed out: "the transparency and traceability of financial or historical data within the distributed ledger may raise the bargaining power of a minority on the upstream of the supply chain when only a few minorities benefit from making unfair profits, it may harm the fair ground for competition". This clearly indicates the need of further strengthening of blockchain anonymity (Halpin, Piekarska, 2017).

A case study in the Netherlands (Ge et al., 2017) revealed that SME have difficulties in adopting the technology, among other lack the know-how to invest in blockchain. According to Chang et al. (2019) lack of knowledge and broad public trust are the two main hindrances for technology diffusion. Namely, the one of the important challenges when it comes to blockchain technology implementation is the lack of knowledge and education. Namely before agricultural producers start to use the blockchain technology, they first have to understand it. Also, there is a need for legal framework to ensure legal validity of the blockchain (World Economic Forum, 2018).

Tribis et al. (2018) in their work agreed with a gap in regulation conformance and legal barriers as well as security and data integrity issues, and added more obstacles that limit the application of technology: the lack of code set standards for transaction, lack of adaptability and adoption, scalability and size, high degree of computerization requirement, complexity and uncertainty, cost of implementation, and in majority absence of evaluation to design systems for a real-world application.

Similarly, Zhao et al. (2019) identified six challenges in agri-food value chain management including: storage capacity and scalability, privacy leakage, high cost and regulation problem, throughput and latency issue, and lack of skills. In line with previous research Pearson et al. (2019) concluded that open challenges are "the need of data standardization in the food domain, ease of use to remove barriers to entry to the food supply chain, governance mechanisms, enhancement of the technology to cope with a large amount of data (scalability), privacy mechanisms to protect users and an iterative approach is required to underpin the adoption of the technology across the whole chain".

Conclusions

Food production in the world had changed considerably. The world faces many challenges when it comes to providing enough food for a constantly growing population. The food production increase as a way of meeting the growing needs of increasing populations lead to considerable change in agribusiness. Also, different kind of food scandals weakened consumers' confidence in the agribusiness sector and increasing demand for information about the way how food is produced creates need for greater transparency.

One of the ways to overcome these problems is the use of information technologies in agriculture. Blockchain technology, as a revolutionary tool, is one of the most promising technologies that helps transform many markets and many economies. Because of that, it is considered that a blockchain technology is a god solution for ongoing problems of the agricultural sector as well. This technology can help solve the problem of efficiency, safety and transparency of food supply chain, can integrate food supply chain and create efficiency gain for every actor of the food supply chain.

However, even though blockchain technology has many benefits and great potential for solving problems of the food system, many challenges and obstacles still exist when it comes to its implementation in the agricultural sector. That is way much work is still needed in the area of blockchain technology implementation in agriculture, and it is very important to realize is it possible to overcome this challenges and risks in the coming period.

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ANALYTICAL SUPPORT TO INTEGRATION PROCESSES AT THE MICRO LEVEL

Marina Leshcheva[1], *Anna Ivolga*[2]

Abstract

An important factor in the success of the integration of agricultural organizations is the availability of adequate analytical support to prevent possible losses and realize the potential synergies of the Association. The article formulates the principles and proposes a model of analytical support of integration processes at the micro level. Stages of analytical activity are allocated and their contents are considered. Definition of the essence of integration processes of analytical support is given, which is considered as a justification of options of management decisions aimed at obtaining benefits from the association of business entities, while internal and external sources of advantages that form the corresponding integration potentials are identified.

Key words: agriculture, economic analysis, integration, methodological support, micro level, principles, algorithms, model.

Introduction

Solving the problems of providing food safety based on import substitution and export expansion requires active involvement of agricultural enterprises into building national balance of trade. However, there are a number of conditions and factors that imply difficulties to standalone producers, even large ones.

Development of integrational ties is one of the solutions. Integration makes possible creation of sustainable and managed raw materials base, opens up the latest technologies, technological tools, marketing mechanisms that would be unavailable to some single producer. Increase of the amount of supply allows participation in development of contractual arrangements with foreign buyers, facilitates access to pre-export financing. However, despite their obvious advantages, integrational ties did not gain widespread (Yendovitskiy, 2008). The development is mainly

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restricted by insufficient analytical support of managerial decisions on integration. Among the underdeveloped issues are those of practical application of analytical techniques that allow justification of integration viability and degree at the micro level (Volgova, 2015). All the above mentioned determines the goal of our research, to formulate guidelines aimed at enhancement of analytical support of integration ties development of agricultural enterprises.

An object of study is activity of large and middle agricultural producers. Subject matter of study is economic relations that are established within the process of analytical support of their integration ties.

Methods of the research

System and complex approach to integration process study formed the basis for research. Application of monographic, logical, expert methods and comparative analysis allowed justification and reasoning of research results.

Results

Functional role of analytical support of integration ties at the micro level means justification of achieving strategic and other company's aims based on synergistic result. It can be achieved by using certain principles, norms and rules of analytical activity. One of them is stage-by-stage approach. Analytical support has various contents depending on the stage of development of integration processes and includes:

- identification of objective needs and capacity assessment of agro-industrial integration;
- selection of possible scenarios and establishing a strategy of integration process development;
- analytical underpinning of certain integration mechanisms and building integrated formations;
- monitoring of their development involving assessment of social and economic results and integration efficiency;
- adaptation planning that is a base for development of remedial actions within the adopted strategy (Pshizova 2014).

An important principle of analytical activity is continuity. It evaluates the need for analytical support of integrational process based on knowledge of economic outlook and data on how the previous strategy that was considered as optimal for some stage of development implements all the useful stuff offered for efficient development of integrational process and what results were obtained (Rakitina, 2013). There should be critical analysis of the existing solutions, assessment of their relevance to the certain stage of development.

The key principle of analytical support of integration processes is clear identification of a goal. The absence of any focus extends the information base, complicates implementation and leads to indistinct conclusions and unacceptable results. Consequently, it is necessary to distinguish the most relevant problems at each stage of integration process development, those that would be an object of analytical support within program development and practical implementation in the foreseeable future (Usenko et al., 2013).

Summing up the experience of creation and practical implementation of integrated formations in agricultural economy made it possible, to a certain extent, to distinguish four main groups of goals of integration process development: increase of competitiveness of agricultural market actors; development of integration for safety purposes as anti-crisis mechanism; investing (acquisition of assets, also for opportunistic goals); and integration aimed at access to information and lobbying.

The principle of focused activity is closely linked to the principle of ranking priorities. Analytical support of integrational processes should be implemented taking into account the priority of the highlighted aim and assessment of possible synergistic effects. For problem ranking it is important to distinguish the following priority groups: 1) production and economic – involvement of previously unused production resources, more extensive processing of raw materials, transition from production of intermediate products to production of goods destined for final consumption; 2) innovation-related science and engineering priorities; 3) social and 4) environmental priorities.

The priority ranking principle is supplemented by the principle of comprehensiveness that means importance of taking into account external factors, condition and prospects for development of the overall economic situation, interregional links, social and environmental situation in the region and in the country.

The following principle is adaptability, which implies that analytical support of integrational process development in ever-changing market conditions is a way of adapting to changes of market conditions, increasing competitiveness and other factors of internal and external environments.

The above mentioned principles lie beneath achieving the proposed model of analytical support of integration process development at the micro level (Picture 1.).

Application of this model implies implementation of several interrelated stages (steps) of analytical activity.

The stage that precedes building integrated formations includes analysis of market conditions, inter-industry proportions, links between enterprises, regional and sectoral characteristics of agribusiness and indication of objective need for integration (Mezhov, Bocharov, 2010). If it is indicated then goes the second, preparatory step.

The preparatory step includes analysis of data on compatibility of enterprises for participation in a single business process, assessment of the level of interest of each party in integration in order to reduce the probability of admitting enterprises whose interests might appear to contradict the interests of the whole company.

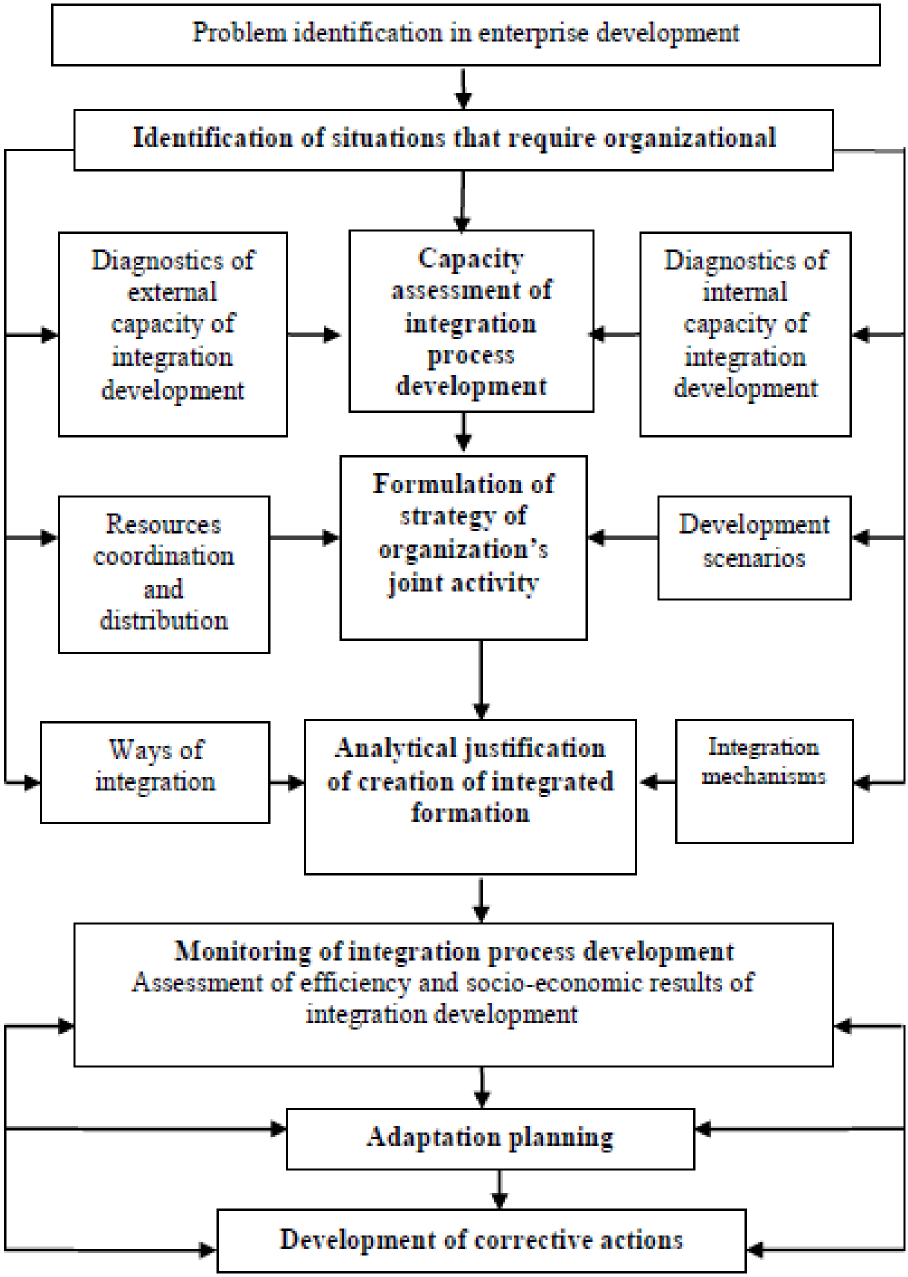
The approach offered makes it possible to assess the level of connection between potential participants of the integrated formation and indicate organizations for which integration into a single structure is a natural extension of existing partnerships. An important step in determining the feasibility of the integrated formation is assessment of structural elements of internal and external capacities of integrational process development that allows determination of possibilities for implementing and enhancing the effect of coordinated joint action.

It also proposes the following sequence of actions:

1. identification of enterprise's characteristics that it can use for exploring opportunities – integration capacities;
2. identification of functional relationship between synergistic effects and corresponding structural elements of internal and external capacities;
3. measuring synergistic effect of the possible integration.

Based on the assessment proposed it is possible to identify specific course of action that would lead to synergistic effect. When the integrated structure is already formed its analytical support is aimed at identification of economic relationships that have already exhausted their resource of efficiency or organization of additional integrational ties between the existing partners or involvement of new counterparties into cooperation. Based on monitoring data, efficiency and socio-economic impact of integration is assessed by the main indicators.

Picture 1. Structure of the proposed model of analytical support of integrational process development at the micro level



Source: Authors' development.

Monitoring data is used for adjustment of strategies and adaptation planning taking into account changes of internal and external environments. Application of adaptation framework will make it possible to take informed decisions in planning and forecasting integration processes and provide background for corrective actions. The essence of analytical support of integrational process is considered as justification of managerial decisions aimed at advantages of integration. In this case, internal and external sources of advantages are distinguished and they form relevant integration capacities.

External capacity is characterized by features of agricultural market and actions of market actors that operate at the market, including the government. Internal capacity is a derivative of capacities of lower-level systems and is implemented as synergistic effect (Pinkevich 2011). Internal and external capacities are the main objects of analysis. In this case, the level of implementation of external integration capacity is directly related to the level of achievement of internal benefits.

Among the consolidated structural elements of internal integration capacity is:

1. Production capacity that is described by the level of intensity, possibility of involvement of previously unused resources, full production capacity utilization and achievement of economies of scale. It is measured by the cost of additional product comparing to disintegrated production.

2. Human resource capacity of integration that consists in optimization of number of direct workers due to improvement of production structure, increase of its capital-labour ratio and decrease of number of administrative staff as the result of centralization of its functions. It can be measures by wages saving per a unit of product in the integrated entity comparing to indicators before integration.

3. Capacity of working assets saving. In case of disintegrated production, the amount of working assets required for processing enterprises is also determined by the costs of agricultural raw materials including the rate of return. Integration helps to reduce the amount of working assets required. Amount of savings describes the size of this integration capacity element.

4. Investment capacity that consists in possible effect of implementation of joint investment projects, use of integrator's investment opportunities. It can be measured by indicators of return on investment.

5. Financial capacity that consists in possibility of raising additional funds of the integrated company. It is measured by specific value and efficiency of application of borrowed funds.

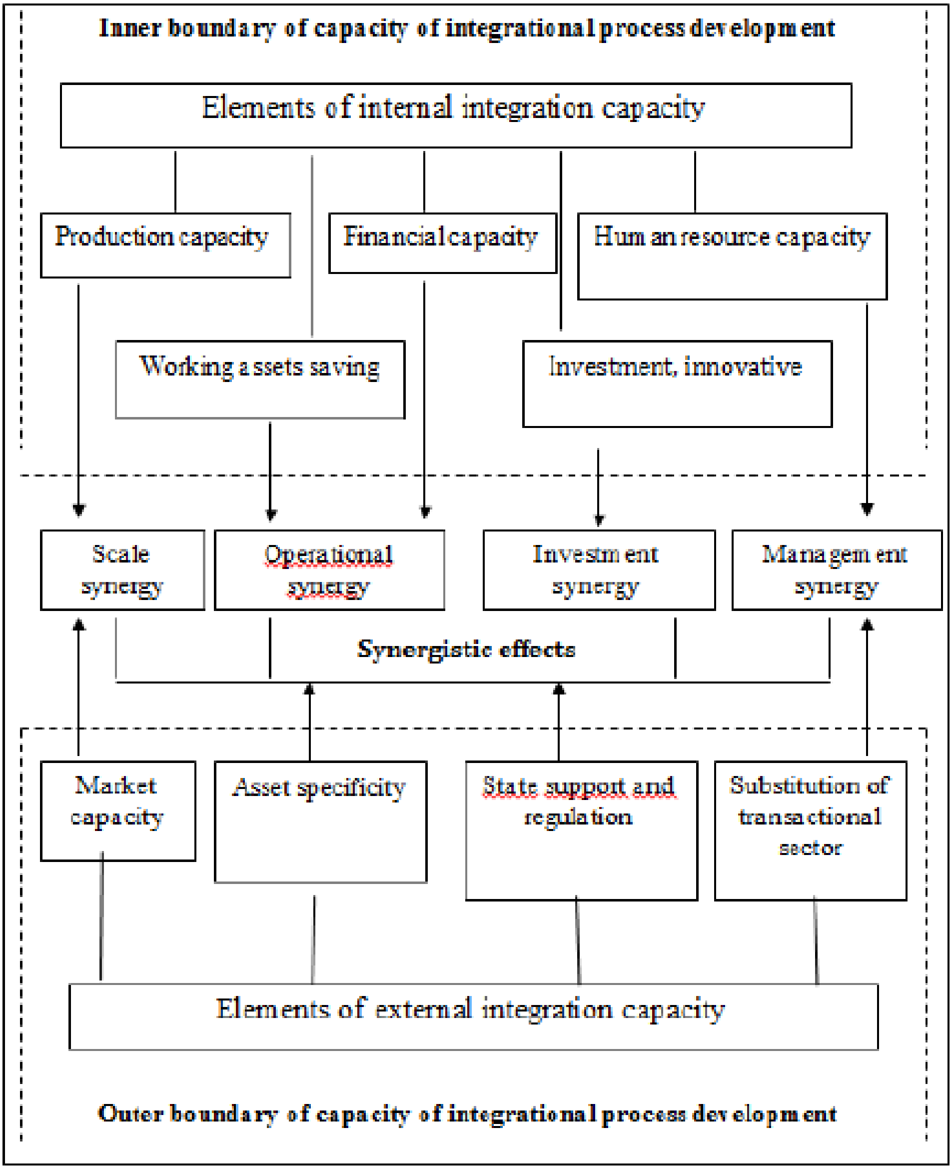
The elements of external capacity of benefits from integration are:

- The level of asset specificity which, in case of agricultural enterprises, includes the level of soil fertility, bioclimatic conditions, investment environment and investment risk in a region, proximity to markets, availability of social and industrial infrastructure. The amount of this element is calculated based on predicted value of additional income obtained as the result of integration with an enterprise that possesses some specific assets comparing to the average level in the industry.
- Capacity of state support and regulation. It is measured by the level of state involvement, support and preferences that the integrated formation gets in contrast to disintegrated one.
- Capacity of substitution of transactional sector in agribusiness is characterized by saving transactional costs as the result of integration.
- Capacity of increasing market power. It is determined as a possibility to offer lower price for a final product due to savings on transactional costs, raw materials purchase, taxes, economies of scale, etc. The integrated formation can offer a price that is lower than industry average and make additional profit due to market-share gain. The amount of this income is a measure of capacity of increasing market power in comparison to disintegrated production.

Structural elements of internal and external integration capacity correspond to certain synergistic effects and that forms the base for a mechanism of achieving total synergistic effect (Picture 2.). The mentioned elements form inner and outer boundaries of capacities of integrational process development.

The inner and outer boundaries of integration capacity vary depending on the step of integration structure development. The system of models reflecting relationship of certain indicators with possibilities for gaining benefits of integration is presented in next table (Table 1.).

Picture 2. Structural scheme of capacities of integration process development



Some sources of synergistic effect exhaust, others appear. If there is no capacity of integrated company development, disintegrating processes intensify up to full separation, allocation and sale of some part of a business.

Table 1. The system of models reflecting influence of certain indicators on gaining benefits of integration

Elements of capacities of integration process development	Relationship of integration benefits and indicators included into the model	Legend
Production	$C_T = f(X_{TY_1}, X_{TY_2}, ..., X_{TYn})$	C_T – increase of commodity output : X_{Ty1} – increase of cultivation area; X_{Ty2} – increase of livestock numbers ; X_{Ty3} – increase of existing production capacity; X_{Ty4} – yield increase; X_{Ty5} – productivity increase; X_{Ty6} – increase of total output per a unit of industrial capacity
Human resources	$C_к = f(X_{кY_1}, X_{кY_2}, ..., X_{кYn})$	C_K - wages saving: X_{Ky1} – change of annual average wage of production workers; X_{Ky2} – decrease of production workers number; X_{Ky3} – decrease of administrative staff; X_{Ky4} – change of annual average wage of administrative staff
Capacity of working assets saving	$C_з = f(X_{зY_1}, X_{зY_2}, ..., X_{зYn})$	$C_з$ – working assets saving : $X_{зy1}$- reduction in expenses for raw materials; $X_{зy2}$ - reduction in transactional costs per unit of product; $X_{зy1}$ – new resource combination providing efficient resource utilization (reduction in consumption of materials, capital intensity, power consumption; labour inputs; more intense use of working assets)
Capacity of increasing market power	$C_в = f(X_{вY_1}, X_{вY_2}, ..., X_{вYn})$	C_B- increase in the commercial output due to improved sales: X_{B1} – sales gain; $X_{в2}$ – profit per rouble of sale
Investment	$C_u = f(X_{uY_1}, X_{uY_2}, ..., X_{uYn})$	C_u – increase in the commercial output due to upgrading of facilities: X_{u1} – volume of raised additional funds; X_{u2} – return on investment
Financial	$C_f = f(X_{fY_1}, X_{fY_2}, ..., X_{fYn})$	C_f – increase in the commercial output due to raising debt capital: X_{fy1} –short-term credits and loans; X_{fy2}- long-term credits and loans; X_{fy3}- amount of commercial output per rouble of short-term credits and loans. X_{fy4} – amount of commercial output per rouble of long-term credits and loans
Capacity of assets specificity	$C_p = f(X_{pY_1}, X_{pY_2}, ..., X_{pYn})$	C_P – additional income from the use of specific assets: X_{py1} – derivation of income from sale of 1 centre of

		products from the industry average; X_{py2} – saving shipping expenses due to market proximity; X_{py3} – saving costs on staff training due to availability of qualified personnel; X_{py4} – saving fixed and variable costs due to production infrastructure
Capacity of state support and regulation	$C_r = f(X_{rY_1}, X_{rY_2},..., X_{rYY})$	**C_r – additional income and costs saving due to state support** X_{ry1} – level of subsidies per 1 ha of agricultural land; X_{ry2} – reimbursement of difference of interest rates for credits; X_{ry3} – subsidies for capital investment; X_{ry4} – costs on soil enrichment; X_{ry5} – costs on supporting activities aimed at horticulture development; X_{ry6} – costs on supporting activities aimed at livestock breeding development X_{ry7}-_ special tax for integrated formations
Capacity of substitution of transactional sector	$C_c = f(X_{cY_1}, X_{cY_2},..., X_{cn_Y})$	**C_c – saving transactional costs** X_{cy1} – contractual obligations implementation rate ; X_{cy2} – negotiation cost; X_{cy3} – costs of information search; X_{cy4} – costs of specifications and protection of property rights; X_{cy5} – costs of evaluating quantity and quality of goods and services; X_{cy6} – costs of opportunistic behaviour
Market capacity	$C_o = f(X_{oY_1}, X_{oY_2},..., X_{oYn})$	**C_o – market share**: X_{ry1} – market share of i type of product to the total volume of sales at i market; X_{ry2} - average-weighted market share to the structure of enterprise's commercial output, X_{ry3} – market share occupied by 10 biggest competitors of a branch; X_{ry4} – Herfindahl-Hirschman index. X_{ry5} – ratio of prices at world and domestic markets ; X_{ry6} – quantity of demand; X_{ry7} – market depth

Availability of capacity of integration process development is of stochastic nature. Its structure is formed on a case-by-case basis and for a certain period of time. Integration is considered to be reasonable if its capacity analysis shows additional benefit in comparison to disintegrated production.

The proposed technique offers capacity matrix compiling in order to assess benefits of integration. The matrix is developed to analyse the maximum possible amount of integration benefits and identify the goals for management activities in order to intensify some capacity. The elements of each internal and external capacity are gradually studied. Indicators revealing integration benefits by each capacity are described.

The mentioned capacities are examined for implementation under conditions of integration process development, their compliance of resource possibilities of the enterprise, level of personnel qualification, intensity of the existing ties, etc. In order to assess compliance of the elements of internal capacity and possibilities for its implementation, matrix resource modelling is applied (Dozorova 2010). Within the matrix the examined capacities are put vertically and enterprise's financial, labour and other resources are put horizontally (Table 2.).

Decomposing internal and external integration capacities has dual-use application. On the one hand, identification of the most significant capacities by the level of impact on synergistic effect makes it possible to adjust management actions. It can be applied when developing technical and economic activities aimed at increase of integration benefits as it gives well-defined objectives for required transformation. These objectives cover the whole enterprise's activity binding target parameters of its operation.

Another application of capacities decomposing arises from the fact that their elements allow compilation of key indicators list. These indicators reflect integration benefits that can be included into the generalizing model as independent variables. Identification of such relation is the aim of the second step of analysis.

Table 2. Matrix model of resource capacity assessment of integrated formations

Capacity (P_n)	Organizations within integrated formation				For the whole of integrated formation	Restrictions on resources
	X_1	X_2	...	X_m		
Production (P_1)	P_1X_1	P_1X_2	...	P_1X_m	$\sum P_1X_m$	$\sum P_1X_m \le R_1$
Working assets saving (P_2)	P_2X_1	P_2X_2	...	P_2X_m	$\sum P_2X_m$	$\sum P_2X_m \le R_2$
Investment (P_3)	P_3X_1	P_3X_2	...	P_3X_m	$\sum P_3X_m$	$\sum P_{mn}X_n \le R_{mn}$

The essence of the developed model of internal capacity assessment of integration process development is summarized in Table 3.

Table 3. Assessment of internal capacity of integration process development

Capacities of integration process development	Benefits of integration	Calculation algorithm
Increasing market power	Growth of current income	$\sum_{i=1}^{n} \Delta S_i Y_i p_i$, where $\Delta S_i Y_i$ - growth of i commercial product volume; p_i – price per unit of i commercial product
Working assets saving	Relative current expenditure saving	$\frac{\sum_{i=1}^{n} C^r_{i1}}{\sum_{i=1}^{n} S_{i1} Y_{i1}} - \frac{\sum_{i=1}^{n} C^r_{i0}}{\sum_{i}^{n} S_{i0} Y_{i0}}$, where $\sum C^r_{j0}$; $\sum C^r_{j1}$ - sum of current expenses; $S_0 Y_0; S_1 Y_1$ – value of production before and after implementation of joint projects
Investment	Increase in income by means of implementation of joint investment projects	$NPV = \sum_{k=1}^{n} \frac{CF}{(1+r)^k} - IC$, where NPV - net present value CF - annual revenue IC - amount of investments
Financial	Raising additional funds	$\rho_a = \rho_{cк} + \frac{3K}{CK}(\rho_{cк} - i)$, where ρ_a – increased amount of return on assets gained due to credits; i – interest rate; $\rho_{cк}$ – return on equity

Assessment of internal capacity of integration process development includes explication of each structural element and identification of particular integration capacities. Then the capacities are grouped by the lines of synergistic effect performance.

Relevance of this stage is explained by the fact that synergistic effects formed by specific internal integration capacities have diverse manifestations (Ushachev 2014). They can be united into three homogeneous groups: effects that provide increase of current income; those that promote cost reduction and effects that provide raise of additional funds.

As a methodological point, implementation of the proposed algorithm is connected to overcoming difficulties of identifying potential integration benefits. Benefits related to expenses can be identified rather accurate. Potential increase of income can only be expected. Formula of possible saving in taxed, transfer prices of raw materials, cost reduction due to eliminating duplication of managerial functions and staff reduction is already polished up and considered to be quite simple. In general terms synergistic effect consisting in cost reduction can be presented as:

$$\frac{\sum_{i=1}^{n} C_{i1}^{r}}{\sum_{i=1}^{n} S_{i1} Y_{i1}} - \frac{\sum_{i=1}^{n} C_{i0}^{r}}{\sum_{i}^{n} S_{i0} Y_{i0}}, \text{ where}$$

$\sum C_{j0}^{r}; \sum C_{j1}^{r}$ - amount of current expenses;

$S_0 Y_0; S_1 Y_1$ - costs of commodity products before and after implementation of joint projects.

It is much more difficult to identify how the revenue can grow in case of consolidation of two companies, especially when there are strategic product/market changes. Potential revenue can be calculated by means of methods used in investment project justification - calculation of norms of return on investment or money flow (Zhirugov 2014).

Comparison of integration benefits considered for integrated structured of various composition allows identification of the most relevant ones for work within a single technological cycle.

Value and possibility of implementation of external integration capacities cannot be quantified. There are no formalized models for such evaluation. The aim is to develop methods of qualitative evaluation. Therefore, we offer to use scoring of each structural element of external capacity of integration process development and appraisal of describing integrated index.

We propose the following formula for its calculation:

$$P = \frac{\sum_{j=1}^{4} \sum_{k=1}^{l} BP_{dk} \times y_{djk}}{\sum_{k=1}^{l} BP_{dk}}, \text{ where}$$

P - integrated appraisal index of external capacity of integration process development;

d - element of external capacity of integration process development;

j - quantity of particular capacities used for analysis;

k - quantity of indicators of particular capacity (within the interval [1, L]);

y_{dk} - score by k capacity of d element of external capacity of integration process development, lies within [1, 25] interval;

BP_{dk} - weigh fractions given to each k indicator of d element of external capacity of integration process development describing its significance for assessment of overall capacity.

The general indicator of capacity is calculated as a weighted sum of particular capacities. Indicators are summed up, each with its weight ratio. The total capacity of integration is calculated by the amount of weighted sum of partial indicators. Disincentive indicators are tentatively multiplied by (-1), (Table 4.).

Table 4. Assessment of external capacity of integration process development

Elements of capacities of integration process development	Indicators of partial capacity	Score	Weight of indicators of partial capacity*
Capacity of assets specificity	X_{py1} – derivation of income from sale of 1 centner of products from the industry average; X_{py2} – saving costs on staff training due to availability of qualified personnel; X_{py3} – saving fixed and variable costs due to production infrastructure	1-25	0,15
Capacity of state support and regulation	X_{sy1} – level of subsidies per 1 ha of agricultural land; X_{sy2} – reimbursement of difference of interest rates for credits; X_{sy3} – subsidies for capital investment; X_{sy4} – tax relief	1-25	0,30
Capacity of transactional sector substitution	X_{cy1} - contractual obligations implementation rate: X_{cy2} – negotiation cost; X_{cy3} – costs of information search; X_{cy4} – costs of specifications and protection of property rights; X_{cy5} - costs of evaluating quantity and quality of goods and services	1-25	0,25
Market capacity	X_{ry1} – market share of i type of product; X_{ry2} – market share occupied by 10 biggest competitors of a branch; X_{ry3} - Herfindahl-Hirschman index. X_{ry4} –ratio of prices at world and domestic markets	1-25	0,30

Source: Established on the basis of analysis of chiefs and experts of agribusiness

Our empirical study allows classification of the level of external potential of integration process development (Table 5.).

Table 5. Classification of external potential of integration process development*

Element	1st category high potential, score	2nd category middle potential, score	3rd category low potential, score
External capacity of integration process development	[10-25]	[1-10]	[0-1]

Source: Interval value is determined based on analysis of chiefs and experts of agribusiness of Stavropol region.

First category characterizes high capacity and the most favourable conditions for integrational process development. Second category corresponds to less favourable external conditions. Third one characterizes limited conditions for its development. The proposed methodology provides approximate, but still formalized assessment of external capacity of integration.

Conclusion

The developed methodology allows planning development of integrational processes based on assessment of internal and external integration capacities taking into account existing financial resources. The proposed procedure makes it possible to compare the expected results of integration at various structure of the integrated formation. Moreover, it allows identifying the need for financing development of enterprise's internal capacity based on the level of expectation. Within this framework, it is possible to plan adjustment of production, human resource, investment, financial and other capacities of integration and manage the size of the expected synergistic effect.

The proposed scheme of analysis will allow more comprehensive analytic justification of managerial decisions concerning integration: avoid spontaneous integrated entities, indicate "growth points" in existing ties between organizations, and choose the most convenient scenario for further activities of the organization taking into account its strategic development plan.

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AGRICULTURAL INSURANCE IN MONTENEGRO

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Abstract

High level of risk is evident in the field of agriculture, thus affecting and making it specific in relation to other activities. The importance of insurance in agriculture is reflected in the fact that it provides economic protection to agricultural producers from various adverse effects. Exposure to constant risks, whose intensity is unpredictable, makes insurance a dynamic category.

The paper will outline the current situation, in addition to problems in insuring crops and animals on family farms in the northern and central part of Montenegro. The aim of the paper is to note problems on the farms and draw certain conclusions in order to improve the insurance situation in the field of agricultural production in Montenegro, based on surveys in three municipalities (Pljevlja, Kolašin, and Bijelo Polje).

Key words: agriculture, insurance, farm, Montenegro

Introduction

From the beginning of the world until present day, human life and his property have been exposed to various risks, caused by either natural disasters or accidents (Jovanović, 2014). Weather conditions as a risk factor are particularly significant in agriculture, which is highly exposed to many risks of natural disasters (Marković et al., 2012). Theodor Brinkmann was the first who pointed out on the importance of risk coverage in the economics of the farms. Modern surveys focus significantly on the reduction of risk (Marković, 2010), therefore, an integrated risk management system is important in order to compensate the weather consequences. The main instruments for managing agricultural risk imply the following: funds for compensation of damages caused by natural disasters and joint insurance funds and insurance itself (Marković, 2009). The economic attractiveness of various risk management

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instruments, including insurance, depends on agricultural exposures (Berg, 2002). It should be noted that after floods, droughts, and similar disasters, an increased discussion about crop insurance arises, observing the possibility how to compensate the loss in production (Breustedt, 2004). Crop and fruit insurance is the most effective measurement for risk management (Bielza et al., 2007). Insurance is a financial instrument for risk management (Ronrbach, 2008). Some authors point to the need to expand the insurance market by more or all types of risks, mainly present in countries of Europe and North America (Berg, 2002; Aidinoglou, 2005; Von Alten, 2008).

Insurance in Montenegro is first mentioned in the Budva Statute dated the 15th century. However, this term was used much earlier in 1353, when confraternity existed due to sharing maritime risk (Kalinić, 2011).

In 1849, the „Association of Maritime Safety" was established, being replaced by „National Insurance" from 1858 to 1874. The first maritime insurance policy was issued in 1852, while the life insurance policy dated from 1826 (Kašćelan, Novović, 2012).

Agriculture is an activity in which a high level of risk is expressed. In the period of transition from which Montenegro is emerging, agriculture did not remain immune to the effects of the transition era. It should be noted that the most important aspects of insurance markets from developed countries might also be applied in countries in transition. Crop and fruit insurance is an instrument for stabilizing farm income (Bokusheva, 2004).

The paper will outline the current situation, in addition to problems in insuring crops and animals on family farms in the northern part of Montenegro. The aim of the paper is to analyse problems in family farms based on survey research in the three municipalities (Pljevlja, Kolašin, and Bijelo Polje) and draw some conclusions in order to improve the insurance situation in agricultural production in Montenegro.

Material and method

Several methods and relevant research procedures related to the problem under study have been used when drafting the paper. Whilst, it is as follows: survey, statistical methods (spreadsheets, percentage calculations), desk research method. The paper uses survey data, relevant domestic and foreign scientific and professional literature, and statistics from the Statistical Office - MONSTAT, in addition to Eurostat data. Data on agricultural producers' observations in regards to crop and fruit insurance were collected through a survey and processed by appropriate statistical methods. Final survey included 27 questions about the respondent's data, data on past activities, attitudes on insurance, and reasons why farmers would choose to insure agricultural production.

The survey comprises farms in three municipalities in Montenegro, namely: Pljevlja, Bijelo Polje and Kolašin. The survey included 60 farms. The criteria that had to be met were as follows: that the farm includes crop and livestock breeding and that the farms are located in the northern area of Montenegro.

Research results

Agriculture is a production based on a number of specifics that distinguishes it from other industries. One of them is that much of the production takes place outdoors, therefore agriculture is said to be an "open-air factory". It is characterized by slow turnover of invested funds and capital. It is not uncommon for the entire work invested to be in vain due to the heavy hail, floods and other natural disasters. For these reasons, farmers need to take risk management and minimization measures. One measure is to insure agricultural production.

Crop and fruit insurance in Europe has a very long tradition and there are several insurance systems. Based on the way of risk compensation, crop and fruit insurance may be divided into: crop and fruit damage insurance, guaranteed yield insurance and weather index insurance (Herbold, 2007). Furthermore, universal and specialized types of insurance differ. In Table 1. is provided an overview of different insurance systems in Europe. It is evident that in all countries there is single-risk (hail) insurance. In many countries, this type of insurance has also been extended to a combination insurance system, which includes several additional risks (fire, thunder, storm, frost). Only a few countries have yield insurance, which includes a multi-risk insurance package, which in addition to the foregoing includes drought, floods, diseases and pests, etc.

Table 1. Insurance of crops and fruits in the European countries

Country	Insurance system	Insured areas, (%)	Share of premium in insurance sum (%)	Government subsidies (%)
Austria	S,K,P	78	2,6	46
Belgium	S	n.p.	n.p.	0
Bulgaria	S,K	52	4,8	0
Great Britain	S	7	0,8	0
Greece	S,K	(100)	2,5	n.p.
Denmark	S	n.p.	n.p.	0
Estonia	S	<1	n.p.	0
Ireland	S	n.p.	n.p.	0
Italy	S,K,P	8	7,4	67
Cyprus	S,K	(100)	7,2	50
Latvia	S	<1	n.p.	50
Luxembourg	S,K,P	45	2,3	50
Hungary	S,K	52	n.p.	0
Germany	S,P	43	1,2	0
Poland	S	7	n.p.	0
Portugal	S,K	22	8,4	68
Romania	S,K	12	n.p.	50
Slovakia	S,K	n.p.	n.p.	50
Slovenia	S,K	17	7,6	45
Serbia	S,K	10	n.p.	30
Finland	S	<1	n.p.	0
France	S,K,P	n.p.	1,7	2,4
Netherlands	S	n.p.	n.p.	0
Czech Republic	S,K	35	1,8	40
Sweden	S,K	60	n.p.	0
Spain	S,K,P	26	6,3	41
Croatia	S,K	3	4,1	25
Turkey	S,K,P	1,8	n.p.	50
S – single - type of insurance, K - combined insurance, P - yield insurance, n.p. - no data				

Source: Bielza et al., 2008.

Great differences are noted if the share of government subsidies in regards to insurance premiums is considered. The largest government subsidies are in Portugal (68%) and Italy (67%). In many countries, farmers are obliged to pay half of the insurance premium, while the other half is reimbursed by the government (Cyprus, Latvia, Lithuania, Luxembourg, Romania and Slovakia). Noteworthy government subsidies also exist in Austria (46%), Slovenia (45%) and Spain (41%). In Serbia (30%) and the Czech Republic (30%), farmers pay two-thirds of the insurance premium, while one-third is covered by the state. If one compares the situation in Montenegro with the afore-mentioned European countries, it should be emphasized that Montenegro is in the group of countries in which the state reimburses half of the insurance premium. Within the Agro budget of Montenegro there is a measure of support for production insurance, which involves co-financing insurance against damage to crops, livestock and facilities up to 50% of the policy. Lovćen osiguranje (Lovćen insurance, joint-stock company) is an insurance company that deals with insurance of agricultural production in Montenegro.

Risk represents odds of an adverse event occurring. The consequences of the risk effect must cause a negative impact on the property or some value, or cause economic damage. Risk management is a set of management methods and techniques that are used to minimize the potential for adverse events and minimize their consequences. The following stages are distinguished in the risk management process: risk identification; risk analysis; risk assessment; choice of methods and risk management; implementation of the selected control and its assessment and retesting (Vujevic, 2009). Risk management in agriculture should be seen as an integral and indispensable part of the stability, development and competitiveness of agricultural production. U.S. farmers have the ability to use almost all forms of risk management, but research shows that they use the most diversification, followed by insurance, forwards, government programs, futures and other forms (Blank, McDonald, 1995). Depending on the time when risk is sought, there is a division into *ex ante* and *ex post* approaches. *Ex-ante* implies activity prior to the occurrence of an insured event, or damage, and *ex post* implies measures subsequent to the occurrence of damage (Hirshc, Nell, 2008). In Table 2. is shown an overview of the use of different risk management instruments in Germany, the Netherlands and Spain.

Table 2. The use of different risk management instruments, in particular countries, in %

Type of instrument	Germany	Netherlands	Spain
Crop insurance	68,7	30,5	59,2
Animal insurance	42,8	37,2	36,6
Diversification	28,4	11,5	18,8
Marketing contracts	49,3	18,6	12,6
Production contracts	16,4	20,8	5,8
Off-farm investments	49,8	6,2	5,8
Off-farm employment	36,8	17,7	4,7
Property insurance	75,1	66,8	29,8
Vertical integration	7,0	4,4	12,6
Avoiding Credit	31,3	38,1	36,6
Hedging	5,0	1,3	1,0
Holding financial reserves	61,2	22,6	22,5

Source: Thematic reviews on risk management in Spain, 2010.

Table 2. shows that Germany is leading in regards to the use of available risk management instruments. This is supported by data showing that farmers use crop insurance the most (68.7%). Moreover, this type of insurance takes a significant place in Spain (59.2%); while its participation in the Netherlands is considerably lower (30.5%). In Spain, animal insurance also has a significant role, being almost equivalent as in the Netherlands, but 6% lower than in Germany. Other instruments such as diversification, marketing contracts, production contracts in Spain are used to a much lesser extent compared to Germany and the Netherlands.

Agricultural production in Montenegro has a long tradition and, on account of available natural resources, may be observed as the backbone of economic development. Limiting factors for the development of the Montenegrin village are the fragmentation of agricultural land and structure of their use. Almost all agricultural production in Montenegro takes place on family farms. According to the latest census of 2010, the total number of agricultural farms is 48,870, of which 48,824 are family agricultural farms or 99%, while only 46 are enterprises engaged in agricultural activity. Family farms and business entities listed in the 2010 Agriculture Census had 221,297.60 ha of total exploited land, accounting for 71.6% of the total available land. The average agricultural farm has 4.6 ha of agricultural land (Monstat, 2011). The structure of exploited agricultural land is as follows: perennial meadows and pastures comprise 94.98% of the total exploited agricultural area, while other categories of land such as gardens, arable land, vineyards, orchards and nurseries together account for just over 5%.

The greatest number of farms using perennial meadows and pastures is based in the municipalities of: Nikšić, Podgorica, Bijelo Polje, Pljevlja and Berane. According to the size of the class of utilized agricultural land, 15,418 family farms are in the range of 0.1- 0.5 ha or 31.6%. There are very few farms whose size ranges from 100 ha or more, merely 425 or 0.87% of the total available land. Shown data indicate that small land farms still prevail in Montenegro.

In the municipalities where survey researches were conducted (Pljevlja, Bijelo Polje, and Kolašin), the size of the agricultural land use class is at the national average. Namely, in the observed areas the largest share of farms is from 1 to 5 ha. Animal husbandry has always been one of the main occupations in the rural area of Montenegro. According to the 2010 Agricultural Census, total number of animal husbandry is 32,675, which is 66.9% of the total number of family farms. The total number of animal units is 17,753. The average number of animal units at family farms is 3.6. Out of a total of 32,675 animal husbandry farms, 24,624 or 75.3% are cattle farmers, whose average number per holding is 3.3 units. Out of a total of 48,824 family farms, 6088 farms or 12.24% are engaged in sheep farming. The average number of sheep per family farm is 37.6 in comparison to the total number of farms engaged in sheep farming, while the average number of sheep is 4.7 units relative to the total number of family farms (Monstat, 2011).

Labour force is becoming a limiting factor in regards to development of farms and revitalization of farms. Demographic depopulation and aging in the countryside represent basic trends in the population development of the people of Montenegro. The demographic picture of the agricultural population of Montenegro is unfavourable. Farmers are aging rapidly, resulting in a high percentage of elderly farmers. On family farms, 23,198 persons in employment are at the age of 65 or older, accounting for 23.5% of the total workforce, while the share of persons under 24 is only 6.8%. Moreover, data indicate that almost 44% of the total number refers to persons over 55 (Monstat, 2011).

The survey was conducted on the territory of the municipalities of Pljevlja, Bijelo Polje and Kolašin, on a sample of 60 family farms. Survey data were obtained through interviews conducted with the owners of family farms. According to the survey, 86.67% of households' owners are men, while women participate with 11.33%. The total number of household members is 238, of which 55.46% are men and 54.54% women. In regards to the age structure, there are a great number of those over the age of 64 or 18.90% of the total, whilst the population under the age of 15 represent 14.71%. Average number of household members in the surveyed farms is 4.

Table 3. Structure of farms surveyed by sex and age

Number of household members									
Sex		**Age**							**Total**
Male	Female	<15	15-24	25-34	35-45	46-54	55-64	>64	
132	106	35	35	29	28	35	31	45	238

Source: Calculation of the author based on the Survey.

In regards to the educational structure, 21.85% accounts population that has eight grades of elementary and four grades of high school, 20.59% refers to population with 4 grades of elementary school, 19.75% to completed three-year high school. Population with no school education participates with 7.98%, which is the same percentage as the population with high education and higher education, with 5.46% of the population having higher education and 2.52% high.

Table 4. Structure of surveyed farms by level of education

Level of education							Total
Without education	4 grades of elementary school	8 grades of elementary school	High school 3 years	High school 4 years	High education	Higher education	
19	49	52	47	52	6	13	238

Source: Calculation of the author based on the Survey.

Pastures and meadows, followed by arable land and gardens, and finally by orchards, account for the largest share of area structure (Table 5.). The remaining areas (vineyards, glasshouses, greenhouses) cumulatively occupy 1.3 ha. Pastures occupy 43.10% of which in own possession 68.19% and lease 31.81%. Meadows occupy 39.84% of the total area, where in own possession 78.23%, the rest is leased and amounts to 21.77%. After pastures and meadows, 14.16% occupy an important place in the structure of the area. The ownership structure of arable land and gardens is such that arable land and gardens in own possession make 88.53% and lease 11.47% of the total area under arable land and gardens. Orchards occupy 2.77% of the total area, whilst fully owned by the owners of the farms. Vineyards occupy 0.20 ha in absolute terms, which is understandable given the climatic conditions characteristic of the surveyed climate, glasshouses 0.30 ha and greenhouses 0.80 ha. The conditions for greenhouse production in the surveyed area are favourable, so they do not represent the main reason for the small share of this type of area. Surveyed farms use 1,132.04 ha of land, of which 76% is owned and 24% leased.

Table 5. Area structure on surveyed farms

Area structure (ha)			Total (ha)
Title of area	**Own possession**	**Leased**	
Arable land and gardens	141,96	18,39	160,35
Orchards	31,40	-	31,40
Vineyards	0,20	-	0,20
Meadows	352,89	98,19	451,08
Pastures	332,72	155,19	487,91
Glasshouse	0,30	-	0,30
Greenhouse	0,80	-	0,80
TOTAL	860,27	271,77	1.132,04

Source: Calculation of the author based on the Survey

The average size of the surveyed farms is 14.34 ha. According to the 2010 Agricultural Census in the observed municipalities, the largest share of farms is of the area of 1-5 ha, which means that size of the surveyed farms is about 2.5 times larger than the average size of farms at the municipal level.

Farms surveyed are of diverse type, which means that they are engaged in both crop and livestock breeding. Due to large areas under meadows and pastures, the surveyed municipalities have favourable conditions for livestock development. Livestock breeding is dominated by sheep farming (926 units), followed by cattle breeding (364 units) and poultry (132 units). In regards to the crop breeding, fodder plants (79.45 ha), cereals (46.60 ha) are represented mostly, and vegetables are grown at 34.30 ha (Table 6.).

Table 6. Breeding structure in surveyed farms

Breeding structure in farms			
Livestock breeding		**Crop breeding**	
Sheep breeding	926 units	Fodder	79,45 ha
Cattle breeding	364 units	Cereals	46,60 ha
		Vegetables	34,30 ha

Source: Calculation of the author based on the Survey.

According to the observed farms, 73.33% of the respondents possess agricultural machinery (tractors and farm machinery), while 26.67% do not possess agricultural machinery. For 48.33% of the respondents, agriculture is the main source of income, 26.67% of respondents, in addition to the income from agriculture, have an income from other sources, while for 25%, agriculture is not the main source of income. Total agricultural income from the surveyed farms averages EUR 6,646.55 annually. Over the past five years, 32% of the respondents suffered up to 50% of farm damages, while the remaining number of farms, in the past five years did not suffer any. In regards to the structure of damages on farms, the greatest share (32%) of damages is in livestock breeding. Damage caused is mainly the result of the effects of production risks (death, weather, game animal attacks, etc.). The most frequent damages were caused by the death with 75% and snow with 25%, which refer as main causes of weather damage. Data obtained indicate that there were significant losses on farms not being covered by basic and supplementary insurance (drought, snow, game animal attack). Damages to farms expressed in cash amount to approximately EUR 40,000.[3] Only one of the 60 surveyed farms was an insurance beneficiary, with the insurance company "Lovćen" insurance A.D. Beneficiary was satisfied with the insurance company.

3 Calculation of the author based on the Survey.

Out of 60 respondents, 48.33% are familiar with the MARD's subsidies[4] regarding insurance, while 51.67% are not familiar and unaware of the MARD's subsidies. Only 8 respondents or 13.56% were sufficiently informed about the offered insurance conditions, while the remaining number of respondents was not sufficiently informed. Positive attitude towards additional education regarding agricultural insurance knowledge was expressed by 75% of respondents, while 25% was not interested in additional education. As a main reason for poor interest in insurance, respondents note a high insurance premium (64.41%), followed by lack of finances (54.24%), then insufficient information (35.59%), while 11.86% of respondents cite that agriculture is not the primary activity on the farm as a reason. It should be noted that 6.78% of respondents cite distrust of financial institutions as a reason, while 10.17% cite other reasons.

When asked if they would insure if that would have contributed to a more insure placement of their products on the domestic market, (93.22%) of the respondents answered positively. If the condition for obtaining subsidies from the MARD was the insurance, 81.36% would be insured, and 57.63% of them would be insured if the insurance would be a condition for obtaining favourable conditions for lending with banks. It should be emphasized that 55.93% of the respondents would be insured if that would be a condition for pursuing activities in the field of agriculture, while 49.15% would be insured if such would contribute to a better placement of their products in the regional market. If increased the volume and capacity of production, 40.68% of the respondents would have insured themselves, as opposed to 59.32% who should not economically protect their production even if such occurs.

A large number of respondents, 71.19%, believe that local government may contribute to increasing the number of insured farms through various types of measures. The main measures cited by the respondents are that: the local government participates in additional insurance premium subsidies, as well as contributing to better information of the farm holders about insurance conditions. Furthermore, respondents believe that by increasing the safer purchase of products, local self-government may contribute to increasing interest in insuring agricultural production.

The most common remarks of respondents regarding agricultural insurance are the following: insurance premium was high, lack of information of farmers, complicated administrative procedure, and lack of trust in insurance companies. Through remarks, respondents provide guidance what should be done in order to increase

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their interest. The most common recommendations relate to the additional education of agricultural producers and that additional efforts should be made due to the provision of a favourable environment for insuring agricultural production for young farmers.

Of the 60 farms surveyed, only one farms insured their production, which is more than a sufficient indicator referring to insurance situation in Montenegro's agriculture. In regards to the insurance companies operating on the territory of the state, only one under non-life insurance offer provides agricultural insurance, and its application has begun in recent years. Given the understanding and traditional way of farming, it is comprehensible that insurance is not as high as in more developed countries. The level of education may be improved through seminars and workshops organized by the competent ministry, insurance companies and the Association of Agricultural Producers. Improving the market environment and therefore the financial position of the producer would create a more favourable climate for a higher level of use of insurance. Government subsidies of up to 50% provided by the MARD are on par with some countries in Europe (Romania, Slovakia, Turkey, Cyprus, etc.).

Conclusion

Specificities characteristic for agriculture make it a very sensitive activity, exposed to a large number of risks that may have long-term negative consequences for agricultural producers. In order to minimize the risks to which they are exposed, producers have at their disposal a number of measures used to protect agricultural production. One of these measures is insurance, which is carried by signing a contract between the "potentially vulnerable", or the insurance beneficiary who is insuring against a certain type of risk and insurance company, that is ready to provide economic protection for a certain amount of financial compensation.

Agricultural insurance in Montenegro is a novelty in the insurance market and as such is underdeveloped. Insurance covers both crop and livestock breeding. Crop breeding farmers have the ability to insure themselves against production risks. Production risks imply weather conditions that affect the production process through their activities. Therefore, producers have the ability to insure against the basic risks (hail, fire and lightning) and thus protect their production against the reduction (loss) of yield. Having special insurance conditions, which include insurance against additional risks (storm, flood, spring frost, saline, etc.); producers may protect their production from the consequences of quantity and quality loss. In regards to the livestock breeding, producers may insure their units from the basic risks (death, slaughter or killing by force or due to economic reasons). Supplementary risks include treatment costs, loss of breeding capacity, responsibility of the owner of the animals, et cetera.

The survey, which was conducted within the framework of the research for the purpose of this paper, was carried out in the municipalities of Pljevlja, Bijelo Polje and Kolašin, located in the north-mountainous part of Montenegro. Sixty family farms were surveyed. Based on the results obtained, it can be noted that agricultural insurance is not at the level necessary for further improvement of agricultural production. Additional efforts need to be made in order to enable insurance as a risk management instrument to have a greater role in ensuring the continued production and more stable income of farms.

Considering that agriculture is a strategic branch of Montenegrin development, it is necessary to improve insurance further as a risk management measure in agriculture. Some of these measures are as follows:

- The current state of the insurance market is not in favour of manufacturers. The reasons should be sought in the fact that only one insurance company offers the possibility of insuring agricultural production;
- It is imperative that other insurance companies also provide agricultural insurance conditions and thus participate in creating a more favourable market environment;
- Inclusion of additional risks that producers face but are not able to insure against such (drought, game animal attack, snow, etc.);
- Undertaking measures in order to improve agricultural infrastructure, construction of urban dwelling stations, construction and reinforcement of protective embankments, drainage channels. Moreover, it is necessary to continuing improvement of agricultural production towards the use of species adapted to climatic conditions;
- Institutional connection implying linking of relevant stakeholders (hydro meteorological institute, scientific institutions, insurance companies) that within their scope of competences would mutually contribute to managing and reducing risk in the field of agriculture;
- Establishing an association of agricultural producers would be provided the possibility of collective insurance, and thus conditions for reducing insurance costs;

- Local self-governments may also contribute to the further improvement and fostering of agricultural insurance by allocating additional subsidies and engaging producers in the process of education;
- Bank insurance relating to the crediting of farms and subsidization of insurance policies against which damage may be recovered;
- In order to ensure a continuous and stable supply of raw materials, the production industry should be engaged in insuring its subcontractors;
- The following measures that may be implemented could also be very important to farmers for the reason that they could reduce risks they face on a daily basis.

Vertical integration that would be reflected in linking primary agricultural producers with sales chains in order to safer placement of their products. There is also the possibility of "invisible exports", reflected in tourism spending. Diversification by which producers, in addition to their core business, would develop additional business activities, such as agro-tourism, processing facilities, etc.

Insurance in agriculture of Montenegro is the best way to secure invested funds and work of agricultural producers, yet they would insure their financial and material stability. Therefore, farmers should bear in mind the statement "that the highest cost is when the investment fails, that is, the safety of the investment is the most fruitful investment".

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FORECASTING THE PRICE INDICATORS OF SIGNIFICANT INDUSTRIAL PLANTS IN THE REPUBLIC OF SRPSKA

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Abstract

Using the ARIMA model, the paper forecasts five-year price and price parity movements of the most represented industrial plants in the Republic of Srpska (soybeans, rapeseed and tobacco). The main goal of the paper was to analyse changes in price and their parities, as well as the future tendency of price indicators of observed crops. The results show that a constant increase in soybean prices over the upcoming five-year period can be expected, where the ratio of soybean prices to wheat will be very favourable. For rapeseed, price fluctuations in the prediction period can be expected, while its parity will be very favourable, as is the case with soybeans. As with soybeans, tobacco can also be expected to have a constant price increase over the five-year forecast period, while tobacco/ wheat parity will continue to decline in the coming period.

Key words: forecasting, ARIMA models, industrial plants, price, price parity.

Introduction

Industrial plants are of great economic importance in our country, and favourable agro-ecological conditions enable successful production. Despite this, Gadžo et al. (2011) state that crops that can be sown under our conditions do not occupy a proper place in the structure of sowing. Specifically, according to data from Institute of Statistics of the Republic of Srpska (ISRS, 2019), the share of industrial plants in cultivated arable land was only 2.41% in 2017, while within the structure of crop production, industrial plants were at last place behind dominant cereals, forage herbs and vegetables. According to the same source, in the observed year, soybeans (4,132 ha), rapeseed (1,978 ha) and tobacco (1,063 ha) were the most cultivated crops, which are also the subject of research. Given the economic importance of the observed industrial crops, the main goal of research was analysis of change in prices and their parities, as well as the future tendencies of these price parameters. The Box-Jenkins methodology or ARIMA models were used for this purpose.

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Many domestic as well as foreign authors have used the ARIMA model in their research, thus predicting production and economic indicators in agriculture, and therefore in crop production (Ivanisević, 2015; Bussay et al., 2015; Hossain, Abdulla, 2015; Novković et al., 2016; Ilić et al., 2016; Iqbal et al., 2016; Jadhav et al., 2017; Santosha et al., 2017; Sharma et al., 2018; Nedeljković, Krstić, 2019). For example, in their paper, Nedeljković and Maksimović (2019a) make a prediction of soybean production in the Republic of Srpska (RS) by selecting the appropriate ARIMA model. Obtained results show that in the coming years, it is expected that the area of this oilseed plant will decrease continuously, and that the production and yield of soybeans will show oscillatory movement in the five-year prediction period.

When it comes to forecasting the prices of certain vegetable crops, Ivanišević et al. (2015) analyse the changes and future tendencies of the price parameters of tomatoes in Serbia using descriptive statistics to analyse the time series of data within the scope of seventeen years (1994-2010), while for the forecasting in the following five years (2011-2015) the authors have used appropriate ARIMA models.

Mutavdžić et al. (2016), using the ARIMA model, predicted the movement of wheat and corn prices and their parities up to the year 2020 in Serbia.

Method and data sources

In the process of collecting, collating and presenting data for analysis in this research, we use the *descriptive analysis method*. It will also be used as a method of determining specific indicators that are relevant to the description of observed features. The descriptive statistics method is used for research purposes to analyse observed features in the period 2005-2017. This include: average value, variation interval/extreme values, coefficient of variation and change rate.

For the purpose of explaining and evaluating variability, as well as statistical inference and predicting the behaviour of observed phenomena in the future, the analytical statistical method will be used.

The prediction of observed phenomena refers to a five-year period, (2018-2022), and ARIMA (*Autoregressive Integrated Moving Average*) models based on time series analysis were used for prediction.

The economic indicators taken for analysis and forecasting of the selected industrial crops are price, as an absolute indicator, and price parity as a relative price indicator. Price analysis covers the period 2005-2017.

The analysis and forecasting of the price parity of the analysed industrial plants were done according to the prices of wheat, which in this case was selected as a competitive crop species in relation to which the economic position of each industrial plant that was the subject of this research was intended to be predicted.

All prices analysed are average annual prices of observed crops in Republic of Srpska published by Republic of Srpska Institute of Statistics, which have been converted from Bosnian marks (BAM) to Euros (EUR) for the purposes of the research in this paper.

The sources of data used in the paper were the data from the Statistical Yearbooks of the Republic of Srpska (Institute of Statistics) for the period 2005-2017, followed by statistical bulletins containing the necessary data for observed municipalities, as well as other available relevant data sources from the websites of the Republic Institute and the line Ministries. The data collected were processed with adequate statistical software (*Statistica 13.1, Eviews 10, SPSS*).

Research results with discussion

Within the analysed period average price of soybeans was 330.63 EUR/t with increasing tendency and annual change rate of 3.25%. The coefficient of variation of 21.14% shows a relatively unstable movement in the observed period with a minimum of 228.9 EUR/t reached at the beginning of analysed period up to a maximum of 495.39 EUR/t recorded in 2012 (Table 1.).

Table 1. Indicators of soybean prices in Republic of Srpska (2005-2017)

Average value (EUR/t)	Min. (EUR/t)	Max. (EUR/t)	Coeff. of variation (%)	The rate of change (%)
330,63	228,9	495,39	21,14	3,25

Source: Authors calculation based on data ISRS, 2019.

The estimated model for analysis and forecasting of soybean prices shows that the price level of the current year is affected by soybean prices from the previous two years, as like random fluctuations from the previous year, with only random fluctuations showing statistical significance (Table 2.).

Table 2. A model for predicting soybean prices

Paramet.	Input: soybean price Transformations: D(1), D(1) Model: (2,1,1)(0,1,0) MS Residual=8055,6					
	Param.	**Asympt. Std. Err.**	**Asympt. t(7)**	**p**	**Lower 95% Conf**	**Upper 95% Conf**
Constant	0,786589	3,336623	2,357441E-01	0,820380	-7,10327	8,676448
p(1)	-0,020627	0,436067	-4,730251E-02	0,963593	-1,05176	1,010506
p(2)	-0,497817	0,431109	-1,154734E+00	0,286092	-1,51723	0,521595
q(1)	0,999898	0,000000	7,293952E+16	0,000000	0,99990	0,999898

Source: Results of the research.

Forecasting soybean prices with the estimated model is showing that a constant price growth can be expected in coming period. In last year the soybean prices will be for 22% higher than the average price in 2005-2017 (Table 3.).

Table 3. Soybean price forecasting (2018-22)

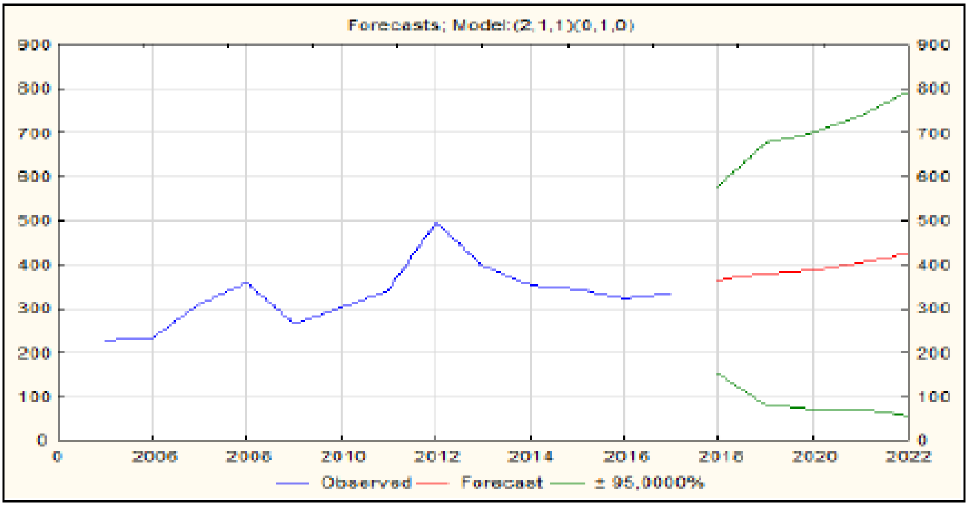
Years	Forecasts; Model: (2,1,1)(0,1,0) Input: Soybean price Start of origin: 1 End of origin: 13			
	Forecast	**Lower 95,0000%**	**Upper 95,0000%**	**Std. Err.**
2018	365,8894	153,6574	578,1214	89,7529
2019	379,6056	82,5284	676,6828	125,6340
2020	386,7366	72,5275	700,9456	132,8790
2021	403,2030	71,3707	735,0353	140,3319
2022	423,9496	55,9156	791,9836	155,6416

Source: Forecast results

The following chart (Chart 1.) confirms the continued rise in the price of soybeans over the forecast period.

Soybean is characterized by very favourable price parity for wheat. Namely, the average of this parity is 1.9 and ranges from 1.45 to 2.31. In the analysed period, this parity shows quite stability with a calculated coefficient of variation of 11.26%, as well as a tendency of faster price growth in relation to wheat at a change rate of 1.16% (Table 4.).

Chart 1. Soybean price movement



Source: Forecast results

Table 4. Indicators of soybean price parity in Republic of Srpska (2005-2017)

Average	Min.	Max.	Coeffi. of variation (%)	The rate of change (%)
1,9	1,45	2,31	11,26	1,16

Source: Authors calculation based on data ISRS, 2019.

The estimated ARIMA model shows that the current year parity is significantly affected by random fluctuations from the previous two years (Table 5.).

Table 5. A model for forecasting soybean / wheat price parity

Paramet.	Input: Soybean/wheat Transformations: D(1) Model: (0,1,2) MS Residual=,05878					
	Param.	**Asympt. Std. Err.**	**Asympt. t(8)**	**p**	**Lower 95% Conf**	**Upper 95% Conf**
Constant	0,021374	0,013330	1,603453E+00	0,143298	-0,008781	0,051529
q(1)	0,635934	0,000000	3,890981E+11	0,000000	0,635964	0,635964
q(2)	0,363994	0,000000	3,890981E+11	0,000000	0,363994	0,363994

Source: Research results

Soybean/wheat parity values obtained from the estimated ARIMA model (0,1,2) show that this parity tends to increase in the future year by year. By the end of the prediction period (2022), tons of soybeans will be worth just under 2.2 tons of wheat (Table 6.).

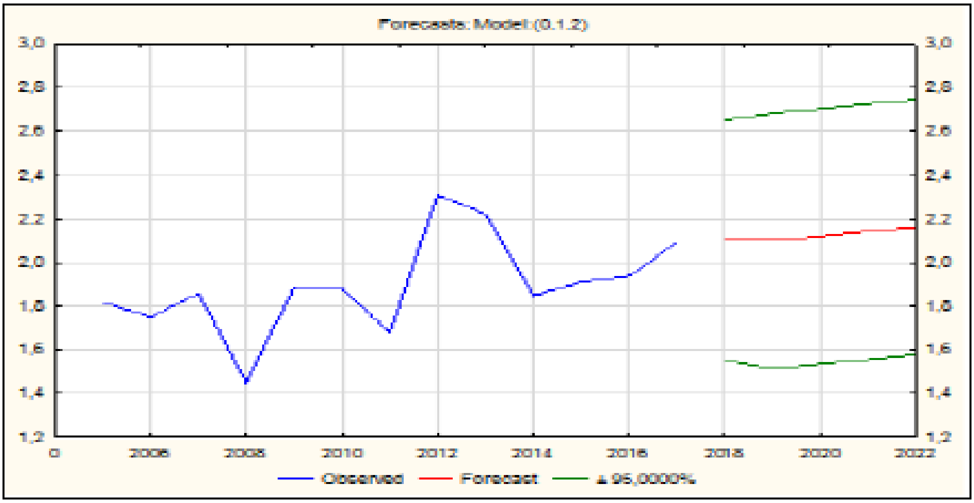
Table 6. Predicting soybean/wheat price parity (2018-22)

Years	Forecasts; Model: (0,1,2) Input: soybean/wheat Start of origin: 1 End of origin: 13			
	Forecast	Lower 95,0000%	Upper 95,0000%	Std. Err.
2018	2,099710	1,551280	2,648139	0,242437
2019	2,097846	1,514201	2,681491	0,258004
2020	2,119220	1,535576	2,702865	0,258004
2021	2,140595	1,556950	2,724239	0,258004
2022	2,161969	1,578325	2,745614	0,258004

Source: Forecast results

Below is a graphical representation of the movement of this parity which shows that significant fluctuations were present in the analysed period, but that in the forecasting period the soybean-wheat price ratio will stabilize (Chart 2.).

Chart 2. Soybean/Wheat Price Parity Movement



Source: Forecast results

What characterized the price of rapeseed in the observed period was a growth tendency that was 3.62%. The average price was at the level of 339.06 EUR/t and ranged from 202.51 EUR/t (2006) to 444.31 EUR/t (2012). The coefficient of variation that measured the stability in price movement of this industrial plant was 22.72% (Table 7.).

Table 7. Indicators of rapeseed in Republic of Srpska (2005-2017)

Average (EUR/t)	Min. (EUR/t)	Max. (EUR/t)	Coeff. of variation (%)	The rate of change (%)
339,06	202,51	444,31	22,72	3,62

Source: Authors calculation based on data ISRS, 2019.

The values of the estimated model for the prediction of rapeseed show that the prices from the previous three periods have a statistically significant effect on the price of rapeseed (Table 8.).

Table 8. A model for forecasting the price of rapeseed

Paramet.	Input: the price of rapeseed Transformations: none Model: (3,0,0) MS Residual=4964,9					
	Param.	**Asympt. Std. Err.**	**Asympt. t(9)**	**p**	**Lower 95% Conf**	**Upper 95% Conf**
Constant	226,8652	137,4673	2	0,133274	-84,1074	537,8378
p(1)	0,7358	0,0000	38341571	0,000000	0,7358	0,7358
p(2)	-0,0654	0,5942	-0	0,914785	-1,4096	1,2788
p(3)	0,3295	0,0000	383415371	0,000000	0,3295	0,3295

Source: Research results

The projected price values show that the price of rapeseed will alternate between from year to year. At the end of the forecast period, the price is expected to be about six percent higher than the average realized price in the observed period (Table 9.).

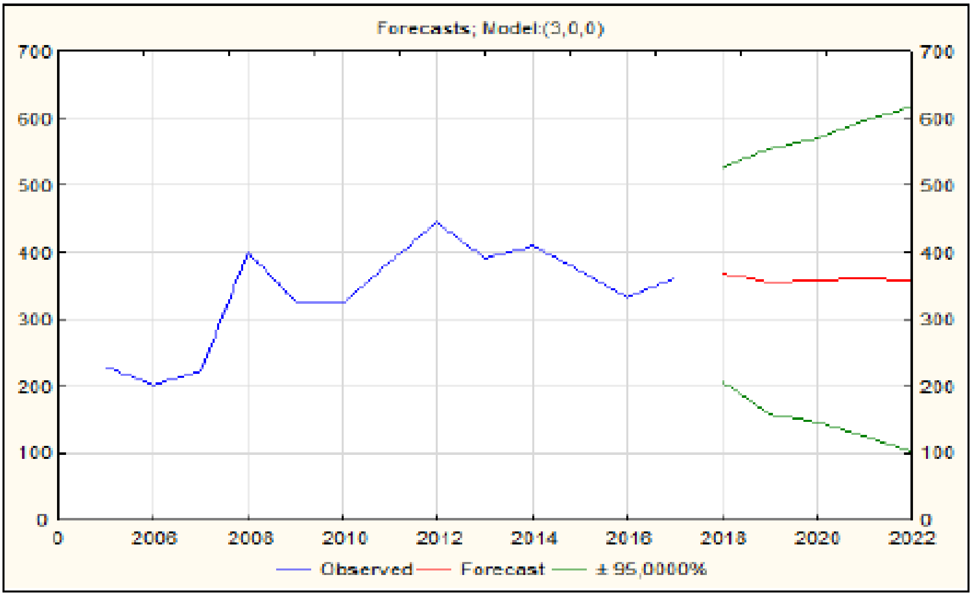
Table 9. Forecasting the price of rapeseed (2018-22)

Years	Forecasts; Model: (3,0,0) Input: the price of rapeseed Start of origin: 1 End of origin: 13			
	Forecast	**Lower 95,0000%**	**Upper 95,0000%**	**Std. Err.**
2018	367,6965	208,2996	527,0933	70,4623
2019	356,6006	158,6999	554,5013	87,4832
2020	357,6949	145,7437	569,6461	93,6943
2021	361,0624	126,4061	595,7186	103,7312
2022	359,8122	101,5835	618,0409	114,1515

Source: Research results

A graphical representation of the price trend for rapeseed shows that prices fluctuated significantly in the analysed period and will decrease during the forecast period (Chart 3.).

Chart 3. The movement of the rapeseed price



Source: Forecast results

The average price parity of rapeseed/wheat of 1.94 shows that, during the analysed period, rapeseed worth almost twice as compared to wheat. The calculated coefficient of variation of 14.53% shows that it is a relatively stable movement of this parity over the observed period. That the price of rapeseed had a higher tendency to increase, compared to wheat, also shows the annual change rate of 1.83%. Rape/wheat parity differs from 1.33 (minimum) to 2.30 (maximum), (Table 10.).

Table 10. Indicators of price parity for rapeseed in Republic of Srpska (2005-2017)

Average (EUR/t)	Min. (EUR/t)	Max. (EUR/t)	Coeff. of variation (%)	The rate of change (%)
1,94	1,33	2,30	14,53	1,83

Source: Authors calculation based on data ISRS, 2019.

The model for the forecasting of rapeseed/wheat price parity shows that the parity value in the current year is influenced by the parity values from the previous two years, with a statistically significant parity from the previous year (Table 11.). Based on the estimated model, the expected parity values for the next five-year period are also predicted (Table 12.). The projected values show that it can be expected that the rapeseed/wheat price parity will drop constantly until the end of the forecast period.

Table 11. A model for forecasting price parity of rapeseed/wheat

Paramet.	Input: rapeseed/wheat Transformations: none Model: (2,0,0) MS Residual=,06378					
	Param.	**Asympt. Std. Err.**	**Asympt. t(10)**	**p**	**Lower 95% Conf**	**Upper 95% Conf**
Constant	1,965216	0,123502	15,91236	0,000000	1,69004	2,240397
p(1)	0,780141	0,33005	2,34273	0,041147	0,03816	1,522121
p(2)	-0,359295	0,331116	-1,08510	0,303342	-1,09707	0,378478

Source: Research results

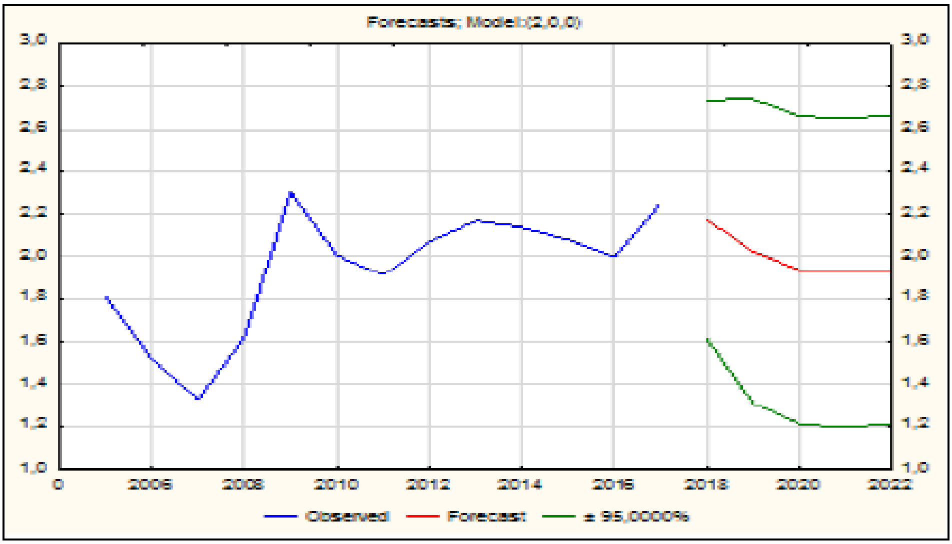
Table 12. Forecasting the price parity of rapeseed/wheat (2018-2022)

Years	Forecasts; Model: (2,0,0) Input: rapeseed/wheat Start of origin: 1 End of origin: 13			
	Forecast	**Lower 95,0000%**	**Upper 95,0000%**	**Std.Err.**
2018	2,174890	1,612168	2,737612	0,252552
2019	2,026470	1,312762	2,740177	0,320316
2020	1,937668	1,210301	2,665035	0,326446
2021	1,921716	1,192749	2,650684	0,327164
2022	1,941178	1,212100	2,670257	0,327214

Source: Forecast results

Chart 4 shows that there is a decline in the price of rapeseed compared to the price of wheat.

Chart 4. Price parity movements of rapeseed/wheat



Source: Forecast result

The price of tobacco is by far the highest among all crop species observed so far and its average for the period 2005-2017 was 1562.22 EUR/t. The price growth rate of this industrial plant in the analysed period was slightly below one percent and recorded moderate variability. The lowest tobacco price of 1,210.26 EUR/t was recorded in 2007, and the highest price of 1877.45 EUR/t was recorded in 2013 (Table 13.).

Table 13. Basic tobacco price indicators in Republic of Srpska (2005-2017)

Average (EUR/t)	Min. (EUR/t)	Max. (EUR/t)	Coeff. of variation (%)	The rate of change (%)
1562,22	1210,26	1877,45	12,71	0,96

Source: Authors calculation based on data ISRS, 2019.

Following could be inferred from the value of the estimated ARIMA model (0,1,2), (Table 14.).

Table 14. A model for forecasting tobacco prices

Paramet.	Input: tobacco price Transformations: D(1) Model: (0,1,2) MS Residual=30438,					
	Param.	Asympt. Std. Err.	Asympt. t(9)	p	Lower 95% Conf	Upper 95% Conf
Constant	29,80546	8,592571	3	0,007063	10,36772	49,24321
q(1)	0,79160	0,000000	619076837	0,000000	0,79160	0,79160
q(2)	0,20838	0,000000	619076837	0,000000	0,20838	0,20838

Source: Research results

Based on the estimated model, expected tobacco prices are forecasted for the period 2018-2022. The forecasted values show that a constant increase of tobacco prices can be expected in the future period, so that at the end of the forecasting period it will be at the level higher than 18% of the average realized price, i.e. 1% more than the maximum price (Table 15.).

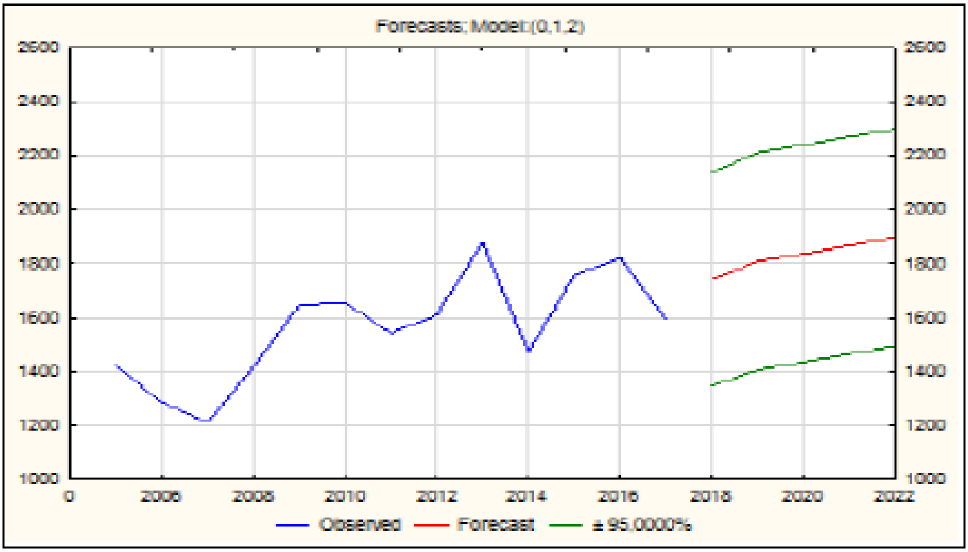
Table 15. Tobacco price forecasting (2018-2022)

Years	Forecasts; Model: (0,1,2) Input: tobacco price Start of origin: 1 End of origin: 13			
	Forecast	Lower 95,0000%	Upper 95,0000%	Std. Err.
2018	1742,247	1347,581	2136,914	174,4648
2019	1807,981	1404,835	2211,127	178,2132
2020	1837,787	1434,640	2240,933	178,2132
2021	1867,592	1464,446	2270,738	178,2132
2022	1897,398	1494,251	2300,544	178,2132

Source: Forecast results

The graphical presentation of tobacco prices in the analysed and forecast period confirms that a constant increase in prices of this crop can be expected (Chart 5.).

Chart 5. Tobacco price movement



Source: Forecast results

Of all the industrial plants analysed so far, tobacco had the most favourable price parity against wheat, which is understandable, since it is a highly commercial type of industrial plant. The average of this parity is 9.22 and ranged from 5.74 to 11.63. The coefficient of variation was 19.25% and a negative annual rate of -1.06 indicated that the tendency for a decrease in the price of tobacco for the analysed period was greater than a decrease in the price of wheat (Table 16.).

Table 16. Basic indicators of tobacco price parity in Republic of Srpska (2005-2017)

Average value	Minimum	Maximum	Coefficient of variation (%)	The rate of change (%)
9,22	5,74	11,63	19,25	1,06

Source: Authors calculation based on data ISRS, 2019.

The model for forecasting tobacco/wheat price parity shows that random fluctuations from the previous two years have a statistically significant effect on the value of parity in the current year (Table 17.).

This parity in the analysed period was characterized by a declining tendency. Predicted parity values for 2018-2022 show that this tendency will continue in the future. From year to year the value of tobacco/wheat parity will be reduced to the level of 7.9 tons of wheat for 1 ton of tobacco (Table 18.).

Table 17. A model for forecasting tobacco/wheat price parity

Paramet.	Input: tobacco/wheat Transformations: D(1) Model: (0,1,2) MS Residual=5,6666					
	Param.	**Asympt. Std. Err.**	**Asympt. t(9)**	**p**	**Lower 95% Conf**	**Upper 95% Conf**
Constant	-0,210764	0,138355	-1,523362E+00	0,162002	-0,523744	0,102216
q(1)	0,550479	0,000000	3,460472E+10	0,000000	0,550479	0,550479
q(2)	0,449519	0,000000	3,460472E+10	0,000000	0,449519	0,449519

Source: Research results

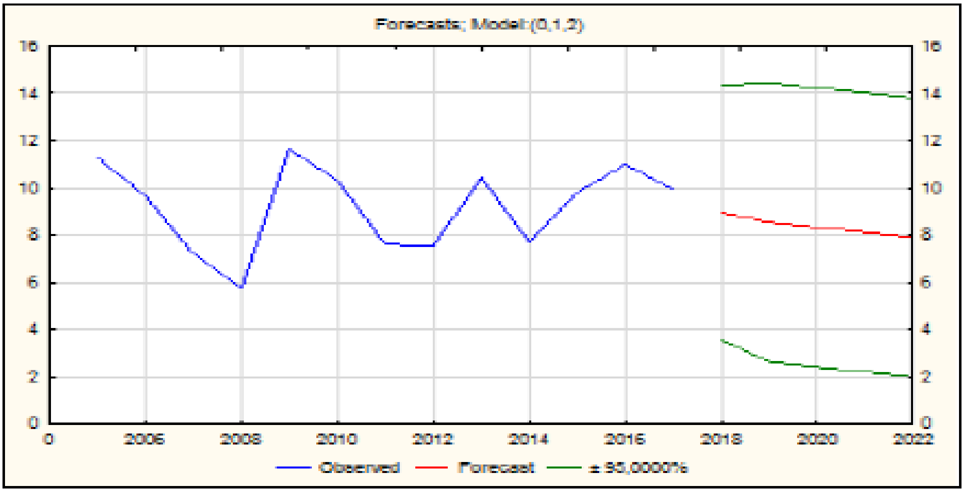
Table 18. Tobacco/wheat price parity forecasting (2018-2022)

Years	Forecasts; Model: (0,1,2) Input: tobacco/wheat Start of origin: 1 End of origin: 13			
	Forecast	**Lower 95,0000%**	**Upper 95,0000%**	**Std. Err.**
2018	8,959541	3,574564	14,34452	2,380461
2019	8,540044	2,636014	14,44407	2,609912
2020	8,329280	2,425250	14,23331	2,609912
2021	8,1185516	2,214486	14,02255	2,609912
2022	7,907752	2,003722	13,81178	2,609912

Source: Forecast results

The graph of tobacco/wheat price parity movements confirms the above-mentioned parity movement characteristics (Chart 6.).

Chart 6. *Tobacco/Wheat Price Parity Movement*



Source: Forecast results

Conclusion

On the basis of the above, we can draw the following conclusions:

- The conducted research shows that a constant increase in soybean prices can be expected over the next five-year period, where the price will eventually reach the level of 423.94 EUR/t. The average parity of the price of soybeans to wheat is very favourable and has a fairly stable movement. There was also a positive tendency of growth of this parity.
- The price of rapeseed was characterized by an upward trend. During the current period, prices from the previous three periods have significantly influenced it, and based on the results of the research, oscillatory movement can be expected in the next five-year period, where the price will invariably rise and fall, and eventually reach a value of 359.81 EUR/t. The average price parity of rapeseed/wheat was very favourable for rapeseed, where rapeseed was worth almost twice as much as wheat and which also tended to grow. This parity is significantly influenced by the ratio of rapeseed and wheat from the previous year, and a constant decline in the value of this parity is expected throughout the forecast period until the last year of forecasting (2022).
- Tobacco prices are affected by random fluctuations from the previous two periods and the projected values show that a constant price increase can be expected, which in the last year will reach the value of 1897.40 EUR/t,

and will exceed the maximum realized price from 2013. In relation to the price of tobacco, its relation with wheat shows a negative tendency. In the prediction period, the tendency of a constant decline of this parity can be expected to continue.

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CREATING RURAL CULTURAL MAPS ON THE BASIS OF RURAL POPULATION`S INTEREST IN CULTURAL ATTRACTIONS

Nataša Đorđević[1], *Danijela Durkalić*[2]

Abstract

In rural areas usually different tourism forms based on natural attractions may be developed, as well as cultural tourism due to the rich intangible and material cultural values. In order to preserve and valorise cultural values, maps are created in which significant cultural resources are located. Based on cultural maps, tourist routes can be formed, as a unique integrated tourism product. For the success of the integrated cultural tourism product, the rural population, as a key stakeholder, should show an interest for cultural tourism and willing to connect with communities in other rural areas included in routes. Regarding to the modern tourist preferences, the aim of this paper is to investigate the rural population`s interest in cultural attractions in order to create cultural maps in Serbian rural areas. Data were collected by survey, while their analysis and processing were done by Statistical Package for the Social Sciences (SPSS).

Key words: rural areas, cultural tourism, attractions, cultural maps.

Introduction

The interpretation of rural tourism varies depending on the country in which it is developed (Nagy et al., 2017):

- In Italy, it includes all countryside related activities;
- In the Netherlands, it is usually seen as a camping holiday close to a farm, where the usual activities are cycling, excursions, and horse-riding;
- In Greece, accommodation in traditionally furnished rooms and breakfast that includes home-made traditional products are the leading services provided in rural tourism. Also, recreational and cultural programs may be available;
- In Finland, a holiday home without catering is usually rented in rural tourism.

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Tourism has become an increasingly important industry over the last decade, and various ways of measuring and defining the performances of a tourist destination have emerged (Durkalić et al., 2019). UNWTO (2019) understands rural tourism as "a type of tourism activity in which the visitor's experience is related to a wide range of products generally linked to nature-based activities, agriculture, rural lifestyle/culture, angling and sightseeing. Rural Tourism activities take place in non-urban (rural) areas with the following characteristics: 1) low population density, 2) landscape and land-use dominated by agriculture and forestry and 3) traditional social structure and lifestyle". Utilizing rural tourism opportunities can be considered one of the key elements of rural development for developing countries. Rural tourism creates many job opportunities for local people, increases living standards, alleviates poverty, and therefore prevents migration from rural to urban areas (Boz et al., 2017).

According to Garrod et al. (2006), "constituent elements of rural capital are: landscape, wildlife (both fauna and flora), biodiversity, geology and soils, air and air quality, hedgerows and field boundaries, agricultural buildings, rural settlements, historical features, streams, rivers, ponds and lakes, water and water quality, woods, forests and plantations, distinctive local customs, languages, costumes, foods, crafts, festivals, traditions, ways of life." The integrated tourism product of rural areas is primarily made up of the natural values, while cultural values need greater promotion in the context of rural tourism because only the creation of a fine integrated rural tourism product is not enough. Success in rural tourism depends upon effective marketing. It must be assured that there is a market for that product and that the potential tourists are told effectively about the product (Euracademy, 2003). For effective promotion of cultural values, destination management may create cultural maps in which significant cultural resources are located. The management of rural destinations should include local communities and represent their interest. For rural tourism success, key stakeholders should work together in determining what they really want from tourism development (Štetić, 2012). In that sense, the main goal of paper is to investigate the rural population`s interest in cultural attractions in order to create cultural maps in Serbian rural areas.

Rural Serbia represents a key part of the Serbian population and resources. Currently around 78% of Serbia's territory is rural (National Programme for Rural Development (NPRD) from 2018 to 2020). Since the 1970s, rural tourism in Serbia has begun to develop. At first, there was uncontrolled access to rural tourism development without a clear market policy. With the new millennium a phase of "dedicated development" has emerged, where for the improvement of rural tourism, relevant state authorities allocated adequate resources in some areas (Vuković et al., 2015). Serbian rural areas have cultural prerequisites for tourism development, such as preserved traditional culture and rural households, monuments, historical sites, folklore, hospitable local population, local food, etc., which may be promoted as unique national cultural tourism product on a tourism market.

Literature review

In rural areas there is a strong sense of community and culture is rather local than cosmopolitan. Compared to urban areas, the way of life in these areas is less materialistic, slower and less complicated. What highlights the importance of these characteristics of rural areas is the growing interest of modern tourists for cultural heritage highlights (Jovanović Tončev, Podovac, 2016).

One of the most common products of cultural tourism in rural areas is a unique traditional culture, and in a present-day context, there is a need to understand it. In her study "Traditional Crafts as a New Attraction for Cultural Tourism" Horjan (2011) states that "tourism and culture are very different in their approach to the common subject of development, so achieving a balance is difficult. On one side if the heritage sector support the idea that tourists should come to original places, to crafts-persons and living human treasures who work in their natural environment, the minimum which is expected from tourism sector is an interest in promoting special niche activities like organised tours to heritage institutions such as open-air museums, traditional fairs or crafts people`s workshops for those groups in the market who are looking for unique experiences."

In the first instance, for cultural planning it is necessary to recognize the distinctive resources of a place and to create policies and strategies on that basis. For identifying, harnessing and then exploiting the creative potential of rural areas it is necessary to do mapping of possibilities based on exploring the distinctive assets of a place. By using vital information provided by a wide-range mapping of the local culture, the policy-makers may be able to respond more effectively to local needs and to maximize opportunities (Assumma, Ventura, 2014).

According to Ohridska Olson (2018) cultural mapping as a process and research method is part of the value and meaning creation of for places and phenomena that can be subject of geospatial relationships. Mapping cultural assets is crucial for place branding – a practice insuring the competitiveness of communities, regions and nations (Pike, 2009; Anholt, 2009), "creating place-embedded symbolic tools" (Duxbury et al., 2015) and for safeguarding the cultural heritage (Ohridska Olson, 2018).

For creating a tourism offer that will contribute to the socio-economic success of rural areas, various factors such as the archaeological, cultural, and natural heritage, networks between all the stakeholders, rural lands, traditional and local food must be integrated (Garau, 2015). Under pressure to create economic growth and employment governments may fall prey to the dangers of random ad hoc development of tourism, without paying attention to the cultural and economic well-being of local communities, environment conservation or inclusion of locals in decision making (Drake 1991; Marsden 1992; Prentice 1993; Meyer, 2004). In that sense today sustainable tourism is seen as the key to rural tourism success.

Today sustainable development is a tourism trend and also a necessity (Đorđević, Kostić, 2019), and studies where sustainability is multidimensionally observed are recently increasing. These studies emphasize that because of the complexity and nature of rural tourism, there is a need for a holistic approach that takes into account the diversity of utilized resources and the stakeholders involved (Ertuna, Kirbas, 2012). In general, sustainable development encourages locals of rural areas to take initiatives in order to protect their environment and to achieve own socio-economic development (Ezeuduji, Rid, 2011).

Numerous studies attest to the importance of community participation in rural tourism development (MacDonald, Jolliffe 2003; Sdrali, Chazapi, 2007; Ezeuduji, Rid, 2011; Ertuna, Kirbas, 2012; Muresan et al., 2016; Rasoolimanesh et al., 2017; Đurkin et al., 2017; Rasoolimanesh et al., 2018; Podovac et al., 2019).

Cultural tourism where tourists visit rural areas in order to experience traditional local culture may provide benefits for host communities and motivate them to maintain and care for their cultural heritage. For the cultural tourism success the involvement and cooperation of locals with policymakers, property owners and tour operators are crucial (Sdrali, Chazapi, 2007; Ezeuduji, Rid, 2011).

Đurkin et al. (2017) point out that «key organizational issues in the management of cultural tourism in rural areas have been identified and linked to rural community capacities in terms of insufficient social and human capital.» For overcoming problems in creating sustainable rural tourism offer based on local culture, a tourism development model where tourism is developed, controlled and owned by the local community, i.e. community-based tourism model can be useful. The use of this model can also be seen as a necessity because cultural tourism assets are usually an inseparable part of local identity.

MacDonald and Jolliffe (2003) in their study about rural tourism in Canada came to the conclusion that locals have pride in their ancestry, want to share it with others and to preserve it for the future. As these authors claim, lifestyles and heritage of the local community, family and community relationships, human and natural resources of rural areas can be utilized through cultural tourism development in these areas.

Methodology

In this paper author used a quantitative methodology that has been implemented on the territory of the Republic of Serbia. The questionnaire was developed on the basis of research on tourist destinations (Almeida, Garrod, 2018) and consisted of 39 questions related to the cognitive and emotional reasons of the respondents for choosing Serbia as a rural cultural tourist destination in order to propose cultural mapping. In addition to specific destination-related questions, the questionnaire also includes socio-demographic issues such as gender, age, region in which the respondent lives, income, education or country of residence.

A five-point scale (from 1 to 5) questionnaire was used for data collection. Participation in completing the questionnaire was voluntary and anonymous. Questionnaires were distributed in class or in the form of a Google questionnaire. A total of 160 valid responses were collected. The time period of the research relates to June - October 2019. The questionnaire was completed by 234 respondents from all over the Serbia. Of interest to our study were respondents who grew up or lived in a rural area. For this reason, further analysis of the data consists of a comparative survey of respondents living or born in rural areas. This achieves a total of 150 valid answers.

Analysis of results

Descriptive analysis shows that the survey of Serbia as a rural cultural - tourist destination attracted almost twice as many respondents who grew up in rural areas (39%) than those living in the same (21%). This is not surprising, since there is a growing trend from rural to urban today (Kostadinov et al., 2014). However, rural and eco-tourism can revitalize the village and inject additional money into the budget (Kostić, Petrovic, 2013; Blažević et al., 2018), and in addition offer tourists new cultural experiences.

Table 1. Demographic characteristic

Variable	Grew up in rural area (Total)	Living in rural area (Total)
	92	**48**
Gender		
Male	36	19
Female	56	29
Age		
18 and younger	0	0
19-30	59	28
31-40	21	13
41-50	7	4
51-60	4	3
over 60	1	0
Grew up in rural area	39%	
Living in rural area	21%	
Current occupation		
Student	24	12
Self-employed	9	7
Employee	47	21
Pensioner	1	0
Unemployed	7	6
Other	4	2
Education		
High school	34	21
Undergraduate degree	32	21
Master degree	24	6
PhD	2	0
Income		
up to 250 EUR	14	8
250- 500 EUR	25	13
500-1000 EUR	18	8
More than 1000 EUR	7	1
I don't want to make a statement	28	18

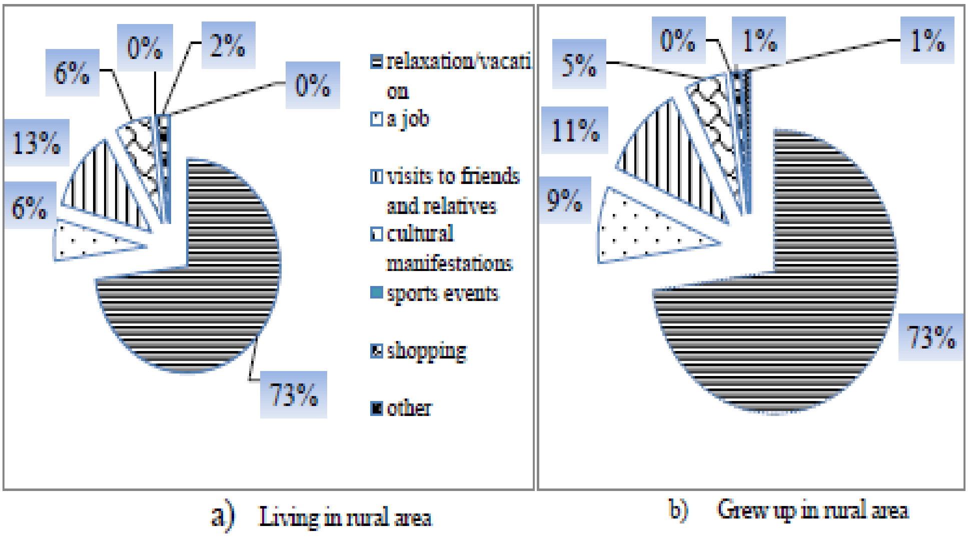
Source: Author`s calculation.

In terms of gender, the largest number of respondents in both cases is female. Regarding age, the respondents most interested in completing the questionnaire were 19-30 and 31-40 years old in both cases. When it comes to income, a significant difference can be observed between those living in rural areas and those who grew up in rural areas. Namely, the highest number of respondents in both cases has a salary of 250-500 EUR, while a larger amount of earnings (over 500 and over 1,000 EUR) is present in the respondents who grew up in rural areas.

In terms of educational qualification, a considerable number of respondents related to rural areas in both cases had completed high school or faculty. Within our sample, there are few respondents living in a rural area with a master's degree and even none with a Ph.D.

Below, Figure 1. shows the primary reasons for choosing a travel in the near future. The interesting fact here is that both groups are most interested in relaxation / vacation, exactly 73% in both groups. After that, the second is visiting to friends and relatives and then a job. As far as cultural manifestations are concerned, they are ranked as fourth in both observed samples.

Figure 1. Primary reason for choosing travel opportunities in the near future



Source: Author`s calculation.

The next set of questions relates to respondents' desire for cultural tourism. We will first look at the results of the descriptive statistics of those respondents living in rural areas.

Table 2. Desire for rural cultural tourism - descriptive statistic (respondents which live in rural area)

Parameter	Are you interested in cultural travel?	Would you go on a trip or a tour that is primarily oriented towards cultural tourism?	Are you interested in literature as part of a cultural offer?	Are you interested in finding out about the links between epic poetry and history and tradition of a specific region?
Mean	4.1875	3.7917	3.3750	3.3542
Standard Error	0.159388	0.18821279	0.203308189	0.215715828
Median	5	4	4	4
Standard Dev.	1.104271	1.303976461	1.408560454	1.494523098
Sample Variance	1.219415	1.70035461	1.984042553	2.233599291
Kurtosis	0.115457	-0.435849122	-1.349650252	-1.337347707
Skewness	-1.08084	-0.797237759	-0.28152836	-0.363620632
Range	4	4	4	4
Minimum	1	1	1	1
Maximum	5	5	5	5

Source: Author`s calculation.

Taking into account the opinion of respondents living in rural areas, it can be seen that most of them are interested in some kind of cultural trip (average mark 4.19 from 5). However, these cultural trips can be for different purposes: serendipitous, purposeful, incidental, casual, sightseeing (McKercher, Du Cros, 2003). This results in different types of this kind of tourism: heritage tourism, cultural thematic routes, cultural city tourism, cultural tours, traditions - ethnic tourism, event and festival tourism, religious tourism - pilgrimage routes and creative culture - creative tourism (Csapo, 2012).

However, when it comes to cultural tourism as a primary-oriented form of travel, it is not on first but on secondary position for respondents living in rural areas. There is less interest from tourists in the rural region for literature as part of the cultural offer and epic poetry, history and tradition of the region. However, this interest is not very low, but rather average, so one can talk about the potential development of these types of rural cultural area, especially when it comes to cultural mapping of particular areas.

In Table 3. is shown descriptive statistics of those respondents which grew up in rural areas. Interest of respondents who grew up in rural areas for rural cultural tourism in function of creating rural cultural maps of Serbia is similar to that of the previous group of respondents. Remarkably, in this group of respondents, slightly more are interested in cultural travel. Also, this group of respondents is more interested in cultural tourism as a primary form of travel. It can be said that such result is expected, given that some of respondents are willing to learn about history of their place through cultural travel.

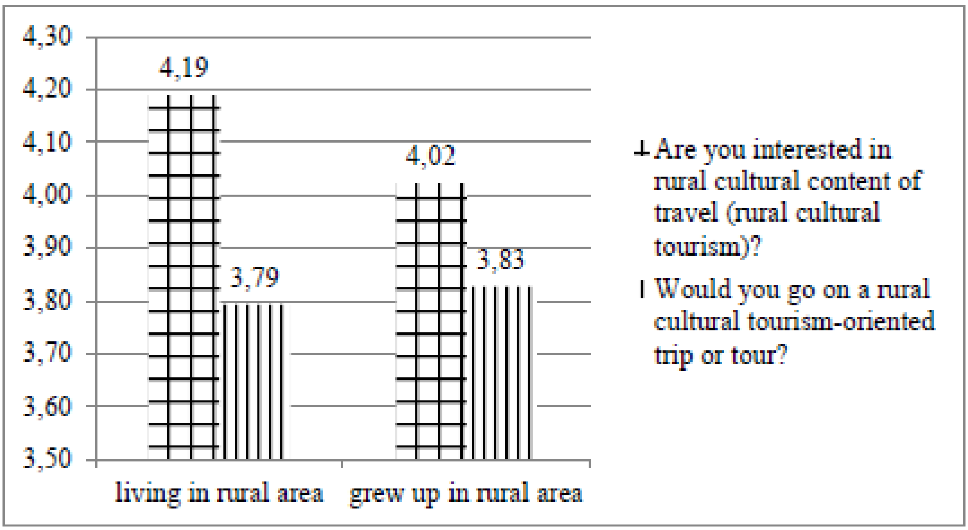
Table 3. Desire for rural cultural tourism - descriptive statistic (respondents which grew up in rural area)

Parameter	Are you interested in cultural travel?	Would you go on a trip or a tour that is primarily oriented towards cultural tourism?	Are you interested in literature as part of a cultural offer?	Are you interested in finding out about the links between epic poetry and history and tradition of a specific region?
Mean	4.125	3.8125	3.395833	3.354167
Standard Error	0.16206	0.185121	0.199155	0.209461
Median	5	4	4	4
Standard Deviation	1.122782	1.282555	1.379787	1.451186
Sample Variance	1.260638	1.644947	1.903812	2.10594
Kurtosis	-0.05879	-0.27779	-1.23668	-1.29264
Skewness	-1.00878	-0.83341	-0.35695	-0.35087
Range	4	4	4	4
Minimum	1	1	1	1
Maximum	5	5	5	5

Source: Author`s calculation.

In further analysis, we are interested in the average score of respondents for rural cultural tourism as a part of the tourist offer of Serbia. In this analysis, too, we distinguish respondents which living in a rural area and respondents which grew up in a rural area.

Figure 2. Average mark of interesting in rural cultural tourism



Source: Author`s calculation.

Based on Figure 2, it can be freely pointed out that interest in rural cultural tourism is high in both groups of respondents. In contrast to the previous analysis, this result indicates that respondents living in rural areas are slightly more interested in rural cultural tourism than respondents who grew up in rural cultural areas.

More specifically, if the questions were focused on a rural culturally oriented tour, both groups of respondents were slightly less interested. However, it can be concluded that interest in this type of tourism is high, so we can speak about special cultural tours with this thematic. With this in mind, it is possible to create cultural mapping that, as an innovative knowledge tool in cultural tourism, can form the backbone for enhancing economic growth on a social, economic and environmental basis.

Conclusion

"Development of tourism cannot be fostered everywhere in the Serbia and at the same pace. The identification and prioritization of rural tourism clusters is based on the concentration of attractive natural and cultural heritage" (Maksin, 2012). In order to promote rural cultural tourism in Serbia by using cultural maps, the local rural community as one of the key stakeholder must show interest in it. A better understanding of rural cultural tourism among the local communities can influence the promotion of their culture to tourists and their will to connect with other rural local communities in that promotion.

The paper has shown the interest of the rural population in cultural attractions in the Republic of Serbia. The aim of the study was to get the original opinion of the rural population about their interest in cultural tourism, in order to establish the basis and proposal for cultural mapping. The result showed that cultural activities are a secondary rather than a primary reason for choosing a destination, but it can be said that choosing cultural attractions is one of the deciding factors for travel, just as the authors of McKercher and Du Cros (2003) have shown.

The results indicate that the development of rural cultural tourism can be based on a new basis, which will provide a potential both a short-term and a long-term economic asset to rural communities. This can ensure long-term growth and a new strategy for rural tourism in culture, especially if we know that the strategy for tourism development can be formed based on competitive advantage, sustainable tourism and knowledge-based tourism (Lakićević, Durkalić, 2018).

In general, culture in this area and its mapping can be used to identify different rural communities as tourist destinations. For further research, this paper provides a good basis for the demarcation and typology of cultural tourism. Based on the results and opinions of respondents related to rural communities, future development strategies can be created. This paper thus forms the basis for the development of cultural mapping that is not yet popular in the Republic of Serbia, especially in rural communities.

Acknowledgements

The 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: 2011-2019.

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SUSTAINABILITY OF AGRICULTURE THROUGH THE UNIVERSITY CURRICULUM

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Abstract

The paper analyses the link between the performance of the Romanian agriculture and the university curriculum. The objectives of the paper are to identify the influence of the university curriculum over the performance of the agriculture. The agro-food sector has benefit in the pre-accession period and after the accession in European Union of important funds from the European Fund for Agriculture and Rural Development for increasing the competitiveness, improving the quality of life in rural area and environmental protection. In this matter, an analysis of the Romanian agriculture performance since the accession to EU and, as well, an analysis of the university curriculum is needed in order to improve the knowledge in the sector and to increase the competitiveness of the agro-food sector.

Key words: agriculture, university curriculum, performance, efficiency, demography.

Introduction

In the last decade, the issue of sustainability (sustainable development) has become the thorniest and the most widely publicized problem in all corners of the world. To ask ourselves "How important is the sustainability of agriculture?" would fall into the category of the most powerful questions possible. Historically and economically speaking, it is useless to prove that human development, welfare and security are the primary derivatives of the agricultural process and progress. The slogan "The right to eat", as stated by the remarkable Romanian professor and researcher Mircea Bulgaru (1995, p. 19), in the work with the same title, represents the first human right, equivalent only to "The right to be born". After 20 years at the publication of the book, which was awarded by the Romanian Academy in 1995, the

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authors would like to supplement the slogan with "The right to eat healthy and rational" in the sense of eating organic (eco/bio) and balanced (with measure).

The very etymology of the term sustainability comes from the field of forestry, designating procedures according to which the production capacity of the forests and the harvested wood is in balance, so that, in the long term, as much wood material can be harvested but at the same time, the forests have to not have to suffer from deforestation. This ecological principle has been extended to all types of resources and ecosystems, in all areas, so that, at present, sustainable development refers to three essential aspects materialized in the following terms: ecological balance, economic security and social equity. The complexity of the theme "Sustainability of agriculture through the prism of the university curriculum" urges us to a holistic evaluation of the phenomenon by analysing and characterizing several domains and interdependent dimensions, from general to particular.

The objective of the paper is to find the directions and activities of the sustainability of agriculture in the university environment.

Methodology

The paper represents an analysis of the university curriculum regarding the sustainability of agriculture in the university environment. The main quantitative indicators used in the analysis were population for which were calculated the average projection variant of the population of the continents of the world, between 2020 and 2100 and variant constant projection fertility (period 2015-2020) of the population of the world's continents, between 2020 and 2100. Another indicator was the number of programs of environmental studies and maximum number of students that can be enrolled.

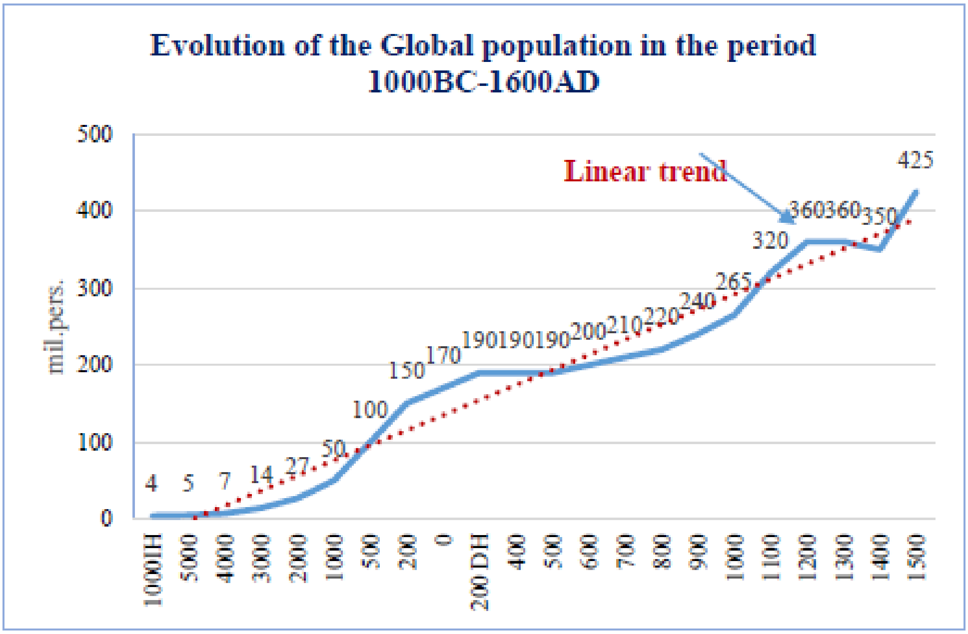
Demographics: Global and regional population

The economic balance is ensured when the demand is equal to the supply. The growth of the global population increases the consumption, respectively the demand for food. In the title of the book "How many people can the Earth host?" published in 1995 by the biologist Joel Cohen (1995)[4], we remain unanswered. Some specialists estimate a maximum of 10 billion, and others only 8 billion. This figure is very close to the present, so most of the answers are far from optimistic. In 1798, Thomas Malthus, an English priest and economist stated his general theory on the population: "that it necessarily grows faster than food

4 Biologist-mathematician, population studies specialist, professor at Rockefeller University in New York and at the Earth Institute at Columbia University.

reserves, until it is reduced by war, plague, or famine." Currently this hypothesis has fallen. According to the statistical data provided by historians and demographers, in the period 1000 IH - 1500 DH the global population was growing slowly but steadily as arithmetic progression (Gogu et al., 2011), (see Annex 1.). In many areas of the world, increasing agricultural yields has raised the threshold of agro-demographic balance. In the long run, the trend of population growth was evident, but it was interrupted by famines, wars and epidemics. The worst disruption was caused by the fourteenth-century plague epidemic, which annihilated a quarter or a third of the populations of Asia, Europe and North Africa, disrupting the respective economies and societies. The plague epidemics continued after the fourteenth century.

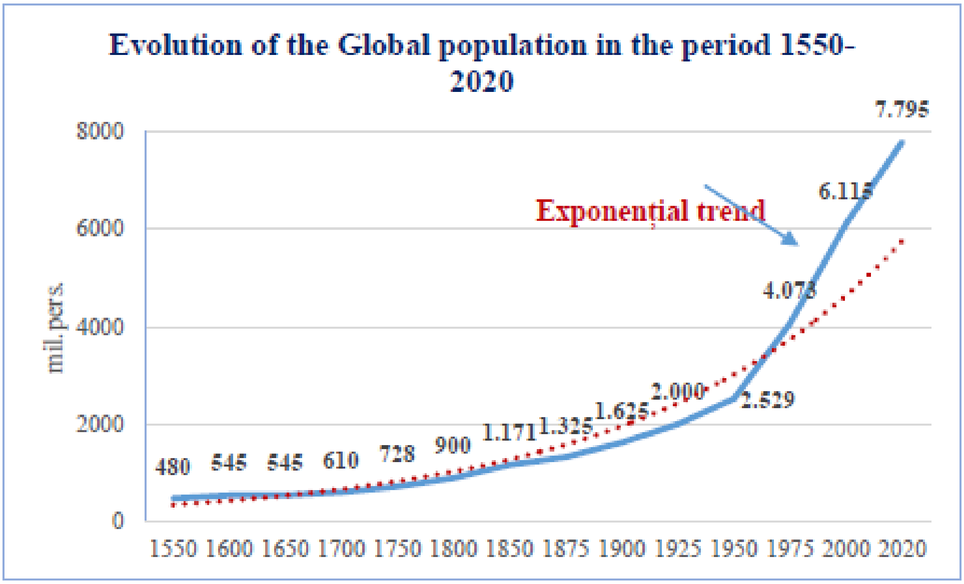
Figure 1. Evolution of the Global population in the period 1000BC-1600AD



Source: Illustration authors by Worldhistorysite, 2019.

After a very slow evolution (for nowadays) for millennia, the population is starting to grow significantly. The population growth of 1600 exceeds the threshold defined by the production of food resources, which leads to the seventeenth century crisis, amplified by religious wars, such as the 30-year war, inflation, the price revolution. Demographers have extrapolated that in the 17^{th} century there were only about half a billion people on Earth.

Figure 2. Evolution of the Global population in the period 1550-2020



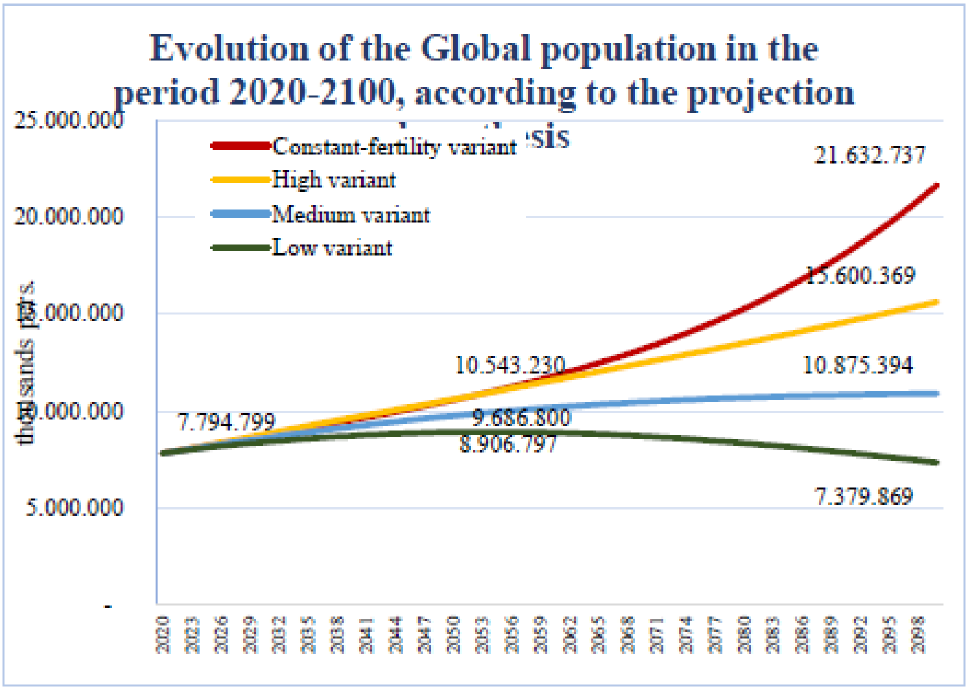
Source: Authors processing by Worldhistorysite, 2019.

Before the 20th century, no one had witnessed the doubling of the human population, but today, the generation born in the 1950s is witnessing its tripling, from 2.5 billion (1950) to 7.7 billion people (year 2019). Although we, in 1999, were watching with great interest on TV "In which country will the new-borns with the number 6 billion be new?" Now I have "given up" this interest, curiosity.

That curiosity has now become a concern. Why worry? As it is difficult not to be alarmed when the population increases in a geometrical progression with approximately 82 million annually (four times the population of Romania and 9 times the population of Serbia),[5] (Annex 1.). During this time, the groundwater is declining, the soil erodes, the glaciers melt, and the natural reserves, fish (the main food of the population over time) forests, etc., it's diminishing (Gogu et al., 2011). UN experts claim that the fertility rate will continue to decline, but the population will continue to grow, reaching the threshold of 9.7 billion by 2050 and 10.875 billion by 2100 (according to the average estimate).

5 The average annual increase in the period 1975-2000 was 81.68 million people/year and in the period 2000-2025 it is 82.76 million people/year

Figure 3. Evolution of the Global population in the period 2020-2100, according to the projection hypothesis



Source: Illustration authors by UN, 2019.

We, Europeans, are spoiled by nature, history and politics. Our material and dietary well-being is still not very affected, felt. Outside Europe, almost one billion people worldwide are malnourished. Over a decade there will probably be two billion mouths "in addition to feeding", most in poor countries (India, Africa, some areas of China). Those people will surely want to escape poverty, and their governments are and will be in a position to provide them with an internal alternative. Thus, the global migration to developed countries will increase (Partachi et al., 2016).

In other news, in the developed countries the natural resources are significantly reduced - the use of coal, oil, cutting forests, etc., and the unrestricted use of fertilizers and pesticides will put the soil and the atmosphere under heavy test.[6] According to the graphical representation 4, we should point out that many of the countries where the population grows considerably are very poor (India, Pakistan, China, etc.), which raises even more problems related to hunger and resource allocation. Specialists are also concerned about the effects that this

6 The Bayer agrarian-chemical and pharmaceutical scandal (treating seeds with toxic-chemical substances that are subsequently found in the final product and kept in the soil for a long time).

increase would have on climate change. How will things look in the next 30 years when the population will increase by 1-2 billion? Hard to imagine, it is known that at present the large number of the population in Asia and Africa is in imbalance in relation to food resources. It is certain that globalization will intensify structurally large proportion of population mobility in search of food and a better life. This mutation will further lead to increasing the discrepancy of the welfare and safety of the population in the world. But population growth is only one factor when it comes to global sustainability. Environment and consumption habits matter and they are not uniform globally.

The environment and food

The next proposed dimension would be to analyse the behaviour of the population in relation to the environment and food consumption. "Our impact on the climate is related to the population in many ways - what resources people use, how large is industrial production, how much energy is needed for heating, cooling and transport," said Amy Snover, director of the University Climate Impact Group from Washington. This year (2019) according to "Real-time world statistics" (Worldometer, 2019) from the environmental point of view 4.8 million ha of forest were lost, 6.5 million ha of agricultural land due to soil erosion, 33.7 billion tons of carbon dioxide (CO_2) were emitted, 11.2 thousand ha of desertification and 9 million tons of toxic waste from industry in air, land and water. For example, the area of land lost due to erosion in a single year globally brings a loss of 22.8 -39.2 million tons of wheat, as well as the total wheat production common in Romania in 2-4 years.

In Europe, virgin forests are almost gone. In Romania we still have virgin forests. There are (still) virgin forests in Bulgaria, Ukraine and Slovakia (Ne-Stiri, 2019a). If in 1974, 12% of Romania's forests were virgin, today the percentage dropped below 2%. And the saddest part is that every 1.2 seconds, 3m² of virgin forest disappears. If the virgin forest disappears, a natural evolution of thousands of years is lost - not only a living lesson kept in true laboratories of nature but also part of the cultural identity of the local communities in Romania. From the point of view of nutrition in the world: about 840 million people are malnourished, at the opposite pole - 1.7 billion overweight people, 745 million obese people, about 20 thousand people die of hunger daily, on average in one USD 356 million is spent each day in treating obesity-related diseases in the US and USD 118.7 million in daily dietary expenses in the US. Food discarded by the whole population of Europe in 2019 is 170,790,534 tons. In poor countries in Africa and South Asia, one person dies of hunger every 3 seconds. Adults and children who died in 2018 due to lack of food represent 20,325,516 deaths.

In the same view, Prof. Corey Bradshaw[7], states that "There is a significant break between the places where population growth is very fast and the places where the highest consumption occurs. In other words, the lifestyle of a person in the US has a greater negative impact compared of a person from Africa. And this means that rapid population growth in Africa would not be as damaging to the environment as a similar growth in other regions". At Romanian level (Ne-Stiri, 2019b): About 1/3 of all Romanian products reaches the waste basket or are wasted unnecessarily, annually. This quantity corresponds to about 2.55 million tons of foodstuffs, which corresponds to the load of 127,500 firings aligned in the column from Bucharest to Munich. Absolutely every one of us spends alone in the household on average 353 gr food daily. Most of the time amount of food thrown away is a complete meal.

"Sustainable development aims to eliminate disparities in access to resources, both for poor or marginalized communities and for future generations, trying to ensure each nation the opportunity to develop according to their own social and cultural values, without denying other nations or future generations this Right" (van Brakel, Zagema, 1996).

Global, national and regional strategies for sustainable development

The unprecedented dynamics and structural changes related to demography, globalization, environment, social relations, social stability and technology, representing a mix of opportunities and threats, will affect each government, demanding individualized responses and measures for each state, region or locality. These impulse factors have become almost universal and require permanent collaboration (Muresan et al., 2010).

Probably, throughout history, no global policy and strategy had as many common elements and interests as the issues of sustainable development and sustainability. In this sense, all the states of the world are concerned about the awareness of governments, corporations, big and small companies, the population regarding social risks and the consequences of not ensuring sustainable development.

In the development of policies and strategies for sustainable development / sustainability, the most current event of historical importance took place in 2015, at the UN General Assembly in NY, where the 2030 Agenda for Sustainable Development was adopted. Structured on the three pillars of sustainable development

7 Director of Global Ecological Laboratory from the University Flinders.

- economic, social and environmental - the 2030 Agenda was adopted by Romania and the European Union (EU). In 2019, holding the Presidency of the Council of the EU, Romania was the European regional leader in the implementation of the Sustainable Development Goals. Many are rightly worried that the planet will not be able to feed 9 billion people. Human beings live from the natural capital - claims Lester Brown[8], eroding soil and depleting groundwater faster than they can be restored. All this will soon limit the production of food. The number of people matters, of course. But, it matters more how people consume resources. The level of education and (in) culture led to the fierce struggle for power, consuming the resources of the planet "free" and irrational. With all these global, regional, national policies and strategies, the population has not yet been aware of the consequences of ecological disaster and population growth.

The directions and activities of the sustainability of agriculture in the university environment

The role of awareness and responsibility lies largely with the education system in general and that of the university in particular, because sustainable development cannot be the work of illiterates. According to the Talloires Declaration of 1990 "Universities educate the majority of individuals responsible for the development and organization of social institutions. For this reason, universities have a huge responsibility to increase awareness, knowledge, development of technologies and tools necessary to create a sustainable environmental future.[9] In this sense, sustainable development causes universities all over the world to rethink their mission and restructure their university program, research programs and campus life. Students need to be increasingly exposed to notions of sustainability, responsibility and the right attitude towards the environment. In the list of 7 Sustainability Indicators identified by ULSF[10] which presents a set of directions and activities found in the universities fully committed to sustainability, the authors propose to complete the set with an essential element namely: the existing university offer in the field of sustainability.

Universities, as significant influencers and agents of change, must play a significant and more prominent role in the change process catalyzed by Sustainable Development Goals (Filho et al., 2019).

8 Head of the Earth Policy Institute in Washington.

9 The 1990 Talloires declaration was signed by over 265 rectors and vice-rectors from universities in over 40 countries on five continents.

10 The Association of University Leaders for a Sustainable Future.

Figure 4. The directions and activities of sustainability in the university environment

Source: Authors opinion.

In Romania, as is presented in the government decision no. 346/3019, the university offer in the fields aimed at agricultural sustainability and the protection of the natural environment has developed 180 degree programs (7.07% of the total existing ones), in which 13,280 students representing 6.46% of the total existing places can enrol (Annex 2.). In terms of student training, in 2017 the share of graduates in the field "Agriculture, forestry, fish farming and veterinary science" in Romania was 4.57%, in Serbia 2.47%, and in Germany 1.85 %.

In order to identify the Romanian university context in ensuring and promoting the sustainability of agriculture, sustainable development, the research was based on the analysis of the existing situation, respectively of the way of carrying out the educational process in this direction. As teachers of the Bucharest University of Economic Studies at the Ethics and Academic Integrity course, we propose the development of a module/chapter that deals with the economist's relationship with the environment, the production and consumption of agricultural products.

Table 1. Number and share of graduates of undergraduate programs in Romania, Germany and Serbia by areas of study and training in 2017.

Areas of study and training (ISCED-F 2013)	Graduates license			Share %		
	Romania	Germany	Serbia	Romania	Germany	Serbia
Education	3.260	43.231	3264	4,58	13,19	8,66
Arts and Humanities	6.981	28.564	3490	9,82	8,72	9,26
Social sciences, journalism and information	6.374	24.141	4180	8,96	7,37	11,09
Business, administration and law	21.460	82.645	10253	30,17	25,22	27,20
Natural sciences, mathematics and statistics	3.829	19.576	1278	5,38	5,97	3,39
Information and communication technologies	4.891	16.461	2243	6,88	5,02	5,95
Engineering, processing and construction	14.001	78.054	6102	19,69	23,82	16,19
Agriculture, forestry, fish farming and veterinary sciences	3.248	6.060	932	4,57	1,85	2,47
Health and social assistance	3.734	16.623	2304	5,25	5,07	6,11
Services	3.347	11.122	3647	4,71	3,39	9,68
Total	71.125	327.687	37693	100,00	100,00	100,00

Source: Calculation based on Eurostat, 2019.

Since the Brundtland Report and the establishment of the Sustainable Development (SD) concept, governments and public institutions are aware of the responsibility in considering environmental, economic and social sustainability in their activities (Amaral et al., 2019).

In relation to sustainable development in the political field, most changes are needed: formulating objectives, taking measures for their transposition into practice, establishing steps for implementation, taking into account individuals, groups, associations, etc. The politics of sustainability requires us all to think what we could achieve if our personal interests were to coincide entirely with the interests of the community. The idea of sustainability thus leads us, in a qualitative leap, to civil participation and, ultimately, to a modernization of democracy. Zaman and Zenovia (2007) says that “One of the major challenges of sustainable development is to find ways to encourage environmentally friendly economic activities and discourage activities that cause environmental damage (air, water and soil pollution, respectively the basement)”.

In summary, the efforts of the academic environment must focus on investing in bio-capacity - introducing, on a large scale, sustainable agricultural practices and economic activities that maintain the balance between ecosystem integrity and long-term productivity. As a result, sustainable development does not only refer to changing people's behaviour regarding the environment, but also to changing the conception regarding the economy, society and politics. In the summary of this part, we remind Joel Cohen - "to take care that all children are nourished, that they can learn and be educated, that they solve the problems they will face as adults", that would ensure the future and we hope that in a happy one.

Conclusions

In the synthesis of the ones presented above, there is a very clear aspect: The population is not aware or does not know the effects of his actions on the environment and on the discrepancies existing in the world. Whatever the case, each person must become more responsible to the environment.

In the legal and social system there are a number of codes: the Labour Code, the Education Code, the Civil Code, the Health Code, the Road Code, etc. In this order of ideas, we propose that, based on global strategies and policies, at international/regional/national level, a Code of Ethics towards the environment should be developed.

Annex 1. Evolution of the global population in 10000 BC - 2100 AC

Years	Persons (millions)	Years	Absolute changes from the previous period (mil pers.)	Average annual increase (mil. pers./year)
10000 IH[1]	4	-	-	-
5000	5	5000	1	0,000
4000	7	1000	2	0,002
3000	14	1000	7	0,007
2000	27	1000	13	0,013
1000	50	100	23	0,230
500	100	500	50	0,100
200	150	300	50	0,167
0	170	200	20	0,100
200 DH[2]	190	200	20	0,100
400	190	200	0	0,000
500	190	100	0	0,000
600	200	100	10	0,100
700	210	100	10	0,100
800	220	100	10	0,100
900	240	100	20	0,200
1000	265	100	25	0,250
1100	320	100	55	0,550
1200	360	100	40	0,400

Years	Persons (millions)	Years	Absolute changes from the previous period (mil pers.)	Average annual increase (mil. pers./year)
1300	360	100	0	0,000
1400	350	100	-10	-0,100
1500	425	100	75	0,750
1550	480	50	55	1,10
1600	545	50	65	1,30
1650	545	50	0	0,00
1700	610	50	65	1,30
1750	728	50	118	2,36
1800	900	50	172	3,44
1850	1.171	50	271	5,42
1875	1.325	25	154	6,16
1900	1.625	25	300	12,00
1925	2.000	25	375	15,00
1950	2.529	25	529	21,16
1975	4.073	25	1.544	61,76
2000	6.115	25	2.042	81,68
2025	8.184 ^{em} /8.254 ^{ef}	25	2.069/2.140 ^{ef}	82,76
2050	9.735 ^{em}/ 10.588 ^{ef}	25	1.551 ^{em}/2.404 ^{ef}	62,04 ^{em} /93,3 ^{ef}
2075	10.577 ^{em} / 12982 ^{ef}	25	842 ^{em} /3.247 ^{ef}	33,68 ^{em} /95.8 ^{ef}
2100	10.878 ^{em} / 15.600 ^{ef}	25	301 ^{em} /5.023 ^{ef}	12,04 ^{em} /104,7 ^{ef}

Source: authors data processing from Worldhistorysite, 2019; UN, 2019.

Nr^{em} - The average projection variant of the population of the continents of the world, between 2020 and 2100.

Nr^{ef} - Variant constant projection fertility (period 2015-2020) of the population of the world's continents, between 2020 and 2100.

Annex 2. Number of fields and programs of environmental studies license in SNIS during the period 2019/2020

Bachelor's degree / Bachelor's degree programs	Number of programs	Maximum number of students who can be enrolled
Agronomy	27	1985
Agriculture	14	1300
Montanology	6	315
Plant protection	1	30
Biotechnologies	12	530
Agricultural biotechnologies	4	200
Medical-veterinary biotechnologies	2	75

Bachelor's degree / Bachelor's degree programs	**Number of programs**	**Maximum number of students who can be enrolled**
Biotechnologies for alimentary industry	4	190
Genetically industry	2	65
Economy	5	630
Agro-food and environmental economics	3	550
Agro-food economy	2	80
Horticulture	20	1395
Horticulture	13	985
Landscape	7	410
Environmental Engineering	44	2860
Hydro technical arrangements and environmental protection	1	60
Computer science applied to environmental engineering	1	60
Engineering of sustainable rural development	2	125
Environmental engineering	7	390
Engineering of biotechnical and ecological systems	5	320
Engineering and environmental protection in agriculture	10	845
Engineering and environmental protection in industry	16	1000
Waste recovery engineering	2	60
Engineering and management in agriculture and rural development	25	2600
Engineering and management of agricultural business	8	910
Engineering and management in public alimentation and agritourist	18	1750
Silviculture	13	1050
Hunting	2	200
Forestry	2	150
Silviculture	9	700
Environmental sciences	24	1510
Chemistry of the environment	1	30
Ecology and environment protection	13	835
Geography of the environment	3	225
Environmental management and audit	1	50
Environmental science	7	420
Zoo-technics	12	815
Fish farming and aquaculture	5	225
Zoo-technics	7	590
Total areas of agricultural sustainability and environmental protection	180	13.280
Total fields and programs of SNIS studies	*2.546*	*205.557*
Share of the some in agricultural sustainability and environmental protection %	*7,07*	*6,46*

Source: HG. 326/2019 Nomenclature of the fields and specializations of undergraduate studies.

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ASSESSING THE ECONOMIC SUSTAINABILITY OF SERBIAN FARMS BASED ON FADN DATASET

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Abstract

The main goal of this paper is to explore economic sustainability of all farm types in Serbia. Number of farms in Serbia decreasing sharply, with 10% rate in period 2012-2018. Economic sustainability is just one dimension of farm sustainability, beside social and ecological dimensions. Knowing that, research is conducted taking in account farmers' point of view, where economic results of farm business are baseline for decisions about farm future. Economic sustainability is first element in focus of farmers, especially when social responsibility is not adequate. Time scope of research is production year 2018. Analysis revealed types of farming, economic size classes and regions that had better economic viability. Farms in north Serbia region from all types of farming scored better technical efficiency results. The most efficient types of farms are poultry and horticulture, while on opposite side worst technical efficiency scored dairying, vineyards and grazing livestock types of farming. Results for 2018 are in line with results for previous year.

Kay words: FADN, farm, sustainability, profitability, efficiency, Serbia.

Introduction

Latest Census of agriculture 2012, followed by Farm structure survey 2018 revealed sharp decrease for 10% of farms number in Serbia (SORS, 2019a,b). Dynamics of changes in structure of types of farming is significantly unequal. For example, in dairy production type number of farms decreased from 154 to 116 thousand, or literally every fourth farm ceased milk production. At same time number of farms in crop production type remains more stable.

Structure of farms according economic size measured in Standard output (SO)

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changes in the way that highest decrease comes from the group of small farms with up to 4,000 EUR of SO, almost equally in both regions Serbia North and Serbia South. Other size groups of farms increased in number indicating that remaining farms increased resources and value of production, and since that some farms moved to bigger size group.

Future changes in farm structure will be influenced by several factors as: labour aging, farm succession process, legal boundaries, economic sustainability etc. To discover trends in farm structure changes and to predict future changes, field research is irreplaceable step in collecting reliable data.

One of the most powerful databases for analysis of economics results of farms and for understanding its economic sustainability is Farm Accountancy Data Network (FADN). Process of establishing FADN system in Serbia started in 2011. Organised by Ministry of agriculture, forestry and water management FADN in Serbia is realising by field work of Serbian agriculture extension service. Farm sample size and quality and reliability of data are improving from year to year. In 2018 number of farms in sample increased to 1,653 from 1,420 farms in previous year. Numerous variables (above 1,000) in FADN database enables to understand economic aspects of farm production across regions in Serbia, by farm production types and by farm sizes.

Sustainability of farms is usually measured trough three dimensions: economics, social end ecological sustainability. Previous researches of farm sustainability in Serbia (Popovic, Knezevic, 2011; Popovic et al., 2011) proved that sustainability of small sized dairy farms is endangered. In sustainability concept it is not possible to construct unique indicator and all three dimensions are equally important (Shadbolt, Martin, 2005). From farmers point of view economic dimension of sustainability have to be achieved in order to keep farm in the business.

Material and methods

All European Union (EU) countries as well as countries candidates, through the FADN collects and processing technical, financial and economic data. In EU over 80,000 agricultural holdings in FADN sample represent population of about 5 million, covering of around 90% of utilized agricultural land and 90% of total agricultural production. This instrument provides data on income and economic activities on agricultural holdings. FADN enables the European Commission (EC) to monitor the economic situation of agricultural holdings in the EU (EC, 2019).

The main purpose of this data is use for analysis, evaluation and development of Common Agricultural Policy (CAP) measures. Implementation of the FADN is the responsibility of Member State which shall nominate the Liaison Agency that collects data and transmits it to the EC and the National Committee to supervise the implementation of the FADN system.

Idea of FADN and its legal basis are established in 1965. Current implementation of FADN in the EU is defined by the following regulations: Council Regulation no. 1217/2009, Council Regulation no. 1318/2013, Commission Delegated Regulation nom 1198/2014 and Commission Implementing Regulation no. 2015/220.

FADN is the only EU instrument that collects detailed financial data from farms so it is therefore a basic and irreplaceable data and information source for EU agricultural policy-makers. The dissemination of FADN results are based on "Standard Results" generated from FADN Farm Returns from each EU country, and checked by the EC.

Standard results are set of statistics, calculated from considerable detailed data reported by National Liaison Agency and published by the Commission. Aggregated data for different groups of farms are available in a Public Database. They describes detailed economic situation of farmers by different groups throughout the EU (Kovacevic et al., 2017).

Farm typology used by EC is defined by predominant activity (enterprise) and economics size of farms expressed in total SO. Each type of farming in practice reflects the different production system. EC use three level typology of farming from aggregate to more specific level:

1. 8 general types and a group of non-classified holdings (labelled with one digit), usually used for comparison on EU level,
2. 21 principal types and a group of non-classified holdings (labelled with two digits),
3. 61 particular types and a group of non-classified holdings (labelled with three digits).

The most detailed typology with 61 type of farming has been created for use by various bodies at EU level. It is very broad and includes all different types of farming that are existing in the EU. All farms are presented in three dimensions in total farm structure by: type of farming, economic size and region where farm exist. The most aggregated level of farm types is those one with one digit, with 8 general types.

Different Types of Farming (TF) at the level of the EU are shown in the Tables 1 and 2. TF 10 applied in Serbia is defined according needs of Ministry of agriculture, forestry and water management, but this classification is suitable to TF 8 (Table 2.).

Table 1. Type of farming in EU by two classifications

General TF		TF 14	
1	Specialist field crops	15	Specialist cereals oilseeds and protein crops
2	Specialist horticulture	16	Specialist other field crops
3	Specialist permanent Crops	35	Specialist wine
4	Specialist grazing livestock	36	Specialist orchards – fruits
5	Specialist granivores	37	Specialist olives
6	Mixed cropping	38	Permanent crops combined
7	Mixed livestock	45	Specialist milk
8	Mixed crops-livestock	49	Specialist cattle
9	Non classifiable	48	Specialist sheep and goats
		20	Specialist horticulture
		50	Specialist granivores
		60	Mixed crops
		70	Mixed livestock
		80	Mixed crops and livestock

Source: EC, 2019.

The National FADN committee of Serbia adopted criteria for FADN field of survey:

1) Two regions Serbia North and Serbia South,
2) Economic size threshold 4,000 EUR,
3) 10 general Types of Farming,
4) 14 economic size of holdings,
5) Based on 2012 Agriculture Census FADN sample should consist of 2,000 households.

According Agriculture Census 2012 only one third of all farms in Serbia had higher SO than threshold of 4,000 EUR. Looking on result of farms above threshold, those farms using 90% of the total utilised agricultural area (UAA) and producing for about 90% of the total agricultural production. Farm structure survey in 2018 revealed that about one half of farms had size above established threshold.

Table 2. Type of farming in EU by TF 8 and variation of TF 10 in Serbia

TF 8 – EU		TF 10 - Serbia	
1	Field-crops	1	Field crops
2	Horticulture	2	Horticulture indoor
		3	Horticulture outdoor
3	Wine	4	Vineyards
4	Other permanent crops	5	Fruits
5	Milk	6	Dairying
6	Other grazing livestock	7	Grazing livestock
7	Granivores	8	Pigs
		9	Poultry
8	Mixed	10	Mixed

Source: EC, 2019; FADNS, 2019.

Economic sustainability of TF 10 in Serbia is estimated through several dimensions. First one is technical efficiency measured as ability of farms to use as less as possible resources to produce one unit of output. Efficiency is mostly used to understand level of competitiveness among farms with different types of farming.

In this research assessment of farms technical efficiency is based on the input-oriented Data envelopment analysis (DEA) method with variable return to scale (VRS), developed by Banker et al. (1984). Method with constant return to scale (CRS) developed earlier by Charnes et al. (1978) has some disadvantages compared with VRS method. The DEA method with VRS has advantages over a model with a CRS in conditions where imperfect competition exists. This causes a situation in which companies do not operate at the optimum level, i.e. size (Coelli et al., 2005). Ratio between CRS and VRS represent efficiency of size for each farm.

Relative technical efficiency is measured for individual farms in the sample of 1,653 farms in two Serbian regions. Each farm is analysed as separated Decision Making Unit (DMU) and compared in relation each farm to all other. All values of estimated farm efficiency by CRS and VRS are in range between 0 and 1, while value of 1 represent efficient farm. Value of size efficiency coefficient that equals to 1 indicates optimal farm size. Otherwise, values lower than 1 indicates inadequate size of the farm where it can be oversized or undersized.

Software applied in this paper to assess technical efficiency of farms is DEAP Version 2.1 developed by Tim Coelli (1996).

Second dimension in analysis of farm economic sustainability is productivity. By definition productivity is ratio of the output(s) that it produces to the input(s) that is used (Coelli et al., 2005). It is absolute indicator and can be calculated as total factor productivity, that ask for aggregating all outputs into one single index of outputs and aggregating all inputs into one single index of inputs. Most often in use are partial productivity measures as are for example labour or land productivity.

Productivity of farms in this research is estimated as labour productivity measured as ratio of total output corrected for balance of current subsidies and taxes, and annual work units (AWU) used at farm. As output measure is chosen money value of farm output realised from farm business in period of one year.

Profitability is examined as third dimension of farm economic sustainability. It is measured as ratio of net farm income and AWU. Net farm income is a measure of return to the equity capital, unpaid labour, and management contributed by the owner/operator to the farm business (Kay et al., 2008).

In economic cost concept net farm income is constituted from opportunity cost and economic profit. On family farms significant share of net farm income is return to resources owned by farmer: family labour, management and capital. In Serbia 99.7% of all farms are family farms.

Results

The economic sustainability is often analysed in literature. Historically, scientific attention at beginning of XX century was focused on profitability and productivity of farms. Since Farrell (1957) constructed concept of economic efficiency measurement, numerous researches arise in that area (Banker et al., 1984; Charnes et al., 1978; Pastor et al., 2002; Coelli et al., 2005; Ruggiero, 2005; Sarkis, 2007; Kay et al., 2008; Bojnec, Latruffe, 2008; Fogarasi, Latruffe, 2009; Reardon et al., 2009; Mussa et al., 2012; Balezentis, Krisciukaitiene, 2013; Kocisova, 2015; Toth, Takacs, 2015; Blazejczyk, Kala, 2015; Madau, 2015; Popovic et al., 2018; Popovic, Panic, 2018). DEA method was most exploited in researches focussed on farms and other subjects in agribusiness sector.

Five variables are chosen for DEA model, embracing all output and input side of farm business. In case of family farms where level of specialisation is low, it is not easy to define single unique output measure. Higher specialisation is noticed in case of several farms with TF poultry and pigs production. Those farms do not own agricultural land and buy on the market all feedstuff. That is why for this purpose output variable is defined as value of production corrected for balance of current subsidies and taxes. It is money value representing unique result of farm activities in one year, from which farmer cover all incurred costs of inputs.

On input side four variables are chosen for DEA model: total intermediate consumption (in RSD), labour input (hours/year), total fixed assets (in RSD) and total UAA (ha). Total intermediate consumption covers total specific crop and livestock costs and overheads arising from production in the accounting year. It is most important group of cost with typically highest share in all accounting costs. Labour input includes total number of family and non-family working hours on farm per year. Total fixed assets include value of much diversified quantity and quality of fixed resources on farms. Last input variable is total UAA, including owned and rented land expressed in hectares.

In Table 3. is analysed descriptive statistics for one output and four inputs variables used in DEA method for Serbian farms in 2018. There is huge variation among farm data, since farm sample cover wide size range of farms from 4,000 EUR SO to the biggest farms.

Table 3. Descriptive statistics for variables of 1653 DMU, used in DEA method

Variable	Unit	Average	Standard deviation	Minimum	Maximum
Value of production + subsidies -taxes	RSD	6,649,420	10,322,297	51,000	164,962,000
Total intermediate consumption	RSD	2,702,699	4,264,277	73,000	78,426,316
Labour input	hour/year	3,629	2,823	100	64,800
Total fixed assets	RSD	16,827,059	21,683,425	332,500	261,476,001
Total UAA	ha	27	42	0	549

Source: FADNS, 2019.

Data in Table 4. uncovers correlation relationship between input and output variables. Strong correlation exists between output variable and total intermediate consumption. Additionally, value of production corrected with balance of current subsidies and taxes is significantly correlated with two other input variables: total fixed assets and total UAA.

Total intermediate consumption is correlated with total fixed assets and total UAA. Significant correlation exists in relationship total fixed assets and total UAA. Typically, the highest share of total fixed assets is value of owned land area. It approves that the most of used agricultural area on farm is owned by farmers.

Weak correlation is noticed only in case of labour input with other four variables. In recent decades farmers adopt whole range of new labour saving technologies what explains low correlation.

Table 4. Correlation analysis of input and output variables for 1653 DMU

Parameter	Value of production + subsidies - taxes	Total intermediate consumption	Labour input	Total fixed assets	Total UAA
Value of production + subsidies - taxes	1				
Total intermediate consumption	0.815	1			
Labour input	0.446	0.375	1		
Total fixed assets	0.593	0.566	0.246	1	
Total UAA	0.624	0.623	0.172	0.703	1

Source: Estimations based on variables from FADNS, 2019.

Estimated technical efficiency of TF 10 Serbian farm based on input-oriented DEA model with VRS are presented for two regions North and South in Tables 5. and 6. Results for farms in Serbia North region revealed variation in efficiency by different TF. The higher technical efficiency generated: poultry (0.543), followed with horticulture, pig and fruit producing TF.

On the other side, the lowest efficiency is encountered by dairying farms (0.229), what explain the biggest decrease in number of dairy farms. Four other TF that generate under average technical efficiency are: field crops, mixed crops and livestock, vineyards and livestock production with grazing livestock.

Average technical efficiency of farms in North region (0.322) is higher than in South region (0.255). Besides that, all TF in North region reached higher technical efficiency comparing with TF in South region. It was expectable, because of better resource structure on farms in North, followed by differences in applied innovative technologies in crop and livestock enterprises.

Table 5. Technical efficiency scores by DEA method of farms in North Serbia regions for 2018

Parameter	DMU	CRS	VRS	Scale efficiency	Efficiency rank
Field crops	346	0.193	0.317	0.639	6
Horticulture indoor	7	0.305	0.490	0.627	2
Horticulture outdoor	12	0.239	0.451	0.446	3
Vineyards	4	0.085	0.276	0.350	8
Fruit production	51	0.151	0.339	0.457	5

Parameter	DMU	CRS	VRS	Scale efficiency	Efficiency rank
Dairying	28	0.156	0.229	0.703	10
Livestock production – grazing livestock	12	0.122	0.265	0.477	9
Pigs production	7	0.115	0.355	0.369	4
Poultry	25	0.337	0.543	0.581	1
Mixed crops and livestock	91	0.145	0.280	0.586	7
Total	583	0.185	0.322	0.603	

Source: Estimate based on DEAP software and FADNS, 2019.

Scores of technical efficiency of TF in Serbia South region in 2018 (Table 6.), are generally lower but in similar formation as on North region. Only exceptions are two TF: horticulture indoor and mixed crops and livestock that exchanged position in relation to average technical efficiency. The best positioning TF are poultry and horticulture outdoor production. Two the worst technically efficient TF are dairying and vineyard production.

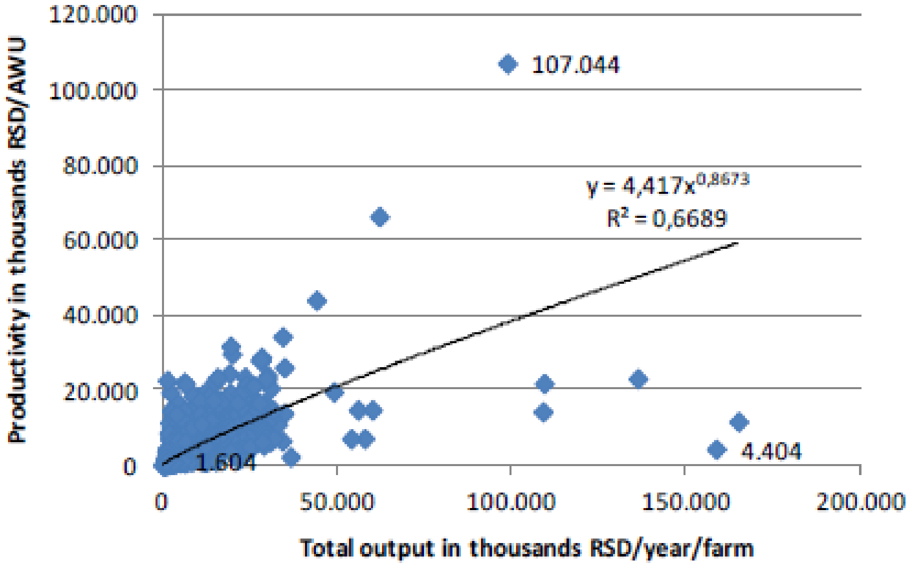
Results of previous research of farm technical efficiency in Serbia for 2017 are in the line with these results (Popovic et al., 2019).

Table 6. Technical efficiency scores by DEA method of farms in South Serbia regions for 2018

Parameter	DMU	CRS	VRS	Scale efficiency	Efficiency rank
Field crops	181	0.106	0.259	0.424	6
Horticulture indoor	16	0.160	0.258	0.639	7
Horticulture outdoor	29	0.191	0.324	0.521	2
Vineyards	7	0.109	0.195	0.564	10
Fruit production	139	0.097	0.284	0.372	4
Dairying	312	0.083	0.220	0.402	9
Livestock production – grazing livestock	113	0.087	0.245	0.390	8
Pigs production	32	0.159	0.285	0.563	3
Poultry	32	0.203	0.331	0.597	1
Mixed crops and livestock	209	0.110	0.266	0.402	5
Total	1070	0.105	0.255	0.419	

Source: Estimate based on DEAP software and FADNS.

Graph 1. Labour productivity of 1,653 farms in Serbia in 2018, distributed by farm size

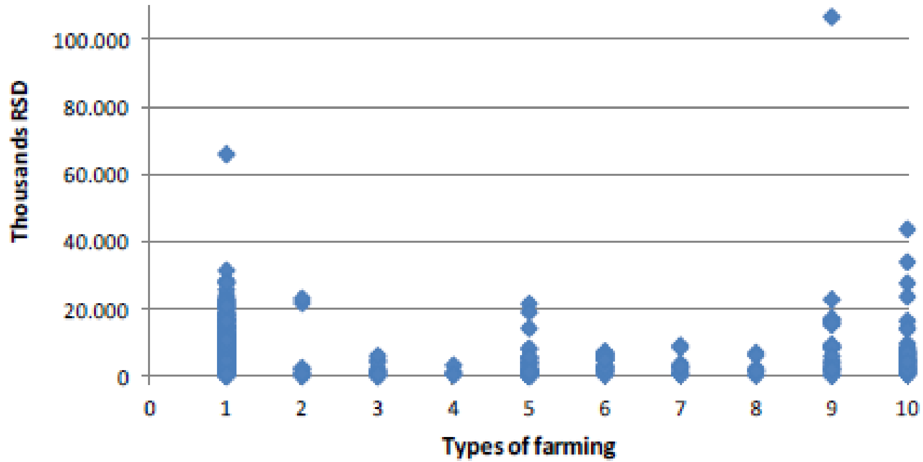


Source: Estimate based on variables from FADNS, 2019.

Partial productivity of 1,653 farms in FADN 2018 sample is presented in Graph 1. Productivity per AWU depends from farm size measured in total output. Coefficient of determination R^2=0.67 in regression explains that partial labour productivity expressed in RSD per AWU depends from size of farm business. The higher size of farm, cause the higher labour productivity. New labour saving technologies are faster adopting by middle and big sized farms, while small farms traditionally depends on higher labour input.

Differences in labour productivity per TF 10 in Serbia North region is presented in Graph 2. Distribution of labour productivity revealed stronger variation among TF 10. Higher levels of labour productivity reached some farms with crop production, mixed crop and livestock production, poultry, fruit and horticulture production. Contrary, the lowest level of productivity realised by vineyard, dairying and pigs production types of farming.

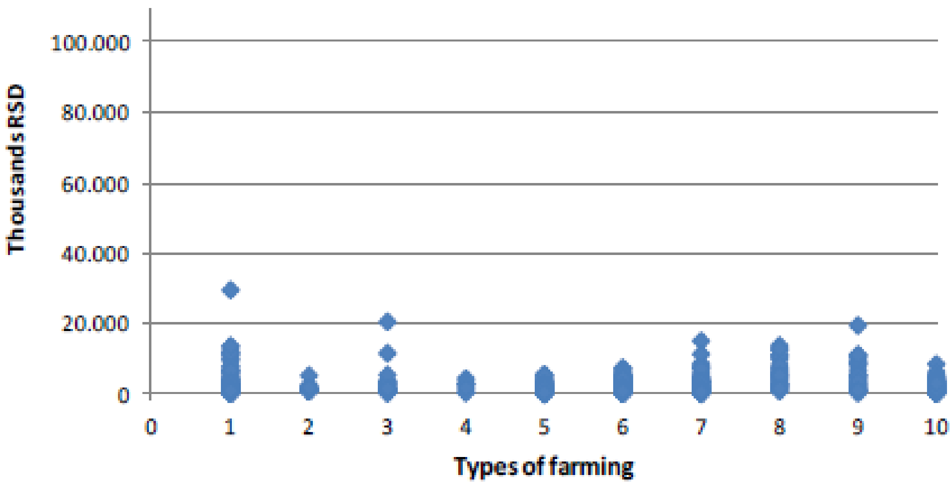
Graph 2. Labour productivity of 583 farms in Serbia North in 2018, distributed by 10 types of farming



Source: Estimate based on variables from FADNS, 2019.

Labour productivity distribution by TF in Serbia South (Graph 3.) is lower and less variable than on farms in North of country. It is especially pronounced in case of four TF: crop, horticulture indoor, fruit and mixed crop and livestock production. Three TF: horticulture outdoor, livestock production - grazing livestock and pigs production had wider range of labour productivity.

Graph 3. Labour productivity of 1,070 farms in Serbia South in 2018, distributed by 10 types of farming.



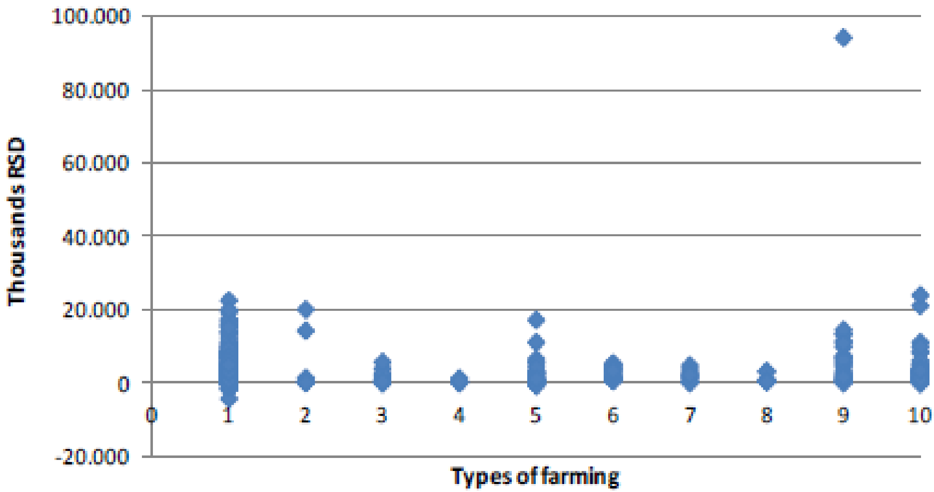
Source: Estimate based on variables from FADNS, 2019.

During production 2018 year weather conditions were average, and production results had to be treated in that way. Drought condition during the previous year decreased crop production and lowered feed production that could have negative production and financial effects in some livestock farms during 2018.

Although 2018 can be treated as normal production year, about 95% of all farms in FADN sample reached profit, while 5% of farms realised loss in farm business. From economic cost concept view profitability situation was strongly different. Remuneration for family owned resources as it is labour and capital cause high opportunity costs. Since the majority of farms in Serbia are family farms and relying usually only on family labour and own capital economic profit is negative in case of those farms that operate with lower accounting profit.

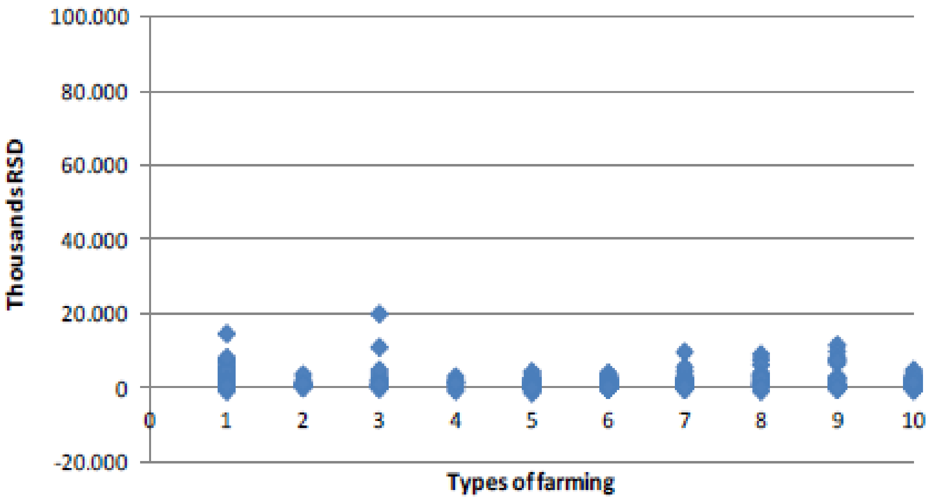
Farm profitability measured in farm income per AWU and distributed per TF 10 is presented in Graph 4. The most numerous type of farming in Serbia North region is crop farm. Few farms in crop TF encountered highest negative financial results in whole farm sample. At same time, some farms in crop TF, as some farms in horticulture, fruit, poultry and mixed crop and livestock production reached the highest profits, comparing with farms in South region. Farms in other TF remain on lower level of profitability per AWU.

Graph 4. Profitability of farms in Serbia North in 2018, distributed by 10 types of farming



Source: Estimate based on variables from FADNS, 2019.

Graph 5. Profitability of farms in Serbia South in 2018, distributed by 10 types of farming



Source: Estimate based on variables from FADNS, 2019.

Farms in Serbia South region (Graph 5.) realised significantly lower profits per AWU. Although, number of farms in sample for this region is almost double than in North region, at same time farms are smaller and profitability distributions per TF had more narrowed range. Comparing with farms in North region some farms in South region with TF as: horticulture outdoor, vineyards, livestock production-grazing livestock and pigs production encountered higher profitability.

Conclusions

Structural changes speed up in the Serbian farm sector. Total number of farms decreased in 6 years period for 10%. Inside types of farming structure changes are even more dramatically. Every fourth dairy farm disappeared in the same time frame. Mostly small farms ceased business, but in some cases it happenings also in range of middle and bigger sized farms. Farms remaining in business constantly increase resources and adjusting to more prospective types of farming.

Economic sustainability of farms based on FADN dataset, measured by three dimensions: technical efficiency, productivity and profitability reveal some answers about farm structure changes. Assessed average technical efficiency of 10 types of farming indicates that farms in Serbia North are more technically efficient than farms in Serbia South region. Variation of technical efficiency coefficients among types of farming is significant. The most technically efficient types of farming in both Serbian regions in 2018 was: poultry and horticulture. Contrary, two the most inefficient types of farming were: dairying and vineyard production. Results are in the line with findings for previous year, what partially explained why farm structure changes are most intensive in dairy sector and especially in Serbia South region.

Analysis of FADN data in sample indicated that labour productivity depends of farm business size. Bigger farms have higher labour productivity measured per AWU. Bigger farms are dominantly located in Serbia North region, what influence regional productivity differences. Labour productivity is much higher in Serbia North region in most types of farming except: pigs production, vineyard and horticulture outdoor production.

Farm profitability analysis disclosed that some farms in Serbia North region reached higher profitability per AWU. It is noticeable in crop, horticulture, fruit, poultry and mixed crop and livestock production. Exceptions are some farms in South region, oriented in vineyard, livestock production-grazing livestock and pigs production types of farming that earned higher profit.

Future changes in Serbian farm sector will continue with decreasing in total farm number, increasing in average resources and adjustment in types of farming with strengthening of specialisation. Process will be influenced by reviled results in analysis of farm economic sustainability. Some farms in Serbia North region in types of farming: poultry, mixed production crop and livestock, crop production and fruit production achieving better production and economic results. At the same time some farms in Serbia South region in types of farming: vineyards, livestock production-grazing livestock, and pigs production realising better labour productivity and higher profitability. Results of those farms will be leading in strategy fitting of other farms. To give stronger forecast of future directions wither time scope should be included in analysis.

Acknowledgements

The research is the part of project results financially supported by Ministry of Education, Science and Technological Development of the Republic of Serbia, projects no. III 46006 and III 46009, as well as the project of the Provincial Secretariat for higher education and scientific research, Autonomous Province of Vojvodina, project no. 142-451-2503/2019-03.

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INNOVATIONS IN CATTLE IMPROVEMENT

Radica Đedović[1]

Abstract

During the 20th century livestock production faced many challenges among which an increase of production, efficient market supply and meeting customer`s demands for plenty of animal products at low cost were the most important ones. Under such circumstances it is not surprising that a primary goal in milk production in the last 50 years was to improve the efficacy of dairy production and to increase milk yield wherein the role and use of selection and genetics was crucial. In the last 40 years in many European countries, milk yield per cow more than doubled. A dramatical increase in milk yield per cow is, among other things, result of rapid genetic progress and progress in production of feedstuffs and farm management. However, in the last several decades the increase of milk yield was mainly followed by decrease in reproduction, occurrence of metabolic disorders with constant decrease in longevity. In line with aforementioned a modern national breeding programs in cattle breeding set as their aim to raise durable, robust cows with good type traits and good fertility and able to maintain already existing high yielding milk production.

All research and innovations related to genetic improvement of cattle should be further continuously conducted through national and international research projects. In the future it is essential to direct the activities on improvement of cattle towards genetics and genomic selection, data collecting, bioinformatics, genetics of functional traits, welfare and designing of breeding programs which keep abreast of advanced knowledge in these fields.

This article provides background and highlights the importance of breeding cattle and milk production improvements. Based on the review of a large number of studies in our country and the world we will give provide an overview of the importance of genetic parameters of milk traits, and potential applications of molecular genetics and genomic selection in dairy cattle.

Key words: innovation, dairy production, cattle.

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The state of cattle dairy production and significance of its improving

Production of food, particularly food of animal origin, has a crucial importance for survival of a whole mankind. Breeders of domestic animals, especially cattle, have a direct responsibility to provide sufficient number of quality and healthy animals to be used for obtaining foodstuffs and non-edible products. In foodstuff production the products such as meat and milk are being obtained. On the other hand, non-edible products also have their place on the market, for example skin. In the future, strategic planning of breeding and selection programmes which will offer even greater possibilities for genetic improvement of traits of interest for cattle breeder will be imperative in farm cattle breeding. Although predictions say that in the next period there will be a significant increase in the number of people in the world it is thought that production of animal products will surpass the demand.

According to FAO projections, demand for food will rise by 2050 in accordance with the increase of inhabitants primarily in developing countries Demand for products of animal origin will rise even more rapidly, taking into consideration changes in the nutrition of some human populations. Therefore, meat production could be doubled (up to 470 million tons in 2050 from 229 million tons consumed during 2000 and production and consumption of milk in the world could rise from 580 to 1,043 million tons), (FAO, 1998). According to present data, production of milk and meat will follow such trend of increase. If not, the countries that do not produce enough their own food will suffer significant expenditures for the import of agricultural products from the countries whose production is greater than consumption. Some developing countries, like ours, have already recognized this possible problem in the future and corrected their programmes accordingly.

On the basis of data published on the site the Statistics Portal, 163,713.45 t of milk was produced in EU in 2017. By analysis of data on milk production in EU in 2015, along with production planned for the next ten years, a constant rise therein is perceived so that according to projections the production of milk in EU in 2026 should reach 175,925.06 t of milk. A high consumption of milk and dairy products is a characteristic of highly developed countries. Sweden has a consumption of 400 l per capita annually, while Finland, Ireland, the Netherlands and other countries consume slightly less quantities. In relation to European average a mean production per cow in Serbia is relatively low - 180 litres per capita what is under European average. In the period from 2008-2013 it accounted for 1,499 billion liters on average or 1% of European production. Primary milk production (dairy cattle breeding) in the Republic of Serbia is determined by a great share of small households with a small number of animals and a small available farmland. A part that belongs to a primary production of milk includes between 18,000 and 20,000 farms.

An average Serbian household has four to five cows (2.8 cows per household on average) with daily yield from 13 to 15 liters per cow. Every year a trend of decrease in the number of small producers and increase of total milk production per cow is being maintained. About 80% of purchased milk is for the most part processed by big dairy plants export-oriented while the rest is processed by small dairies. According to the National Statistical Office total milk production in Serbia has been recording a minor rise since 2015 (1,501 billion liters), to 1,504 billion liters in 2016 and 1,506 billion liters in 2017.

Along with physical increase of the volume of milk production in the world and in our country it is necessary to work on the improvement of cattle traits and take into consideration many other issues with regard to global sustainability such as: health and welfare, greenhouse effect, climate changes, use of natural resources, food safety and public health, production efficiency, etc. In this context, farmers, together with specialists in the field of zootechnologies and scientific workers are the ones who are able to give a positive contribution to these challenges by including them into breeding and selection programmes.

Improvement of cattle

Rising of cattle includes several stages: breeding, reproduction and improvement whose integral part is selection. This cycle lasts about five years on average. These procedures provide continual improvement of cattle traits through generations. Until lately research work in cattle selection has exclusively been based on the use of methods of quantitative genetics wherein the variance of phenotypic or production traits of population represented the basis of selection advance (Djedović et al., 2013a). By applying quantitative genetics, various traits can be measured on the basis of which the animals with best production results and health status can be chosen as parents of the next generation.

The greatest challenges during the twentieth century in livestock production were the increase of the production with efficient supply of market and meeting consumers` demands for plenty of animal products at low prices. In such circumstances it is not surprising that a major goal in dairy production in the last 50 years was to improve the efficiency of production and to increase milk yield wherein the role and application of selection and genetics was essential. In many European countries, milk yield per cow more than doubled in the last 40 years. A dramatical rise in milk yield per cow is among else, a result of rapid genetic advance as well as advance in production of feeding stuffs and farm management. An average ECM (Energy Corrected Milk) of dairy cows increased from 4,200 kg to 9,000 kg between 1957 and 2003 (Pryce, Veerkamp, 2001). An average milk production of 10,000 kg per cow and more is no longer characteristic only for the USA and developed European countries but is more and more common in Serbia as well. Data from national databases on milk yield in Great Britain show increase of average yields of milk in cows in standard lactation of about 200 kg/annually from 1996 to 2002. The half of this advancement (50%) in milk yield is attributed to the use of methods of selection and genetics (Pryce, Veerkamp, 2001). It can be illustrated, for example, by the milk yield in Holstein cows in the USA where between 1993 and 2002 average milk yield increased by 1,287 kg out of which 708 kg or 55% depended on hereditary base. Since the end of 1990s the following facts had to be faced: the increase in milk yield was mostly accompanied by decrease in reproduction, increase in milk yield caused health disorders with constant decrease in longevity. Precisely these reasons led to redefining the breeding programmes in contemporary approach in selection of dairy cattle which changed the focus of selection from milk yield traits to considerably more balanced approach where the accent is given to functional traits, primarily longevity and exterior traits (Miglior et al., 2005). New national breeding programmes in cattle breeding set as an aim the raising of durable, robust dairy cows with good type traits and fertility able to maintain already existing high yielding milk production.

Among other things, breeding and selection programmes in cattle breeding are formulated with the aim to utilize genetic variation in a sustainable way. There are programmes of genetic improvement within and between breeds. Such programmes increase competitiveness and sustainability of production of livestock products (Bogdanović et al., 2005; Bogdanović et al., 2014). A major key in breeding and selection programmes for all kinds of domestic animals and therefore cattle as well is the estimation of animal breeding value. Estimation of breeding value is the most complex factor in cattle improvement. Exact estimations of breeding value need a precise application of genetic parameters and data measured in animal as well as the results of its ancestors, relatives and descendants.

For the estimation of animal breeding value linear models which in adequate way explain the nature of data and their biological character are most often used. In practice, linear models are very important primarily due to their simplicity, easy understanding and a high degree of harmony between real results and expected values and finally due to a high degree of accuracy of ranking of productive and other traits which we want to improve (Djedović, 2015). By advancing these models and developing new softwares the accuracy and effect of selection is also improving.

In procedures for cattle improvement linear methods and models which contain combination of fixed parameters (year, farm, season) and randomly changeable variables (genetic effect of sire, individual) are most often used, which depending on examined trait can be mutualy dependant (correlated) or independent with either presence or absence of interactions between them. Actually, a solution made by chosen model represents a breeding value of an individual for the traits on which selection is performed.

Over more than half of the last century within a number of projects formulated in the Chair for animal breeding and improvement of domestic and raised animals of the Agricultural Faculty of the University of Belgrade the research with a view to estimating genetic parameters and breeding value of parents, in the first place, sires, for the most important traits of interest by application of various methods and models was conducted. In the nineties of the last century the method of Least Squares - LSM was mostly used for estimation of genetic variability and correlation of the traits of cattle. In our country only after the year 2000 for the estimation of breeding value of cattle traits BLUP-AM (Multitrait Best Linear Unbiased Prediction - Animal Model) which completely employs available data and provides maximum correlation between estimated breeding value and aggregate genotype of animals was used. The use of BLUP-AM results in highest possible genetic trends of analysed traits. Besides providing information about more important genetic indicators of existing population, a genetic trend of cattle traits can be used also in the estimation of selection success of previous generations as well as for predicting expected changes in the future. Understanding of genetic trends can provide a solution to applied selection in the herd, and/or can be a signal for change in selection and management. In addition, the estimation of genetic trend is of a multifold importance for improvement in dairy cow populations taking into account the importance of this type of cattle for an entire livestock production. In our country an estimated trend of milk yield traits at an annual level was 36.05 kg, 0.003% and 0.95 kg, for milk yield, milk fat content and milk fat yield, respectively (Djedović et al., 2013a; Djedović et al., 2017). A relatively low genetic trend in our country can be explained by low intensity of bull's selection and low heritability values of studied traits.

As it has already been pointed out over many years, serious problems in raising cattle for dairy production appeared due to a bovine decreased resistance, decreased lifetime, and therefore decreased production lifetime. Thus, for example, in cows that have problems with toes a feed consumption can be reduced by more than 15%. As a consequence of such state the yield of totally produced milk is reduced as well (sometimes even more than 30%). Besides problems with productivity there occurs weakening of a general health state, reproduction is being disturbed and there is a danger of other infections. In modern dairy cattle breeding less and less cows are being culled according to a previously made plan since the increase in production is followed by the increase of various risks as well. Total annual cullings of cows account for up to 30%. In the conditions of the most intensive production it can reach more than 45%. The greatest number of cows is being culled due to problems with reproduction and diseases of udders, legs and toes. These problems cause more than 55% of total cullings or nearly 70% of unplanned cullings. Metabolic disorders alone, in the conditions of normal production, cannot be a dominant cause of cullings. However, they contribute to the occurrence of problems in reproduction, incidence of mastitis and diseases of legs and toes, as well as to a low production.

The results of the research conducted in our country over a past several years showed that animals whose duration of productive lifetime is known accomplished 3.04 lactations on average while animals that were treated as incomplete records accomplished 2.30 lactations. Determined survival rates indicate that almost 50% cows are being culled during the first and second lactation while an average annual rate of culling accounts for 28.1%. By use of a survival analysis a statistically significant effect of farm, year and season of calving, age at first calving, share of genes of Holstein-Friesian breed and lactation on a duration of productive life was determined (Stanojević, 2017).

It seems inevitable that selection in the future will be more intensively conducted on the traits related to longevity and resistance in order to make the production itself economically justified. Breeding and selection work in modern cattle breeding is, besides realization of high milk production, also directed to creating breeding females with ability to calve easily (Djedović et al., 2013b), what is particularly important for maintaining high fertility and long life span, or in other words, lifetime milk production. Cows that have difficult calvings with high calf mortality produce lower yield of milk due to longer recovery. Bearing this in mind, a good functional status of animal has become one of breeding goals for farmers throughout the world (Bogdanović et al., 2005).

These problems connected with longevity, resistance, body development and reproductive disorders are more than sufficient cause for protection and use of autochthonous breeds of cattle in which these traits have been preserved. Programmes of biodiversity should be designed in such a way that they optimally use genetic variations between and within populations. Breeders` organisations must contribute to preserving genetic diversity in their populations of animals. With reference to this they must continually monitor rate and degree of inbreeding and genetic drift. Preservation of biodiversity is reflected in identification of rare genes in populations and their preservation in small populations. Their preservation is a priority since besides preserving variability in populations by preserving biodiversity a possibility of further raising of cattle is opened as well. Preservation of biodiversity is also an important issue from the aspect of preserving and improving local species and breeds which are very important in marginal regions (Djedović et al., 2012).

New national breeding programmes in cattle breeding set as an aim raising of durable, robust cows with good type traits, of good fertility and able to maintain an existing high yielding milk production at the same level. Linear estimation of type traits is the basis of all modern classification systems and foundation of all systems for describing the appearance of diary cows. It is based on measurements of certain type traits without giving opinion about them and describes the degree of trait expressiveness and not its desirability (Janković et al., 2016). On the basis of score for each trait or on linear score the animals are being ranked in certain categories and according to desirability chosen to be the parents of succeeding generations.

Linear estimation provides interpretation of biological relationships between type traits. Namely, selection of dairy cows on the basis of exterior is controlled by measurings and estimation of various type traits (body, dairy character, legs and udders) which are the best indicators of capability of production of milk and calves as well as of health and longevity of an animal. A significance of linear system of estimation is reflected in the fact that it enables styding both phenotypic and genotypic variability of type traits, provides calculation of heritability coefficients and correlations of type traits with productive traits and other research connected with body development, reproduction, productive life and longevity (Janković et al., 2016). It is desirable that cows should be linearly estimated in the first lactation from 30 to 150 day after calving and in that sense a numerical estimation of animal for certain traits is predicted. This numerical, i.e. linear estimation, includes estimation of every predicted trait in its biological extremes in the range from 1-9.

Overall estimation of type traits is defined by the country in which linear estimation is carried out in accordance with an economic importance of some type traits and breeding goals defined. Type traits are included into type functional aggregates and total score is formed for them and afterwards, depending on the importance of each functional aggregate, a total score is being formed for the type. According to Interbull (2011) recommendations type traits are divided into 4 functional aggregates (groups), (besides which a belonging singular type traits are also stated):

- frame (height of loins, back line, chest width, body depth, position and width of pelvis);
- dairy character (angularity);
- legs and toes (position of back legs from the back, position of back legs from the side, angle of toes);
- udder (fore-udder attachment, front teat position, teat length, udder depth, rear udder height, central ligament, rear teat position, rear teat length).

In these linear type traits, the udder traits are among the most important criteria used for predicting milk production. In high-yielding dairy cows the udder traits are defined by a number of singular traits such as fore-udder and rear udder attachment, udder depth, fore teat and rear teat length, etc. Udder traits show low to medium and high heritabilities and can be estimated relatively early in life what is deemed desirable from the aspect of selection of cows for milk production (Khan, Khan, 2016). Thus, for example, udder depth is a very good indicator of milk yield in lactation (Lin et al., 1987). Selection on increase of milk yield will most probably cause increase of udder secretory tissue and likewise the volume of udder will tend to increase as well. On the other hand non-functional forms (such as for example disbalance between fore and rear part of udder) can lead to early damage of udder and decreased milk yield Numerous studies showed that there exists both positive and negative correlation between milk yield traits and linear traits of udder in dairy cows. Studying genetic parameters for udder traits only, Liu et al. (2014) obtained values of genetic correlations of udder traits with milk production in the values of very weak (-0.20 for udder depth) to very strong (0.82 for rear udder width). Bohlouli et al. (2015) in their study on correlations between type traits and milk yield established positive correlations in all type traits which were in the interval of very weak as 0.02 for front teat position to weak as 0.26 for angularity. Also, Khan and Khan (2016) in their research obtained the values of genetic correlations ranging from very weak for udder depth (-0.23) to medium for rear udder width (0.40).

According to Bohlouli et al. (2015) udder depth is in a negative correlation with longevity of dairy cows. Heritability of udder volume is lower compared to singular anatomic traits of udder due to the fact that volume and mass of udders are in every moment under the effect of several factors. These factors are: milk yield, interval between two milkings, occurrence of mastitis or oedema, depositing of fat in udder, etc. Boelling and Pollot (1998) indicate a negative effect of wide and deep udders on cow locomotive organs and on their restrained movements. Also, Caraviello et al. (2003) reported that cows with deeper udders had tendency to exhibit higher levels of somatic cells in milk. The attachment and rear udder height, as well as strength of central ligament show a high correlation with lifetime milk production (Sewalem et al., 2004; Duru et al., 2012). Udder diseases are frequent cause of culling of dairy cows from productive herd. The traits of udder structure, teat structure and count of somatic cells are recognized as the traits which are potentially useful for indirect selection on udder health (Rogers et al., 1999). Styding the correlation between the traits of udder structure and incidence of clinical mastitis, Rogers et al. (1999) determined positive genetic correlations for all udder traits being in the range of extremely low of 0.09 for rear udder height to strong of 0.52 for udder depth, while extremely low negative correlations were obtained only for the traits of teat length and rear udder width (-0.02; -0.07). In general, selection on the traits of udder also contributes to improving milk quality by decreasing the frequency of problems connected with udder health but also with legs and toes which provide a normal locomotion to a cow and therefore can influence the decrease of level of stress which can very often affect the decrease of milk yield (Campos et al., 2015).

All things considered there was an increasing number of studies on heritability and correlation of udder traits and milk yield conducted in the world in the last decade particularly in reference to automatic milking performed by robots.

Use of molecular genetics and genomics in cattle improving

Besides use of a traditional selection of cattle on the basis of linear methods and models there is an evident development of biotechnological methods and their use in livestock breeding. From the aspect of animal improvement, this scientific discipline is dividied into two major categories: reproductive technologies (artificial insemination, embryotransfer, sex control, cloning) and molecular technology (DNA fingerprinting, marker-assisted selection, gene transfer).

During the last two decades a polymerase chain reaction (PCR), and somewhat later DNA sequentioning as principal research methods in molecular genetics have become an integral part of modern methods of cattle improvement and economically acceptable to a wider circle of scientists (Avise, 2004). Also, a few new genetic markers have been developed (GM) such as microsatellites and polymorphism of one nucleotide (SNP-Single Nucleotide Polymorphism), and at the same time computer programmes were enhanced for data processing what enabled application of molecular techniques in many research fields, especially in livestock breeding.

According to reliability, specificity and speed of analysis, adequate gene markers were established. Research conducted in individual animals and in populations via gene markers does not demand expensive and sophisticated equipment in contrast to complex DNA research such as sequentioning.

In practical application following gene markers are mostly used: RFLP (Restriction Fragment Length Polymorphisms), SSLP (Simple Sequence Length Polymorphism), AFLP (Amplified Fragment Polymorphism), RAPD (Random Amplification of Polymorphic DNA), VNTR (Variable Number Tandem Repeats), SNP (Single Nucleotide Polymorphism), STR (Short Tandem Repeat), MP (Microsatellite Polymorphism), MS (Minisatellites). In general, dominant and co-dominant markers are distinguished. The first provide possibility of analysis of more sites at the same time (RAPD), i.e. they can multiply more DNA sequences in one PCR reaction (Polymerase Chain Reaction), while the others (RFLP, minisatellites) are more accurate in experiments because they make possible to do the analysis of one site on DNA although for their use it is necessary to know the exact DNA sequence.

Among mentioned markers the largest application in cattle improvement has found microsatellites and polymorphisms of a single nucleotide (SNP). SNP can be placed inside encoding sequence of genes and in non-sequentioning fragments of DNA. In encoding fragments (egzoni) they can be directly connected to the function of proteins. Since these markers are stable in respect to inheritance they are very suitable for a long-term selection.

In a similar way in which artificial insemination is most widely accepted technology in cattle insemination the use of genetic markers in selection of farm animals will find its place in the future. The idea of using genetic markers in livestock breeding appeared in 1983 and during the nineties of the 20th century a Marker assisted selection, i.e. MAS was developed.

In the mapping of locuses of quantitative traits QTL *(Quantitative Trait Loci)* molecular markers are used to improve the efficiency of selection in so-called MAS (*marker assisted selection*). QTL got the name due to significant relationships observed between allelic variances and quantitative traits. Because of the proximity of locuses associated with economically important traits of farm animals the possibility of recombination is reduced what provokes increased chances for discovering interesting genotypes. Experiences in the application of this method showed that MAS technology linked with developed reproductive technologies results in shortening of generation interval and therefore in increasing the intensity of selection and faster genetic advance defined in breeding and selection programme for individual breeds. Taking into account a relatively small number of markers which in the nineties of the last century were at disposal, the use of MAS method was limited but all the same it had a positive contribution to selection work. It is not likely that this method will replace present methods but along with the use of genomic selection and traditional methods it can raise the level of efficiency of selection onto a higher level.

Fast development of molecular genetics provided a direct analysis of animal genome, research into the structure and functions of genes what helped us to understand better the action of hereditary basis. By providing insight into a structure and function of genomes and genes, bovine decoded gene maps and genetic markers have become tools used in selection and have a significant effect on the improvement of productive traits, elimination of hereditary diseases (heterozygotes with hereditary error) and greater reliability of selection work.

In order to make a genetic profile of an individual it is necessary to do mapping of genomes and genes. Basis for understanding of the action of genome are gene maps as well as practical use of genetic markers in selection programmes. They are composed of defined genes or fragments of chromosomes which make a foundation for their further completing. Until now the most completely decoded map is of a human genome. Among the first published gene maps were gene maps for cattle based on microsatellites. Major uses of genetic markers for selection of breeding livestock animals were defined by Bekman and Seler. They started from the presumption that polymorphism of genetic markers has a potential to estimate gene locuses which affect economic traits. Also they bore in mind the theory that selection based on markers could be used in multiplication and management of useful allelles within breeding stock population.

Sequentioning reveals polymorphism of a single nucleotide (SNP) or varying of DNA sequences and represents one of basic methodical approaches to DNA genotypisation in cattle. The concept of SNP (Single Nucleotide Polymorphism) represents the replacement of one nucleotid by another. It can be found in encoding and non-encoding gene regions. In the situation when two different nucleotides exist at the same site inside genome or on pair of chromosomes it is the question of their polymorphism. Two DNA fragments on which sequentioning has been done, for example AACGTCACT and AACGTCAGT, differ in one nucleotide. There are two different in the first C (cytosine) and in second G (guanine).

Besides a great role in human medicine in discovering various causes of diseases and disorders, SNP genotyping (ghenos-gene, types-trace, mark) has an important role in livestock breeding as well, particularly in cattle breeding. With their help the traits inherited from parents can be early determined. By a statistical procedure used for these SNP their relationship or participation in genomic breeding value (gPV) can be determined.

gPV = sum of all SNP effects = participation of gene markers in PV

A genotyping procedure is a complex and demanding one. Genotyping itself means comparison of chip and animal DNA and reactions between them. Data obtained therein are processed by help of specialized computer programmes which provide genotype for each singular individual. Genotyping can be conducted in individuals of both sexes immediately after birth. DNA necessary for genotyping can be isolated from blood, tissue, semen, hair, etc. Use of only one SNP chip can determine thousands of SNP of animals at the same time.

The first company which developed chip (2007) for identification of the site of gene in which 54.001 SNP of calf is placed was company *Illumina* from San Diego. Later, one Dutch company offered a chip which could determine 60,000 of SNP. In order to reduce cost and make use more simple a chip of lower density has been developed (*Low density*) with only 3,000 SNP markers of lower safety (for selection of female animals) during two-step, i.e. two-stage selection.

The value of every individual marker is determined in relation to so-called reference population (group of breeding males with a reliable PV = number of results of progeny testing and studied DNA profile). Candidates for selection are young animals to which these calculations refer. The least number of individuals of reference population is about 1,000 male animals with the exact indices of functional and productive traits. After SNP analyses the results are used in making patterns of estimation of analysed traits and PV is being determined. By placing a certain effect for each marker in relation to the average and positive effects of all markers the indices of genomic selection for certain cattle breeds are obtained. The result of genotyping of male animals is a great accuracy of prediction. Furthermore, an early sampling and high accuracy of PV has a great importance in the choice of dams of future breeding animals. Moreover, this method could be useful in choosing donors for embryo transfer, as well as for the estimation of their offspring, ranking, i.e. removing weaker animals from the breeding stock.

By genomic selection a cheap genotyping of an individual is possible independently of age and sex, as well as calculating a breeding value of male and female calves even in the age of only several days (Ivanković, 2012). Patry and Ducrocq (2011) reported that further development of genomic selection and the increase in availability of genotypes would lead to increase in reliability of genomic breeding value (gPV). A key problem in determination of gPV is the estimation of output of some SNP alleles on the traits of interest. According to Habier et al. (2007) predicting a genomic breeding value is more reliable when young individuals share the same origin with the individuals from reference population so that optimal strategy for choice of reference population could be genetic proximity between the individuals for determination of a reference population and young individuals – candidates.

One of the problems of genomic selection is that there is still a small number of animals which have been genotyped so it is a great problem to combine genomic and non-genomic data of all individuals, regardless whether they have been genomically tested or not. Nevertheless, in the last few years number of genotyped animals in the world was increasing steadily and for example tempo of genotyping in the USA in 2015 was about 50,000 animal/month.

Taking into account that so far dense maps of markers per acceptable price of genotyping have been available a genomic selection already provides a high accuracy of predicting the breeding value in genotyped animals. It is necessary to consider the advantages of the use of genomic selection in our country as well especially when improvement of the most important traits of cattle is in question (Djedović et al., 2012).

Another great contribution of molecular genetics is its use in detecting polymorphic variants of genes which act on physiological process of milk secretion. By connecting these genes with milk yield traits a great possibility of extra improvement of individual`s predisposition and cattle populations for this production is being opened. A dairy processing industry is especially interested in these contributions. By use of PCR and RFPL techiques it is possible to determine a variability of milk protein fractions. A determination of variants of casein and lactoglobuline as the most important milk proteins are particularly important for milk processing (Ivanković, 2012). In our country the research regarding determination of frequency of primary polymorphic variants of kappa casein in the milk of Simmental cows, the crossbreds obtained by crossing Simmental breed with Red Holstein and autochthonous breed Busha was conducted as well. The results obtained made possible realization of comparative advantages of mentioned genotypes associated with qualitative and quantitative traits of milk yield and advantages of milk for further processing (Djedović, 2015).

It is expected that in the future consumers will demand to know in detail the composition and quality of animal foodstuffs which they consume. It is supposed that products on whose wrapping there will be information about certain proteins or fat acids will be demanded on the market and will have primacy over the foodstuffs used today. Trend of consumption of milk and meat will be continued and their quality is being estimated according to the quantity of certain proteins and composition of fatty acids.

New events on the market give rise to a strategic problem regarding tolerance of human organism to type A_1 milk. The most important ingredients in milk are proteins composed of long chains of amino acids. One of these proteins is beta-casein. It is thought that about five thousand years ago there occurred a mutation in amino acid composition in this protein making it to produce peptide called BCM7 (beta-casomorphin 7). What is interesting is the fact that the mutation happened in high-yielding Black and White breed cows but not in the cows originated from Asia and Africa. Almost all Holstein cows have this peptide and they are called cows of type A_1. Cows of type A_2 don't have this peptide. What is actually the difference and why is the consumption of milk of type A_1 compromised? The reason is in different investigations which suggest that peptide BCM7 can even act as an opioid and to a certain degree contributes to development of different chronic diseases, including autoimmune states, heart diseases, autism, schizophrenia and various neurological disorders. On the other hand, this peptide in human organism is not able to make a damage of wider extent if gastrointestinal tract of man is healhty. Australia was the first to place type A_2 milk on the market. From a genetic standpoint the milk of type A_1, as well as type A_2, is obtained from parents who are homozygotous for BCM7 peptide, while in the case of heterozygous parents there is milk of type A_1A_2, in which case one parent has this peptide. It is interesting that this peptide cannot be found in goat nor in the sheep milk.

Current and future challenges in genetic improvement of cattle

As it has already been stated, other aspects, besides profitability, may impact breeding and selection programmes in livestock production and therefore in cattle breeding as well. In the foreground there is the impact of climate changes and an environment protection. Climate changes affect food production and its safety (more frequent events of extreme climate conditions, emergence of new pathogens and diseases, etc.). However, a livestock production itself is according to 1998 FAO report responsible for emission of 18% gasses of greenhouse, carbon-dioxide (CO_2), methane (CH_4), nitrogen-suboxide (N_2O) etc., considered to be the greatest culprits for global climate changes on Earth. Livestock production is, directly or indirectly, responsible for 37% emission of methane, 65% nitrogen oxide and 9% emission of carbon-dioxide. As it can be seen from the data, livestock production greatly affects climate changes which are mostly associated with the growth of average annual temperatures what is evident in our region as well. Furthermore, to a significant extent, climate changes affect productivity, well-being and health of cattle used for production purposes. Over a few past decades the effect of high summer temperatures on production and health of animals has already been investigated. This problem is particularly evident in farms and tied systems of keeping cattle where during a whole year animals are kept in stables with relatively small yards and most often fed concentrated and conserved feedstuffs.

As it is well-known, cattle like all other mammals belong to homeothermal (warmblooded) animals, i.e. they have the ability to maintain stable body temperature independent on environment temperature. The condition of maintenance of homeothermia in the conditions of environmental variable outside temperatures means to maintain a constant thermal balance or balance between creating and releasing the heat from the organism. Most animals can, fairly easily, maintain homeothermia of their organism if outside air temperature is in interval from 5°C to 30°C. It should be pointed out that cattle, like majority of other species of animals, can easier endure lower air temperatures than higher ones. As air temperature decreases or what is even more dangerous, increases, likewise a defensive mechanism of creating or releasing heat from the organism ”gets involved“, all with a view to necessary maintenance of homeothermia. However, it is possible only to a certain limit. In other words, if air temperature continues to rise, especially if it is accompanied by increase of air humidity as well, it becomes more and more harder for defensive mechanisms to perform their function due to overheating of organism what gradually leads to increased generating of body heat and eventually to the increase of body temperature and the occurrence of heat stress. Today it is common to use so-called”temperature-humidity index“ (THI or TH index) for the estimation of heat stress in cattle which is calculated on the basis of temperature and humidity of air by means of special formulas. For determination of THI value certain tables were made which serve to determine the concrete value of TH index on the basis of measured air temperature and humidity.

At a current level of agricultural production, problems are also evident in environmental protection which arises due to unsuitable use of chemical substances which are being unprofessionally used by farmers and thus a greater quantity of contaminating matters gets into soil, surface and underground waters. A substantial pollution of land and water flows by nutrients comes from livestock farms and slaughter industry.

Over a few last years a great success in improvement of cattle, with a favourable accent on the environment, was achieved by improving nutrition efficiency. This is directly related to selection of animals which will use diet nitrogen and phosphorous efficiently what decreases secretion of these elements into environment. In this case, feed conversion is crucial. Although a favourable effect is reached still there is enough space for this process to be improved in all species of domestic animals and therefore in cattle as well. The advancement shall require more knowledge in the field of genomics, functioning of digestive tract and metabolism of mineral and nutritional matters as well as suitable methods for improvement of environment on a global scale.

Cattle can make an effect on the environment by maintaining ecosystem by spending their time on pastures. This practice will certainly be continued in the future and the animals of special genotypes will be kept on pastures. It is necessary to additionally increase the level of production and to decrease the cost of product. It is also necessary to secure adequate number of foodstuffs (milk and meat) in relation to an increasing number of human population. Therefore it is necessary to make a balance between the level of production, selection, fertility and well-being of animals (health, reproduction, resistance, longevity) and people`s needs.

In the next period, majority of cattle will certainly be raised in big units although a great number of animals still exist in family households. In this case, well-being of animals will be a priority. For that reason the attention should be devoted to development of efficient systems of information management for monitoring productivity and health status. An increasing number of working operations in cattle breeding will be performed by automated systems. Significant changes will happen in the world of mechanization and in such a way that workers on the farms will have to devote more time to system management and much less to problematic animals. A traditional definition of breeder of domestic animals shall in that way be replaced in the sense that breeders will dominantly utilize facts, information technologies and numbers on the basis of which they will make decisions regarding selection, reproduction, well-being, health protection and preservation of environment.

Conclusion

All research activites and innovations regarding genetic improvement in cattle should be further continuously conducted through national and international research projects. During making concepts and realization of projects concerning cattle improvement in the future it is necessary to direct research tasks and activities to genomic selection, data collection, bio-informatics, genetic of functional traits and designing of breeding programmes. For example, genomic selection enables better control of origin and prevents sib-mating while the greatest advantage of genomic selection is in improvement of traits with low heritability such as fertility and longevity. This should certainly be accompanied by the research based on reproduction which is currently the major reason of culling high-yielding cows from production. Furthermore, more reliable methods and models for estimation of cattle traits breeding value should be developed during which process information on genomic and traditional selection should be combined.

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FARM MANAGEMENT INSURANCE IN THE REPUBLIC OF SERBIA[1]

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Abstract

The main goal of this article is to present the state and trend of agricultural insurance development in the Republic of Serbia, as to investigate the factors that determine the extent of agricultural insurance.

Agricultural insurance in the Republic of Serbia is underdeveloped. During 2015, the number of signed policies was 19,799, or 3.13% of the total number of agricultural households. Mainly plant production is secured with almost 90% participation. The total premium for crop and fruit insurance is around 130 million EUR. The insured areas cover an average of 400,000 ha or 13% of the total arable land, with a slight upward trend.

Factors on which the development of insurance depends are the economic development of the country, the state financial support, the offers of insurance companies, the specialization of production, the level of information of farmers, their perceptions of the importance of insurance, etc. Farmers perceive agricultural insurance as beneficial. They cite stability of production/income as the main motive for concluding insurance contracts, and other motives such as personal perceptions, information and education are important. Farmers who do not have an insurance policy state as a key limiting factor the lack of financial resources, as the price of insurance, lack of adequate information, distrust, etc.

Key words: management, insurance, farm.

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1 Paper is part of the project III 46006 - Sustainable Agriculture and Rural Development in Terms of the Republic of Serbia Strategic Goals Realization within the Danube Region, funded by Ministry of Education, Science and Technical Development of the Republic of Serbia. Project period 2011-2019.

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Introduction

Agriculture is of great importance to every national economy. It participates in GDP creation, employs a large number of people, is a way of life for people in rural areas.

Problems of today, such as, global warming, natural disasters, pandemics, etc. have a significant negative impact on agricultural production. Production risks in agriculture are increasing. The most common risk management instruments in agriculture include: insurance, claims and mutual insurance funds (Marković, 2013). The protection of agricultural production through insurance is the safest and overall protection (Čolović, Mrvić Petrović, 2014).

Despite the involvement of state-of-the-art production factors (technology), agricultural production is constantly exposed to predictable and unpredictable risks. Exactly, risks and uncertainty are a determining factor in access to insurance companies› services. Insurance companies exist to ensure greater safety of production and less damage if they occur.

Insurance is the type of business in which the insurer takes action to indemnify the insured in the event that the insured event occurs for a specified amount. Insurance premium represents the price for the insurance service. The size of the premium is directly proportional to the size of risk, the value of the insured sum and the length of service (Žarković et al., 2014). Agricultural insurance provides compensation for economic loss derived from the damage to crops and animals in the event of adverse natural and other phenomena (Hatch, 2008). A key role of insurance is the indirect economic protection of life and property from the impacts of natural forces and disasters. Main feature of agricultural insurance is reduced diversification, due to the large possibility of correlation between risks, that is, its occurrence in a large number of farmers (Petrović et al., 2013).

Insurance ensures the stability of production, as it covers the damage caused by the realization of risk. Insurance is an economic form of production protection, which ensures certainty of the results of work and invested resources (Marković, 2009; Marković, 2013).

Insurance management and agricultural production, despite their decades-long cooperation, continue to be directed at one another. This is supported by the fact that currently secured privately owned agricultural production covers only 12% of total agricultural holdings[4]. The market logic of business and the requirement for sustainability, with all the effects of competition and risk of survival, are a sure indicator of the expansion of cooperation between insurance companies and policy makers.

The reason for the low rate of insurance of agricultural production is not only the high risks and therefore the high premiums, but also the way in which protection through insurance is realized, and the paper will seek to shed light on the problems of insurance of agricultural holdings and propose guidelines for improving the situation.

New challenges are imperative in the flexibility and content of insurance policies and services, since competition laws affect all market players, including these services. Insurance companies are also finding innovative and attractive forms of services to cover risks and damages in agriculture, and their realization requires far more and better customer animation, i.e. agricultural producers.

Damage and losses suffered are not just direct losses of the manufacturer. Given the inelasticity of demand for most agricultural and food products, market supply volatility is possible. A smaller supply will imply price volatility and a weakening of purchasing power with inflationary consequences and other market disruptions. In this regard, the state has an interest in engaging in certain ways in agricultural production insurance programs, be it co-financing of insurance premiums, risk prevention etc.

Research goals and methodology

The main goal of this paper is to present the state and trend of agricultural insurance development in the Republic of Serbia, as well as to investigate the factors that determine the scope of agricultural insurance.

The paper applies general scientific methods to review previous research, and the empirical part of the paper is based on a survey questionnaire and a graphical method.

Agricultural production insurance in the Republic of Serbia

Given the multifaceted importance of agriculture and its supporting activities, both for the overall development and stability and security of the essential food mar-

4 A slightly better situation with regard to insurance is with legal entities. According to Nemanja Beljanski (Generali Insurance), about 50% of the area is processed annually by legal entities, which is only 15% of the total arable land (Poljoprivrednik, 2019).

kets, insurance companies recognize a strong interest in providing services and see a further perspective on engagement and mutual permeation.

Agricultural insurance covers two sectors: 1) crop and fruit insurance; and 2) livestock insurance. For crops and fruits, insurance covers loss of yield derived from damages to crops. Livestock insurance covers all types of farmed animals and certain types of wild animals. The main risks involve death, emergency killing or slaughtering of animals towards the illness or accident, with the potential to insure against many additional risks. Only animals of a certain age can be provided, provided they are healthy, well-maintained and kept in acceptable conditions (Miletić et al., 2016; Čolović et al., 2016).

Crop and animal insurance is becoming increasingly important, as an instrument of agricultural policy (Ramsey, Santeramo, 2017). The importance of understanding the risks that farmers are exposed to and the forms of risk management available to farmers are crucial given the importance of agriculture and the fact that a stable agricultural sector can mitigate the negative economic consequences of the crisis (FAO, 2009). In the world, crop and fruit insurance is significantly more prevalent than animal insurance. Such is the trend with us. For example, the number of crop and fruit insurance contracts in 2008 was 15,186, representing 87.10% of agricultural insurance (Markovic, 2013).

The following arrangements have been integrated into the crop and fruit insurance, offering:

- basic risk packages that provide the payment of damage caused by hail, fire and lightning;
- supplemental risk packages including storm, spring and/or fall frost, floods, loss of seed quality, post-harvest, harvesting risk packages.

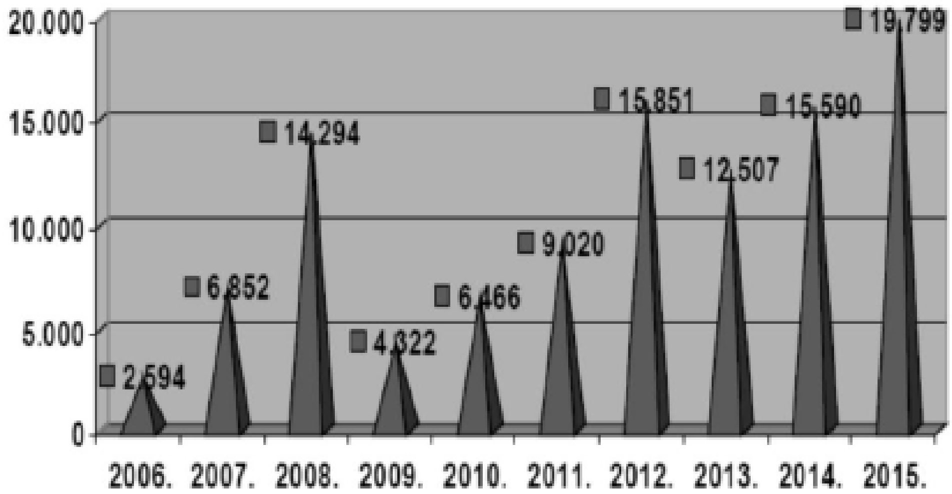
Animals can be secured from (Čolović et al., 2016):

- a basic risk, which involves the death, forcible slaughter or forcible killing, towards the illness or accident;
- additional risks that can be inferred at the basic risk, such as insuring male breeding heads from loss of breeding capacity, ensuring the loss of calves or foals at childbirth, ensuring risk of loss of breeding capacity of heifers or cows, insurance against the risk of castration and ovariiotomy, animal insurance at exhibitions, etc.

In order to get a clearer picture of the state of agricultural insurance at the national level, some basic indicators will be presented:

- share of secured agricultural land,
- number of signed policies,
- the size of the agricultural insurance premium,
- number of agricultural holdings using the right to recourse to insurance premiums[5].

Graph 1. Estimation of the number of insured agricultural holdings in the Republic of Serbia (2006-2015)*



Source: Radović, 2016.

Note: *According to reports of 4 the largest companies that have agricultural insurance in offer.

Previous period characterized a positive trend in number of agricultural holdings concluding the insurance contracts (Njegomir, Rihter, 2018). So, e.g. in 2015, 19,799 farms were insured, representing just 3.13% of the total number of farms. An additional disadvantage is the low share of animal insurance, only 1,531 farms (Radović, 2016).

Agricultural insurance is an extremely risky business and it is often the case that insurance companies produce negative results, where the damage rate is

5 Since the Republic of Serbia does not keep a register of insured agricultural holdings, for the number of holdings that use the right to regress premiums, we take data on the total number of insured agricultural holdings (Radović, 2017).

almost 100%. The average value of damage claims in Europe ranges from 60% to 70% of the insurance premium (Marović et al., 2017). For this reason, many companies in the domestic market do not offer agriculture, and those that have thus expand their client portfolio and promote their business.

Crop insurance

Crops are grown mainly outdoors, which means that they are exposed to various risks, especially weather, which can sometimes be predicted but almost often impossible to control and avoid. The realization of various risks in production, i.e. the occurrence of damages is not sporadic, so it is of great importance to take measures to reduce the risks and damages in agricultural production.

Climate change and trends suggest that greater realizations of risk and, consequently, greater losses of crop yields can be expected. Hatch (2008) points out that climate shocks can destroy crops, livestock and other productive assets. Many low-income rural households cite weather risks as their number one concern. One of the key innovations in the Serbian insurance market is the emergence of index flood and drought insurance. For now, only corn, soybean and sugar beet cover has been provided (Petrovic et al., 2013). Mladenovic (Danube Insurance) notes that it is more worthwhile to conclude insurance contracts than “looking at the sky” and the costs that may arise from realizing the risks (Poljoprivrednik, 2019).

The degree of development of agricultural insurance is measured through the risks covered by insurance, the number and type of insurance policies, as well as through state assistance (premium regression), (Labudović Stanković, Todorović, 2011). Plant production insurance is one of the most risky insurance businesses, implying a tight supply by insurance companies, and risk coverage is often limited to the basic ones.

According to Žarković et al. (2014), the value of total arable products on arable land in the Republic of Serbia is approximately 3.3 billion EUR. The total premium that can be generated by securing crops and fruit is around 130 million EUR. This data indicates that the crop insurance is underdeveloped.

The average price of wheat insurance (basic package) for the insurance sum of 100,000 RSD, which is the average production value per hectare, assuming recourse to 40%, is only 1,200 RSD (Poljoprivrednik, 2019). Considering that insurance costs are extremely low (the share of total costs is 1.5% - 2% (Miletić et al., 2016), agricultural insurance must be important. Many experts argue that agricultural insurance costs are negligible in relation to the benefits it provides (Radović, 2016).

Farmers largely rely solely on government assistance, neglecting not only the possibility and need to conclude insurance, but also abandon preventive risk reduction measures, leading to the creation of a moral hazard situation - abuse of insurance (Marović et al., 2017).

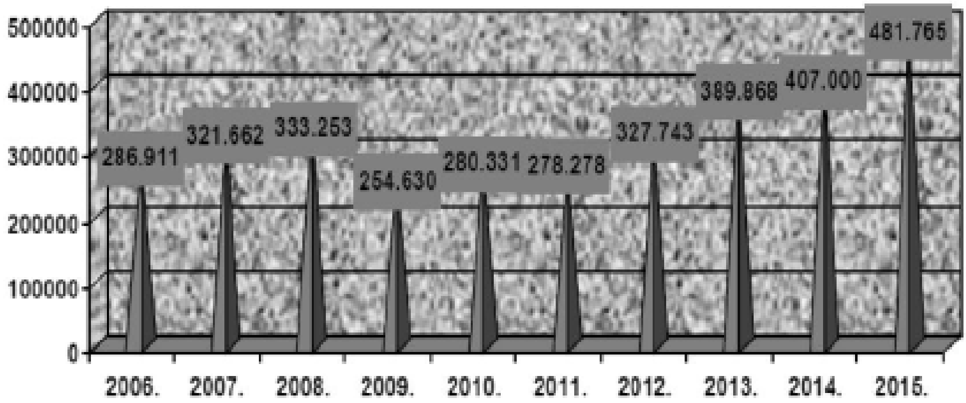
Given the importance of agricultural production, the government seeks to reduce the negative impact of risk on farmers. The most common form of government intervention occurs in the form of insurance premium regression (Petrović et al., 2013). Regressing insurance premiums is the most widely used model for stimulating the development of insurance in agriculture.

In 2006, in order to encourage farmers to conclude insurance contracts, a measure of premium regression was introduced. Initially, the regression was 30%, only for registered farms where agriculture is the only source of income (Birovljev et al., 2015). Although other criteria or conditions are likely to be significantly more effective, such as e.g. respect for environmental measures and best (ecological) agricultural practices (Žarković et al., 2014). In 2019, 600 million RSD was set aside for regressing the insurance premium, which is four times more than in 2018 (Poljoprivrednik, 2019). Since 2008, the state has been subsidizing 40% of the insurance premium[6]. Farmers working under difficult conditions are entitled to a refund of 45%. In areas particularly vulnerable to the weather factor, the recourse to insurance premiums is as high as 70% in 2019 (Poljoprivrednik, 2019). There is a belief that an increase in agricultural insurance recourse will significantly increase the number of insurance policies.

In Italy, the crop insurance premium is subsidized at 64%, in Spain at 49%, in Austria at 46%, in the Czech Republic at 30%. In Slovenia, basic risks are subsidized from 30 to 50% (Bielza Diaz Caneja et al., 2009).

6 Regression of the insurance premium relates to a maximum of 20 ha under a suitable crop (OGRS, 38/2012).

Graph 2. Trend of agricultural land insurance in the Republic of Serbia (2006-2015)*



Source: Radović, 2016.

Note: * According to reports of 4 the largest companies that have agricultural insurance in offer.

Graph 2. shows the variations of the area covered by the insurance policy, which on average provided 300,000 ha or 8% of the total arable land. Optimism is pouring in that since 2011, there has been a slight upward trend in areas under insurance.

The coverage of arable agricultural land by insurance is extremely low in the Republic of Serbia. The most secured areas were in 2015, when 481,765 hectares were insured. This is 9.5% of the total agricultural area, or 13.74% of the total arable agricultural area. Miletić et al. (2016) consider that the increase in secured agricultural land occurred after the catastrophic floods that hit certain areas of the Republic of Serbia in 2014. Take Germany, for example, in which almost half of the arable land is insured (43% or 7.3 million ha) and the insurance premium collected is 129 million EUR (Markovic, 2009).

Some surveys show that in sum of registered farms at national level (450,000 farms) only small number buy insurance (Žarković et al., 2014). The number of insurance contracts (policies) concluded in crop production in 2017 were 30,346, and in 2018, 39,212 (Radović, in: Poljoprivrednik, 2019). From 2005 to 2013, the number of agricultural insurance policies (crops and animals) ranged between 10,000 and 15,000 (Radovic, 2016).

Furthermore, the crop and fruit insurance premium is constantly recording growth for the observed period (2006-2015), which gives rise to optimism that such a trend will continue in the future. A comparative overview of changes in the level of insurance premiums for the crop and livestock production in the Republic of Serbia is presented within the next table.

Table 1. Agricultural insurance premium in the Republic of Serbia

Year	Plant production insurance premium (in 000 RSD)	Animal insurance premium (in 000 RSD)
2006	611.691	409.737
2007	751.461	516.619
2008	1.105.208	511.247
2009	746.736	377.500
2010	793.873	283.180
2011	968.926	269.200
2012	1.126.363	438.397
2013	1.503.919	405.255
2014	1.603.900	440.739
2015	1.672.794	522.067

Source: Radović, 2016.

Far more attention must be paid to securing crops and fruits under our conditions, as risks are realized year after year and huge damage is done (Marković, 2013).

Livestock insurance

Great care, dedication and commitment in livestock production is not enough to eliminate all the dangers and accidents that can happen, so livestock insurance is a reality, and with increasing investment in high-growth animals and state-of-the-art equipment, the risks are increasing. Despite the relatively low insurance premiums, livestock insurance has to small share within the agricultural insurance in the Republic of Serbia.

In general, livestock insurance allows the insurance of healthy animals, such are: cattle, pigs, sheep, goats, horses, poultry, fish, dogs, bees, mink, and farmed pheasants, as well as exotic animals kept as domestic. This kind of insurance covers just animals but not their products (Čolović et al., 2016). In the insurance of livestock or crops, the insured has to undertake all anticipated, agreed, or other measures, preventing the occurrence of any insurance event.

In general, very few farms enter into a livestock insurance contract. The number of animal insurance policies in 2017 was 3,642, while 4,506 policies were concluded in 2018 (Radovic, in: Poljoprivrednik, 2019). In the period 2006-2015, the number of animal insurance contracts varied by year from 1,500 to

5,500, with a slight upward trend since 2013 (Radovic, 2016). Animal insurance is most often related to the risk of sudden mortality and is often associated with loans obtained (Marovic et al., 2017).

The total premium of livestock insurance has a slight upward trend (Table 1.), but it is certainly less in comparison with crop and fruit insurance. For the period 2006-2015, the premium under concluded animal insurance contracts ranged from 269 million to 522 million RSD. The animal insurance premium has fluctuated significantly over the observed period, but its value relative to the crop and fruit insurance premium increased slightly, by only 27% in 2015, compared to 2006 (Radovic, 2016).

The average insurance policy for sheep and goats is about 10%, for cows and heifers about 9%, breeding pigs about 8%, and for breeding poultry about 10% of their value, that is, the sum of insurance. For livestock in fattening, the insurance price percentage ranges from 4.5% to 8% of their value at the end of fattening (Poljoprivrednik, 2019).

In order to ensure full economic protection, i.e. effective risk management in livestock farming, cooperation among agricultural producers, insurance companies and the state is necessary (Markovic, Jovanovic, 2010).

Factors of Insurance Development in the Republic of Serbia

The number of insurance contracts in the agricultural sector is increasing year by year, but this is still not satisfactory (Poljoprivrednik, 2019).

The level of development of agricultural insurance depends on the economic development of the country, the financial support of the state, the supply of insurance companies, the volume of investments (higher investments require protection), the economic strength of agricultural entities, the specialization of production, the level of awareness of farmers, their perception of the importance of insurance, etc.

The problem of financing agriculture, inconsistent agrarian policy, insufficient support for agriculture, and inadequate conditions in the financial market have put agriculture in a difficult state, and therefore insurance. The underdeveloped and unregulated markets, along with the uncontrolled import of agri-food products, have generated unfavourable economic position of agriculture. Poor organization of the agrarian sector, lack of association, unfavourable ownership structure (small and fragmented possessions), and unfavourable demographic structure in rural areas make it impossible to intensify agricultural production. In such a situation, it is somewhat understandable that agricultural insurance has practically not come to life.

A lower insurance premium encourages farmers to buy insurance, so it is important to consider further reducing the insurance premium. For example, before 2000, the US government subsidized a 30% crop insurance premium. About 40% of the area under maize and wheat was secured at that time. After 2000, US subsidies increased to 60% and approximately 80% of corn and wheat were secured (WBG, 2014).

Manić (2012) and later on Radović (2016) points out that recourse is not sufficient for greater expansion of agricultural insurance. Farms that invest significantly large amounts of money in the reproduction process or expand capacity will not "gamble", that is, they are very likely to think about insurance. Also, farms that specialize in some production have accepted a higher level of risk, and are therefore more motivated to enter into insurance contracts. In practice, it is often the case that most small farmers do not have basic information about the possibility of protecting their production through insurance. Not many farmers think that insurance is a tool to get their money, which they gain through hard work.

The role of the state is to encourage the development of agricultural insurance, and some of the models are the introduction of partially compulsory agricultural insurance, as well as the provision of greater funds for regressing the insurance premium. Partially compulsory agricultural insurance would be compulsory for all agricultural entities benefiting from a state resource[7] (Radovic, 2016). Some authors have advocated that agricultural insurance be compulsory, but the question is how to impose this on small farmers, who do not have the financial means to reproduce easily. For farmers who have financial difficulties in doing business, they treat insurance as a cost without which they can. Farmers believe that the state is obliged to compensate for damage caused by natural disasters[8] (which in practice happens), so this is another important reason for the underdevelopment of agricultural insurance (Vojinović et al., 2015).

7 It is considered that state resources are used by agricultural entities, which receive subsidies from the state, use state land, subsidized loans, etc. (Radović, 2016).

8 Many countries are involved in agricultural insurance, to reduce the need for ad hoc disaster programs, which are expensive and inefficient (WBG, 2014).

Furthermore, Kočović et al. (2016) point out that in the Republic of Serbia compulsory agricultural insurance should be introduced due to the high budget deficit, as a short-term solution. Vojinović et al. (2015) argue that compulsory agricultural insurance is not good, arguing that business relationships should be built on the economic interest of stakeholders and not on coercion.

Farmer education is a key factor in the development of agricultural insurance, and should be addressed by the state, insurance companies, the agricultural advisory service, as well as the media. Farmers do not trust the insurance institution enough, and it can be said that the lack of trust is the reason for the small number of concluded agricultural insurance contracts (Poljoprivrednik, 2019). Farmers' distrust of the insurance institution is the result of negative experiences with insurance companies regarding the damage assessment, overall expediency and complexity of the whole business.

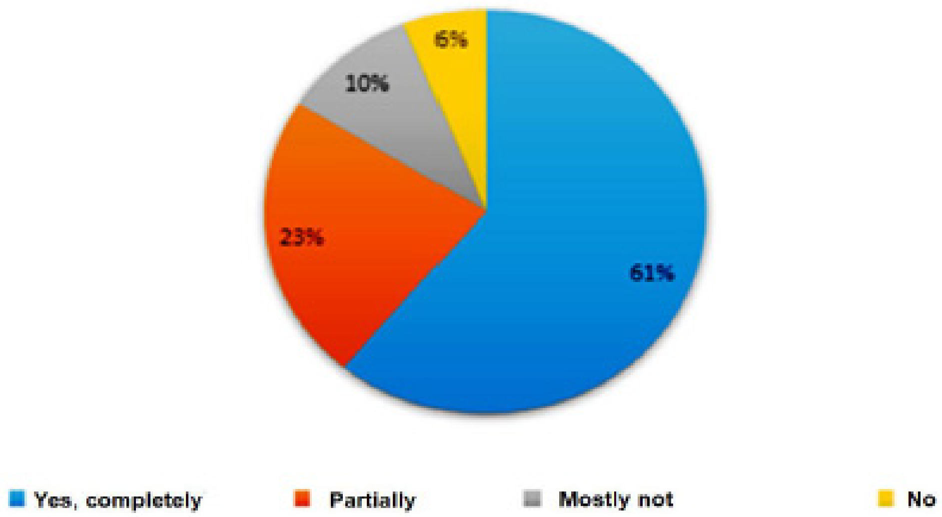
Transparency is of particular importance for developing and maintaining confidence in agricultural insurance programs. Achieving transparency is only possible if all participants openly participate, discuss, and understand the insurance process (WBG, 2014).

Perceptions of farmers' insurance production

A survey of farmers' perceptions of agricultural production insurance was carried out in 2019, which surveyed 31 agricultural holdings, ranging in size from 10-100 ha of land. Respondents were the owners of farms (29) and managers (2). It was a stratified random sample, referring to agricultural holdings in 11 municipalities in the territory of AP Vojvodina (21 agricultural holdings), while in 5 municipalities of Central Serbia 10 households were surveyed. The research was conducted to determine farmers' perceptions and to identify key factors that determine insurance contracts.

Of the total number of respondents, 7 (22.5%) have some type of agricultural insurance. They were mainly crop insurance (basic package) and only one farm had an animal insurance policy.

Graph 3. Perceptions of farmers' insurance production

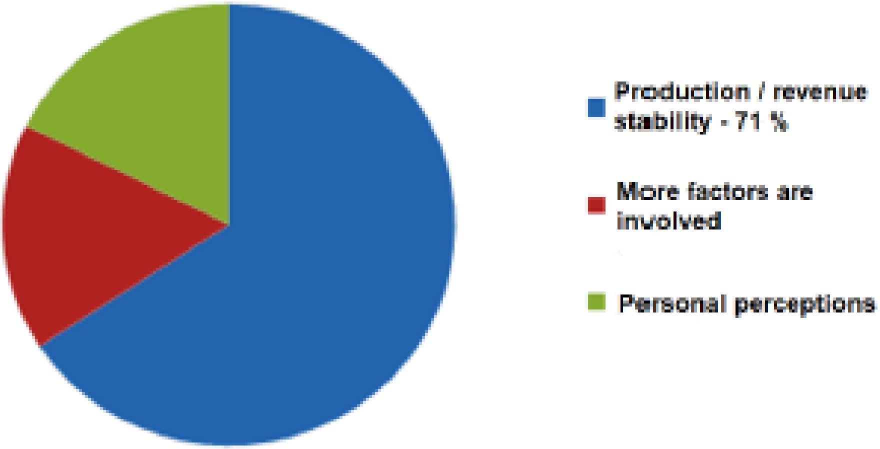


When it comes to agricultural production insurance, the majority of respondents (61%) completely agree that agricultural insurance is important and one of the ways to improve the stability of production, economic effects, and thus the living standards of agricultural families. In part, 23% of respondents believe this, while 10% of respondents believe that agricultural insurance is only an additional levy and has no greater economic significance for them. Only 6% of respondents say that agricultural insurance is without importance to them. It is optimistic that most farmers have a good opinion on insurance, which is certainly one of the key prerequisites for dynamizing agricultural insurance.

Farmers' insurance motives

Around 5/7 respondents (71%) consider that stability of production or income is of great importance in opting for farmers for insurance packages, while one respondent believes that other motives are equally represented. On the other hand, one farmer points out that income stability is not the most important factor for him, but he accepts insurance thanks to personal perceptions.

Graph 4. Factors that determine the conclusion of an insurance contract

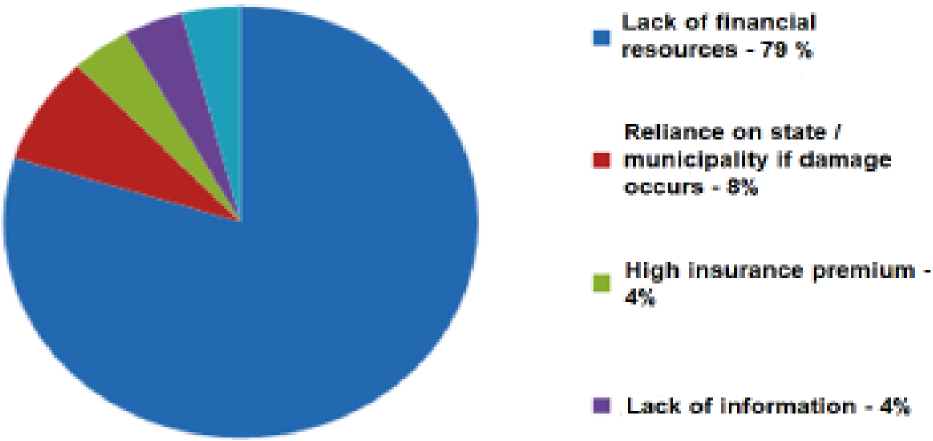


Farmers point out that significant state aid is in the form of regressing insurance premiums. Other factors, such as production specialization, awareness and education, motivate them to conclude insurance contracts.

Limiting factors in agricultural insurance

Farmers who do not have an insurance policy cite lack of financial resources as a key limiting factor. As many as 19 out of 24 (79%) stated that this was the main reason and that they often failed to finance the reproduction process and were forced to take risks. Two farmers (8%) said they were counting on the assistance of the state or municipality in case of damage caused by natural disasters. Other farmers state that the insurance premium is high, that they are uninformed about insurance options and packages, express distrust of the insurance companies, and state that there is a lack of transparency in the insurance business.

Graph 5. Farmers' perceptions of factors limiting agricultural insurance



In order to dynamize insurance, it is necessary for agricultural policy makers to create incentive measures that will be in the function of agricultural development, and thus insurance, since only an economically strong farm will be able to contract production insurance.

Conclusion

Agricultural insurance in the Republic of Serbia is not developed. Few households have insurance contracts. Farmers believe that insurance is useful and cite the problem of lack of financial resources as one of the most important factors hampering the development of insurance, as well as agriculture. They emphasize non-information, distrust, non-transparency as factors that deter them from insuring themselves. For those involved in insurance programs, the most important motive is the stability of production, and other factors are of minor importance.

Prospect of insurance development must include a significantly more active role for the state (partly compulsory insurance, additional increase in insurance premium recourse, education through the media and professional advisory services, etc.). Insurance companies should recognize and exploit the potential of agricultural insurance in the perspective. In this context, it is necessary to strengthen promotion, innovate supply, field work, and adjust insurance prices and payment dynamics, according to the capabilities of farmers. Above all, farmers' awareness and insurance culture should be fostered.

Agricultural insurance is crucial for the further development of this strategically important economic activity, but also for the comprehensive development of rural areas. Since national agriculture is based on a private family farm, it is of interest to find mechanisms and models to monitor, stabilize and maintain their production. Agricultural insurance is provided as a basic opportunity to stabilize incomes, secure supply of foodstuffs to the population, dynamize trade and especially exports, which has not reached the desired level.

Agricultural insurance is not compulsory, but the conditionality of obtaining subsidies in agriculture would have multiple effects. The state would thus encourage the development of agriculture, stability and predictability of farmers' incomes, as well as stability in the supply of agri-food products. In same time, the state has to protect the incentive funds invested and secure the budget from unplanned expenditures.

Farmers should be stimulated by economic measures to conclude insurance contracts and adjust the premium amount to their economic strength, i.e. subsidize relatively small producers, whether registered or not. There is an opinion that the incentives that farmers receive from the budget should be made conditional on the conclusion of insurance contracts, as is the practice of EU countries.

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FAKE FOOD: WHAT CAN WE DO ABOUT FOOD FRAUD?

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Abstract

Various studies have been made to assess the present situation with diet in the world and the situation that will develop in the next 10 to 30 years, based on different assumptions. The question we usually get imposes when looking at the situation of supply and demand of food in the world is whether the world as a whole has the capacity to produce it all the food needed to provide adequate nutrition for the population. Food security crises, such as madness from cows, dioxin pollution, bird flu and the like, have caused much interest and loss of public confidence in the capacity of the food industry and food safety authorities. In order to regain consumer confidence, it is neces-

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sary to take action by food control authorities to protect against unsafe food and foodborne illnesses. The movement of safe food products on the market contributes to life interests of the population (their health and well-being, as well as fulfilment of social needs and economic aspects). An effective food safety control system is the most important factor in protecting the health and safety of consumers and ensuring a safe and quality food product placed on the international market.

Food safety and quality are of paramount importance internationally and nationally. Increasing the number of Member States within the World Health Organization has to be in line with the Agreement on Sanitary and Phytosanitary Measures and Technical Barriers to Trade Agreement, to transform the global way of agricultural trade and food products. With full membership in the World Trade Organization, the Republic of North Macedonia has gained access to many markets, but we are also committed to abolishing a number of import restrictions, as well as aligning the legislation with the acquis. Implementing these processes in a proper manner will enable consumers to have confidence in quality and safe food in the Republic of North Macedonia. Access to safe, quality and diverse food as a basic human rights law was highlighted at the 1992 International Conference on Nutrition and the 1996 World Food Summit. Supplying food and proper nutrition is a prerequisite for promoting and maintaining public health. Despite the efforts and commitments made nationally and internationally, there is still a need to adopt policies to reduce food-related diseases and their cost for social and health services. As in the past, today special attention is paid to the safety of animal products. International trade in products of animal origin requires proof of origin and ingredients of certain products, physic-chemical certificates and microbiological correctness, confirmation of the absence or existence of defined tolerable amounts of different residues of chemical origin in food and feed, species of protein and fat in the products. All of this has been done to prevent the spread of various infectious diseases and poisonings in humans and animals that are associated with food or from cultural, religious or gastronomic habits. The food safety objectives are set by expert committees and risk assessment studies and surveillance and inspection activities performed by government agencies.

*T*he main goals of this paper are to answer our questions: Organization of the way information is communicated to other agencies and Member States; Improving communication between stakeholders agencies; Improve the working of the partnership between agencies and get help; An opportunity to learn from the experiences of other delegates.

Key words: food fraud, fake food, food scandal, food from animal origin, food law.

Introduction

In recent years, in the scientific circles there have been sharp discussions about food fraud principles, so it is arose a clear request for the action, while there are different opinions on how to do it, all of which is accessible through stakeholder solutions and procedures.

The views of all stakeholders in food fraud policy have one purpose – to impede or decrease the food deception and to advance functioning of complete food system. By developing analytical tools that established enterprise and prevention theories, it is strived to comprehend the mechanism of food fraud occurrences.

*T*he main goals of this paper are to answer our questions: Organization of the way information is communicated to other agencies and Member States; Improving communication between stakeholders agencies; Improve the working of the partnership between agencies and get help; An opportunity to learn from the experiences of other delegates.

Used data sources and methods

For the past five years, food scams have been of interest to me and my coworkers. We searched several databases, and wide range of literature sources in line to food fraud. Analysis did not address several topics such as "fraud drivers", "consumer fraud care", "consumer perceptions and attitudes towards food fraud incident", "responsibility, responsibility and guilt" and "behavioural response to consumers" and "response of the supply chain", but not growing perception of food risk. As the scientific concerns towards the food fraud, especially from the aspect of risks prospects, have been started relatively recently, several media, scientific articles, or government and trade associations' reports were studied. Beside, searching was also focused on web throughout the certain key words, such are "food", "food fraud" and "counterfeiting".

Food fraud and the law

Food fraud is generally seen as the deliberate or wilful change or addition, tampering or misrepresentations related to food, edible ingredients or packaging in order to approach to higher profit.

Terms like “food crime”, “food related criminality”, or “fake food” may be known such as food fraud, and they are the reason because consumers for an inferior product pay a high price.

Health risk for someone who has food allergies, or when added to food hazardous material in certain cases is emerging issue around the world.

Food fraud can be found in all different types of food but may be most often reported in: Meat; Milk; Fruit juices; Honey; and Pet food.

Among the biggest bans worldwide is the ban on selling food that is unsafe or falsely labelled. But despite the ban, we are witnessing food fraud more often and this practice is a problem worldwide. It is very difficult to know exactly how much food fraud is happening in the world today. Some estimations show that it burdens the global food industry with 10-15 billion USD annually, impacting the 10% of total food trade.

Food fraud can happen at all steps of food production (manipulation with raw materials, processing procedures, packaging, etc.).

Combatting food fraud represents mutual responsibility of state authorities, food-industry and final consumers.

Food fraud and legislation

Food fraud is deeply reconsidered in EU Regulation no. 178/2002 (EC, 2002), where are defined the basic principles and requirements of food law, emphasizing the significance of food safety and its implications. Closely, in Article 8 is stated: “Food law shall aim at the protection of the interests of consumers and shall provide a basis for consumers to make informed choices in relation to the foods they use”.

Its’ directed to the prevention and control of[8]: a) crooked or dishonest practices; b) forgery of food products; and c) certain practices that could trick the consumers (Moore et al., 2012).

8 See more in Section 8 of the Regulation (EC) no. 178/2002.

Living in difficult times, the need for food is increasing day by day. By 2050, the world will have ten billion mouths to feed. We are faced with droughts, floods and rainfalls on a daily basis, completely changing the climate of the world, making it difficult to provide enough food.

The latest report by the UN Commission on Climate Change (IPC) shows that global food supply has led to a dramatic decline in world wheat and maize production. Seafood is also affected, as catches in some tropical areas fall by 40% to 60%. The public is raising awareness of climate change and food production, but the situation is seriously bad.

The big challenge we face is what means measurable results of research, innovation and new technologies in the food chain that will restore the confidence of the citizens (Albanese, 2012; Lord et al., 2017).

Food shortages are the first reason we are increasingly confronted with the problem of food fraud. Economic profits also play a major role in fraud. Any substitution, mixing, misrepresentation or packaging of food has major economic benefits. Persons responsible for protecting human and animal health from unsafe food, by introducing standards and regulations, strive to keep food quality and safety worldwide. The most common solutions to this problem worldwide are provided by Codex Alimentarius, the European Union Directives, the Global Food Safety Initiative, the International Standards Organization which also has a technical commission on countermeasures and fraud control.

Food scams are often economically motivated and produce dire consequences for human health. Estimates of the financial profits of the fraudsters burden the worldwide food industry with USD 40 billion annually. Even more significant is the fact that such scams permanently destroy valuable brands, causing long-lasting industry-wide damages, termination of export markets and losing consumer confidence.

From year to year the number of food frauds, driven by economic profits from country to country, is increasing, so today it is present all over the world. The world's largest reported cases of food fraud are:

- In China in 2008, presence of melamine in food for babies, or in 2015 appearance of "zombie" frozen meat,
- In Russian Federation in 2015, presence of palm oil in milk,

- In Italy in 2011, accident with illegal eco production, or in 2014 existence of hydrogen peroxide in seafood products,
- In England in 2013, adding of pig and horse meat in beef burgers,
- In Australia in 2013, selling of free-range eggs coming from caged hens,
- In Mexico, from 2005 to current period, selling of meat and meat products from undeclared species,
- In USA, from 2009 to current period, presence of Salmonella in peanuts, selling of fake honey, or meat from undeclared species.

Serious public health consequences have led to some food fraud incidents, which, although they look harmless, have huge consequences. These consequences have shown the vulnerability of regulatory systems, quality assurance systems, in such cases they have been exploited in malicious processes. Following the occurrence of several of these incidents worldwide, guidelines have been adopted containing the recommended food safety management system, all of which are based on the requirements set out in the HACCP. It will be used in all cases to make proper food defences and prevent food fraud. The HACCP is expected to provide unintentional food pollution prevention, while the Food Defence Tool will be used as a Critical Assessment Point for Threat Assessment, and for Food Scams, the HACCP Tool is a Critical Vulnerability Checkpoint, this the tool is actually expected to prevent economically-motivated food fraud.

In the past, there have been many examples of malicious food fraud. One happened in September 1984 in Oregon in USA as Salmonella contamination in a number of restaurants devised and made by a religious sect intended to disrupt local elections. A similar hearing has been brewing in September 2002 in China, where a restaurant owner at a business rival's facility spread deadly poison that killed 38 people and seriously injured hundreds.

Not every product causes interest to be counterfeited. The most of the advantages are products that contain an easily counterfeit ingredient. These ingredients also determine the level of economic motivation, as it is easier to replace them with much cheaper ones, making the product more competitive, increasing demand for it and actually cheating consumers. Very often, counterfeit products are expensive products, which allow for a large financial return (in the case of counterfeiting of honey).

As a result of food fraud, its defined 3 types of public health risks (FDA, 2009; FDA, 2011; GAO, 2011):

Direct risk of food fraud is when there is an immediate risk to the consumer due to an acute toxic (deadly) contaminant.

Indirect risk occurs in cases of prolonged exposure to toxic material that chronically contaminates the body in low doses. Excluding preservatives or vitamins is an indirect risk of food fraud.

Often in everyday life we come across *technical risks* of food fraud, which means wrongly declared food, errors in food composition, product origin, and shelf life.

The types of food fraud (Figure 1.) are as follows:

- Mislabelling, the activity of putting weak wraps during the packaging in order to achieve higher profits,
- Dilution, or mixing the liquids of different value (at the expense of the most expensive one),
- Concealment, or concealing of low-quality food ingredients or products,
- Counterfeiting, brand name copying process, similar packaging and recipes or processing method in order to achieve higher profits,
- Replacement, or replacing in some extent of high value with lower value ingredients in final product,
- Unhallowed improvement, or adding of unknown and unreported ingredients to foodstuffs to enhance their quality attributes,
- Grey market / theft / diversion production, which is the sale of surplus, unregistered product, resulting in loss of copyright or brand payments.

Food fraud can be done in different ways, by misrepresenting the composition of the product (e.g., adding colour to change the look of the product or adding a cheaper ingredient to reduce product costs, increase its volume). Notices of such products are horse meat scams, sold as beef, water-thinned products, lower quality vegetable oil scams presented as olive oil, and then sold as extra virgin olive oil. These scams are attractive because this food supply chain (Canada and the US) is so large and complex that some of these incidents simply go unnoticed. However, in none of these cases does the inclusion of a more expensive ingredient replace a lower quality ingredient.

Figure 1. Type of food fraud

Source: Spink, 2011.

Therefore, our goal was to find out if food processors tackle the intent of food fraud and what steps can be taken to detect and prevent them.

Experienced food manufacturers often answer the question, "Have you discovered food fraud in your supply chain?" NO. However, almost 40% of these manufacturers did not report their experience with product fraud. Asked "Do you use analytical testing to detect food fraud?" Most respond that they do not. Usually they do not do analytical testing because they use suppliers that have product certifications, or they trust suppliers for long years of collaboration, or working exclusively with users of programs that allow them to get a quality product.

Manufacturers that test their products usually test end products on specific parameters using methods such as gas chromatography, high-pressure liquid chromatography, infrared spectroscopy and infrared spectroscopy, which are highly sensitive and can confirm the quality of the product.

Most manufacturers, following the emergence of several major frauds that have emerged around the world, have expressed a need for testing equipment, thereby enabling increased food prevention and consumer protection against non-compliant quality and safety requirements. Worldwide, smaller manufacturers should also be able to easily access such equipment, thereby establishing greater market control.

In scientific research, several types of food counterfeiting, dilution, substitution, distortion, miss-marking and unauthorized improvement have been identified. Not every type of fraud can be categorized into these types, but most often these are ways of committing fraud (EC, 2002; Everstine et al., 2013). Introducing a product different from what it really is counterfeiting. Often, fraudulent products are represented by a well-known brand, or contain a label indicating a method of production in accordance with certain religious requirements (Halal, Kosher) or quality and safety labels (BRC, IFAC, FSSF 22,000).

When it comes to counterfeiting food with the dilution method, we actually have the addition of cheap substances, such as water. Most often this type of counterfeiting is found in the meat industry by adding water to meat, especially chicken. This practice can be legal if the water is listed on the label.

Counterfeiting using the replacement method is fraud where the product declaration indicates the presence of a species other than the species used in the production. This practice is often found in fish products. A worldwide scandal involving the use of horse meat in hamburgers declared to contain beef is a substitute for honey.

Hiding as a counterfeit means adding a certain ingredient that will conceal the true nutritional qualities of the product. The case of adding melamine to infant formulas. Adding dyes and other chemicals to the product also means hiding the counterfeiting of certain defects in the product. Misleading labelling may apply to all types of food counterfeiting, but the term is generally used to refer to distortions of label information, such as durability marking.

Food counterfeiters are often economically motivated to deceive the consumer and unaware that they can pose a threat to human health (e.g. infant formula melamine, salmonella in peanuts, seafood, etc.).

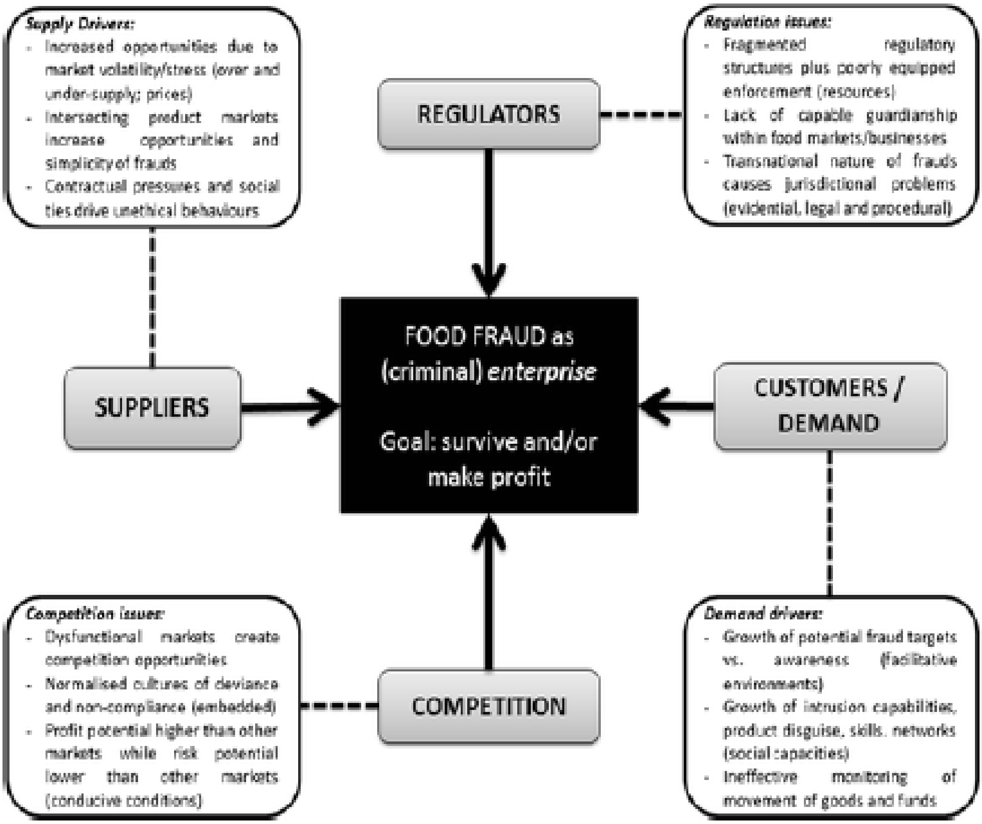
Positioning of the any foodstuff or ingredient at the market initiate the certain range of economic interest to commit fraud. In line to market competitiveness growth is usually raising the intensification of appearance of low-value edible elements as substitutes. Valuable foodstuffs for which subtle features represent important price distinction may use as profitable alternatives for fraudsters. It could be nicely expressed by the statement of Andy Morling (from the British National Crime Unit): "Where there is cash, there is crime, where there is a lot of cash, there's a lot of crime". Besides, fraud could be encouraged by cultural background and behavioural factors.

In the context of a criminal enterprise for food fraud, Figure 2. clearly shows mentioned pressures and drivers. Through the processes of socialization, individual actors rely on the certain normative, values, and hidden expectations they experienced, so as a result, have manifested responses to pressures that are driving business and industrial cultures.

Every component of management must show success, as failure of any component reduces profitability, and endangers market survival.

Each individual part of the enterprise can develop specific indicators for each component that will explain the situation and the environment, the nature of the supply, any market volatility and opportunities, the intersection of product markets and contractual arrangements. Market analysis should give us answers to demand levels and growth potential, so if they are resilient or inelastic it provides ability for hidden transfer of un-allowed products. Competition of products and existence of dysfunctional food markets are actually drivers of matching alternatives for trade (growing possibilities to catch the profit at the expense of risks decreasing). Besides, drivers could be also the lack of quality regulators (in situation of their over-fragmentation or over-complexity), as they could make easer the enrolment within the existing system licensing or certain market segment (lack of well-tailored regulative and level of legislation enforcement efficiency). Therefore, it's expected to organize proper insight in fraud accidents, as well as in their elements and influence on personal and collective behaviours (DHS, 2003).

Figure 2. Company behave towards the food fraud within the lawful market



Source: Albanese, 2012.

What consumers can do to combat food fraud?

Consumers have a key role in activities related to food fraud occurring in all parts of the world, since such frauds are designed to deceive consumers, and it is not easy to know whether the food is counterfeit or not. So they have significant role in identifying and tackling food fraud. The fight against fraud needs to be brought together by governments, industries and consumers, as it is a shared responsibility. The consumer part could be in checking the labels so you can determine if the consumer is all the information is reliable, for example: if the fruit is labelled a Canadian Product and the majority of the population is aware that the conditions for producing such fruit are not permanent in Canada, you should immediately ask yourself if this is a product fraud opportunity. This example can be used for many different types of products on the market.

When we look at the price, we often think that a certain price is too good to be true, for example: Parmesan Regency cheese which is very similar to Parmesan cheese but not the same product and hence the price is very different. Similar is the case with extra virgin olive oil, which is cheaper but because it is not authentic.

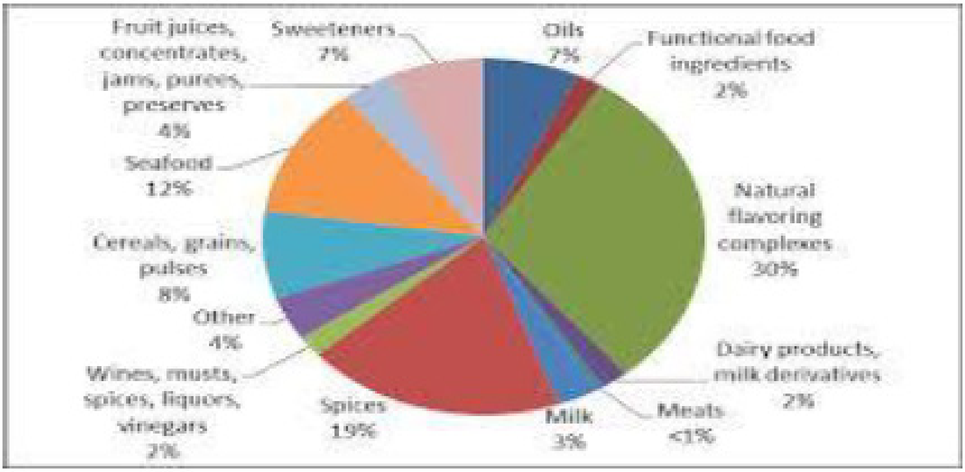
Very important in the fight against food fraud is the exchange of information, for example we should tell the whole family and all the people we contact in our daily lives if food fraud has occurred to us, this way of informing the general public will help build awareness of this issue.

Companies (retailers, manufacturers, associations) should be contacted on a permanent basis for information on where food is produced or how it is produced. Consumer awareness encourages the industry to be more cautious about food fraud.

The largest observed food frauds in certain database are done for the period 1980-2010 (Moore et al., 2012,) indicate olive oil (16%), milk (14%), honey (7%), saffron (5%), orange juice (4%), coffee (3%), and apple juice (2%). Figure 3 gives an overview by the main category of food ingredients. According to the main food ingredient, oils (24%), milk (14%) and spices (11%) represent nearly 50% of all reported cases.

The most popular foods subjected to frequent counterfeiting in the last 10 years were: (1) meat, (2) milk, (3) honey, (4) juice, (5) pet food.

Figure 3. Leading Reported Types of Fraud



Source: Moore et al., 2012.

Meat

Meat and meat products worldwide are products that are often subject to counterfeiting. Experience from the last few years has shown me that Canada and America are facing the same problem. Misrepresentation of meat types, origin, organic status, Halal status is the most common fraud in the meat industry. Compliance with expiration dates of particularly important information on frozen meat. Use of unauthorized veterinary medicines in the treatment of animals. Bleach treatment to enhance appearance, with formalin to extend shelf life. Adding water and other fillers to increase product weight and volume (Moore et al., 2012).

Milk

Milk and dairy products that are universally used for both adults and children and are easily perishable worldwide are at the top of counterfeit foods. In cases of withdrawal of whole product lines milk formula for infant nutrition, because the product contains melamine. Dairy products are often counterfeited with the addition of pollutants and forbidden additives as are formaldehyde, hydrogen peroxide, urea, cleaners, starch, pig fat, livestock dung and false animal ingredients that extend shelf life, improve product consistency or affect taste (Moore et al., 2012).

Fruit juices

Very often on the market we find products that are declared as 100% freshly squeezed juices, and in fact they are instant juices. After deeper analysis, it could be noticed that most of them include fake ingredients (e.g. potassium sulphate, monosodium glutamate, ascorbic acid and corn syrup, etc.). Unlabelled mixtures of natural juices and low-cost fillers are often on shelves in the retail, while their prices are like buying instant fresh squeezed juice, forcing the consumer to think well whenever the price seems to be unbelievably low (FDA, 2011; Moore et al., 2012).

Honey

Tests to determine the quality of honey show that in recent years honey as an expensive product is often counterfeit made of glycoside syrups and sold at enormously high prices. Antibiotics and lead have also been found in most of the tested samples. It has been found that most of the imported honey contains fragments of antibiotics and lead. Certain cheap food-products present in retail and labelled as clean or eco product are usually far from that. They could involve blend of corn, sugar or glucose syrup and some non-honey elements (Fortin, 2009; Spink, 2011).

Pet Food

One of the ways in the world to make money by forging food is with food that is intended for pet consumption. In the United States in 2018, pet food sales reached a record USD 90 billion. There are numerous instances of fraud in this food, very often food that contains feathers, by-products, and all are labelled as high quality ingredients. Particularly interesting is the case where a Texas pet food factory lost USD 4.5 million in litigation and a five-year prison sentence for the person responsible for misrepresenting such food through a string of distributors on the US market.

What we can do about food fraud

Food counterfeiting in recent years has become a complex and interdisciplinary issue that has been already dealt in different legislation. The public eye is on government agencies with the expectation that they will solve the problems that consumers face and locate them with manufacturers, distributors and retailers. When governments tackle all of these frauds, the responsibility of producers will increase and the number of frauds will be reduced. Very important are the Government's programs that provide great support for the development of current prevention and additional protection plans in the food supply chain.

The most realistic are the expectations of the citizens from the state agencies are fulfilling their demands for quality food in the markets. Government agencies can do much to reduce food fraud by working with academic and non-governmental organizations, engaging citizens, and narrower areas of focus. State programs implemented effectively and quickly at the state level have a significant impact on the likelihood of fraud. These one-country food fraud prevention plans may be a model used by other countries where they have proved successful (Spink, Moyer, 2011a; Spink, Moyer, 2011b; GFSI, 2012).

State agencies should consider present or upcoming regulatory demands for compliance, to keep business sustainable, and such access have to limit the likelihood of fraud. Economic impact of food fraud has raised awareness and coincided with the promotion of the academic focus on proactive prevention. Taken together, government agencies, academia and the food industry have taken proactive and proactive ways to tackle food fraud.

Complexity of food fraud prevention could lead to the activation of numerous analytical methods and applicable theory. Traditional systems are often turned off because they do not provide enough power to detect food fraud. The role of science, with the development of new tests and methods, will be an essential link in the system of protecting consumers against future food fraud.

Conclusions

In this article we wanted to present the situation with food fraud, to put in place the fraud prevention activities, to understand the nature of the activities being undertaken and the behaviour of everyone involved in the fraud.

If we integrate an enterprise model and test it on an action model, we will actually get a complete picture of food fraud and how to prevent it. We must emphasize that there are unbearable conditions that shape events and circumstances, but we must distinguish those conditions from the procedures of the committees. Precautionary and proactive action should be logical behave of formal and informal answer to food fraud (Spink, Moyer, 2011a), providing the adequate infrastructure to interconnect various state and professional policies.

The greatest insight after all these years is the knowledge that any food fraud is considered a crime by the manufacturing companies and it is very important to monitor production at all stages and by using preventive measures to strengthen the system of safe food production.

The expected actions of actors across this system, under the influence of external pressures and all ethical drivers, by redefining the answers can reduce the occurrence of false acts. A comparative analysis must be made and its vulnerabilities identified, and this identification will inform us where and how to direct our resources to prevent food fraud. It should be mentioned that analysis based on empirical approach to elements that initiate the fraud in food production, directed to interventions in particular activities are the main sources or approaches in the process of fraud prevention. Focusing on specific areas is also needed to focus all attention on the system. Critical access to markets and industries to prevent malfunctioning and reproduce fraudulent environments is one of the most important situations in the system. We've mentioned several times above that food scams are not a novelty today, and it is difficult to eliminate scams anytime soon. The modernization of the trade by creating longer and more complex supply chains that are more global and more complex provides greater opportunities for food fraud, so expectation is to increase the attention of producer companies.

Companies will continue to look for ways to improve their programs, but by balancing the investments they make with the relative risk they see in their particular processing sector.

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ANALYSIS OF THE MILK MARKET IN ROMANIA

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Abstract

The agri-food sector of Romania occupies an important position in the national agricultural economy. Milk is one of the main agricultural products of Romania, being the second most consumed food after meat. The objective of the paper was to analyse the internal milk market in the period 2014-2018. In this regard, an evaluation was made on indicators such as primary production, supply and demand, consumption and prices. The milk processing industry is developing. The sector is being restructured to meet the European food safety and quality standards imposed. Milk production decreased by 8% in 2018 and reached 43,121 hectolitres compared to 46,615 hectolitres in 2014. The milk production in Romanian farms stood at 4,443.30 t in 2018. The market for milk consumption in Romania was 244.1 l/inhabitant in 2017. The average price of cow's milk in 2018 was 1.89 RON, which decreased with 10% compared to 2014, and the sheep market increased by 35% compared to 2014, reaching 2.37 RON in 2018. In Romania, the monthly consumption of milk per capita is still reduced compared to the rest of the European countries, and amounts 5.7 litres of processed milk. The problems on the market have led to increased imports.

Key words: milk, dairy products, price, consumption, production.

Introduction

Milk is one of the most valuable agricultural raw materials worldwide (Haas et al., 2019). In 2013, global milk production reached USD 328 billion, with cow milk share of 82.7%, buffalo milk (13.3%), goat milk (2.3%), sheep milk (1.3%) and camel milk (0.4%). By 2025, global milk production is expected to increase by 23% from 2013 global production level (FAO, 2019).

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The milk sector is of particular importance for the European Union (EU) and is one of the important sectors of economic agriculture in Romania. Total EU-28 milk production was estimated at around 154 million tonnes in 2014.

Romania has a total area of 238,390 km^2, being the 9th largest in Europe (EU, 2019), and the population is 19,530,631 people according to NIS data. The large area of land favours the breeding of animals, representing a national advantage to generate development in the livestock sector insufficiently exploited. However, the development of the Romanian dairy sector has been hampered for several years by several factors, such as the high degree of fragmentation of surfaces (small size of farms), the aging farming community, poor farm management practices, limited access to contributions and lack of organization of farmers (Dobra, Sandru, 2016).

Also, breeding animals for milk is a sector with tradition in Romania. Especially this is practiced in mountain or rural areas. Romania has a good climate to provide food for these animals and has large areas for grazing. These occupations of livestock breeding have advantages for those in the mountains and rural areas such as income insurance, but also providing a stable job. The diversity of the productions they make, the low energy consumption and the nature of the feeds they use, give the bovine breeding and exploitation the character of a sustainable activity and perspective (MARD, 2019).

In Romania, pastures and hayfields occupy an important area, estimated at approximately 4.8 million hectares (NIS, 2019). Of this surface, two thirds are used for grazing, and one third is occupied by hay, useful for raising animals.

In the current conception of the EU, pastures are a major element of sustainable agricultural systems represented by animal welfare, feed supply, soil quality and optimal use of less productive land (Stanciu, 2014).

Milk and dairy products are important components of people's diet, being recommended for all age groups. The dairy sector is indispensable for the global development of an economy, as it provides a vital link between agriculture and the food industry (Nica, 2017).

The various studies carried out over time have developed the belief that milk and dairy products are very healthy for the human body to function in optimal parameters, milk being a very good source of calcium, protein, minerals and vitamins (Ienovan, 2019).

Milk minerals are crucial for human health (Franzoi et al., 2017). Milk and dairy products has a beneficial effect on bone mineral density. The contribution of milk and dairy products has been associated with a low risk of childhood obesity, cardiovascular disease or type II diabetes.

Milk and dairy products contain a number of nutrients. Important chemical components in milk include water, fats, protein, carbohydrates, minerals, organic acids, enzymes and vitamins (Imran et al., 2008). These components satisfy the demand of the consumer who is looking for more and more innovative products, with a consistent quality (Guetouache et al., 2014).

In Romania, large quantities of cow and sheep milk are marketed, while smaller quantities of buffalo and goat milk are both, consumed or marketed.

The specific feature of the milk production and processing sector in Romania is the high fragmentation at the level of producers (Romania has the largest number of milk farms in Europe), as well as the very large share of family farms (about 87% of the total number from farms have on average 1-2 cows). The reduction of livestock led to a decrease in agricultural production (Dobra, Sandru, 2016).

The milk and dairy sector is second in importance in Romania, after the meat sector, being an important sector in national agriculture. In 2016, the Romanian dairy market was estimated by local players at EUR 800 million (Food market in Romania, 2016).

The main goal of the study is to analyse the milk market in Romania, in particular the total milk production, average (monthly) consumption per person of dairy products, and average milk prices, but also the import and export of milk and dairy products within the period 2014-2018.

Materials and methods

In order to have an overview on the market of milk and dairy products in Romania, a series of indicators was analysed. The study followed the evolution of supply and demand on the market in the period 2014-2018. Thus were analysed the livestock of cattle, sheep and goat, the average monthly consumption per person of dairy products, the average price of milk, but also the import and export values for dairy products. Data were retrieved from national and international databases such as National Institute of Statistics, Faostat, Eurostat, Intracen, research reports and were processed and interpreted using time comparison with mobile base index (Panzaru, Medelete, 2005). The trade reflects the imports and the exports in a region during a specified period.

Results

The livestock of animals is large enough to structure the productions in two categories: milk and meat. The potential of national markets is still unexploited, although the market is diverse, and the processors mainly focus on certain products.

From the livestock of two million cows, about 50% are raised in individual households, according to NIS data. Milk production is not valued, in the sense that not all milk is delivered to the factory because it does not comply with European standards regarding milk quality and hygiene. Also, the small individual farmers are spread and the quantities collected from them are small.

Romania registered a significant economic growth reported in the EU in 2017, but the livestock sector, especially the cattle herds, registered losses. These losses can be due to the low selling price of the products and the conditions for breeding animals and the marketing conditions of the products derived from them imposed at national level are very restrictive, which discourages small farmers.

Within the period 2014-2018, the number of livestock in Romania had an oscillating trend. Thus, in 2018 compared to 2013, the number of cattle decreased by 4.43%, and that of sheep and goats is increasing by 6.9% and 8.6% respectively.

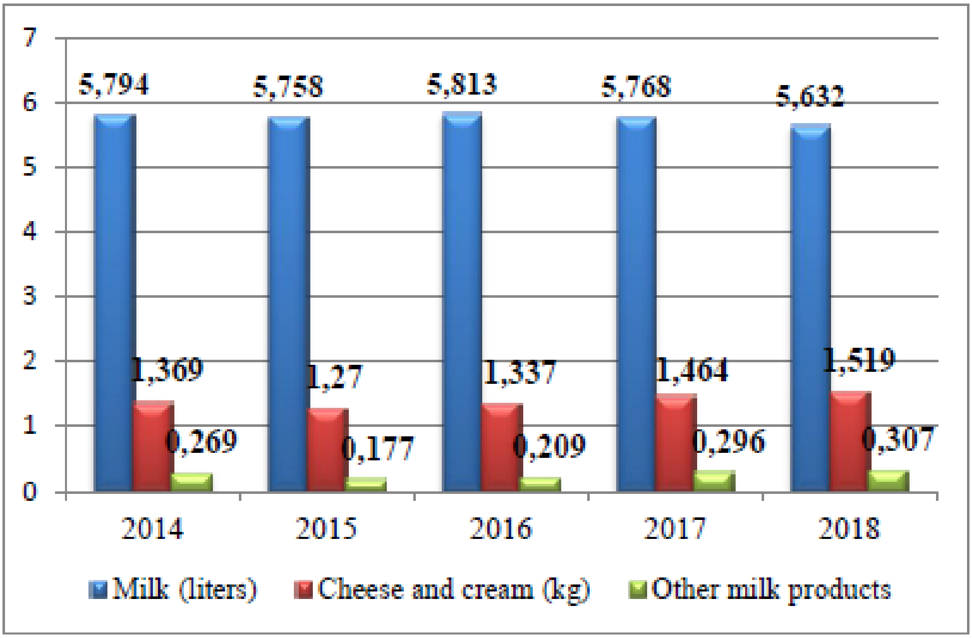
Table 1. The livestock in Romania in the period 2014-2018

Year	Cattle	Sheep	Goats
2014	2,068,888	9,518,225	1,417,176
2015	2,092,414	9,809,512	1,440,151
2015/2014 (%)	+1.14	+ 3.06	+ 1.62
2016	2,049,713	9,875,483	1,483,146
2016/2015 (%)	- 97.96	+ 0.67	+ 2.99
2017	2,011,128	9,981,859	1,503,270
2017/2016 (%)	- 2.04	+ 1.08	+ 1.36
2018	1,977,232	10,176,400	1,539,317
2018/2019 (%)	- 1.69	+ 1.95	+ 2.40
Average	2,039,875	9,872,295.8	1,476,612

Source: NIS, 2019.

The global dairy market is mainly segmented by product types: milk, cheese, yogurt, butter, cream, powdered milk and whole milk, skimmed milk and others. Indices regarding the average consumption of one person / month of milk, cheese and cream and other dairy products in Romania are shown in Chart 1. Milk had a downward trend, while the consumption of cheese and other milk products increased.

Chart 1. Dairy products consumed on average by one person / month,

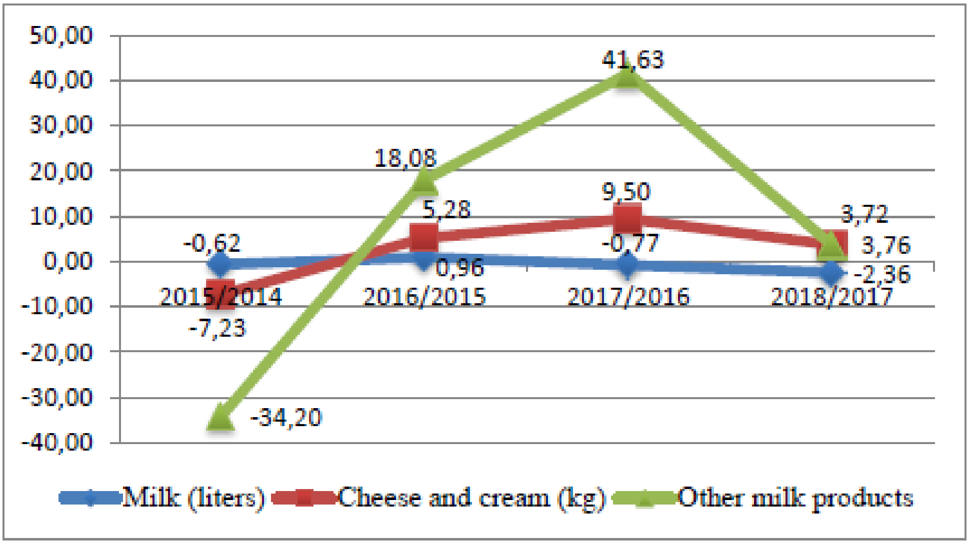


Source: NIS, 2019.

The average monthly milk consumption in Romania was 5.7 l/person in 2014, more than 5.6 l/person in 2018. According to the Romanian Association of Milk Industry (APRIL, 2019), 60% of milk produced in Romania is used for self-consumption. Diversification of the production of dairy products is an alternative for extending the market and maintains the profitability of the dairies (Popescu, 2015).

During the analysed period, it is noted that there were significant increases for other dairy products. The highest growth was recorded in 2017, where compared to 2016, the increase was 41.63% (Chart 2.). Visible increases were also noted for cheese, in the period analysed. Thus, in 2015 there is a decrease in consumption compared to 2014 of -7.23%, but also reaching 9.5% growth in 2017. Milk consumption has a downward trend, the decrease in 2018 being -2.36% compared to 2017.

Chart 2. Percentage evolution of the average monthly consumption of dairy products per person per year



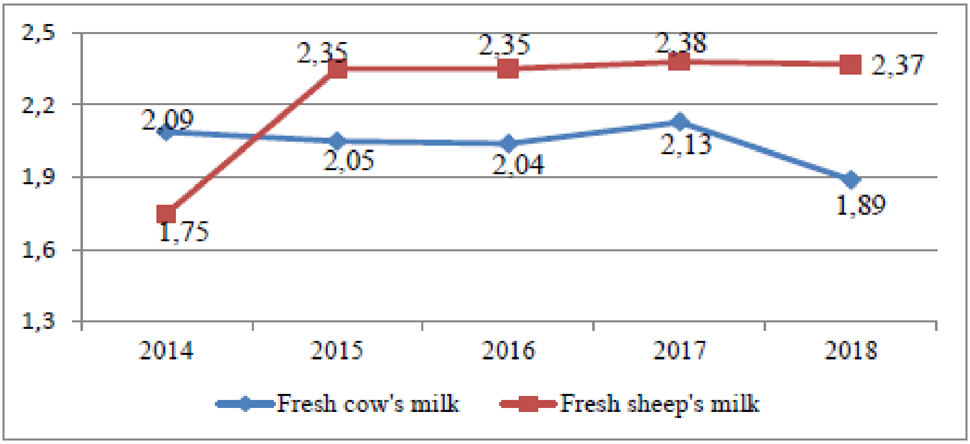
With the increase in purchasing power in the current period, there is an increase in consumption of dairy products (e.g. cheese or yoghurt). So, cheese consumption increased by 10% in 2018 compared to 2014, and consumption of other products also increased by 14% in 2018 compared to 2014.

The level of cheese and cream consumption is more differentiated according to the number of people in the household, the highest being registered in the household of one person: 1.86 kg/person per month. The average annual cheese consumption in Romania is estimated at around 5 kg/person, including homemade cheeses sold on farmers markets (Food market in Romania, 2016). Butter is considered an expensive product by Romanians, as compared to their purchasing power, and consumption of this product is reduced.

The purchase of milk and dairy products is greatly influenced by the price. The price of milk depends on the economic and political situation in the world. It is also influenced by the geographical location, the season and the prices of the basic materials such as feed, electricity, and fuel (Paura, Arhipova, 2015).

Regarding the average price of milk in Romania (Chart 3.), there is an increase of 35% in the case of fresh sheep milk, from 1.75 RON/l in 2014 to 2.37 RON/l in 2018. Fresh cow milk registered decrease in the analysed period of 9.5% from 2.09 RON/l in 2014 to 1.89 RON/l in 2018.

Chart 3. Evolution of the average milk price (RON/l) in Romania, period 2014-2018.



Source: NIS, 2019.

For the food market, price fluctuations, as well as production and political risks represent uncertainties for farmers. The most important risks that dairy farmers are currently facing are various market risks followed by production and policy risks (Schaper et al., 2010).

Global milk production in 2018 is estimated at 843 million t, an increase of 2.2% compared to 2017, due to production expansions in some countries (FAO, 2019).

The total milk production in Romania registered a decrease of 7.5% in 2018 compared to 2014, from 50,535 l to 46,741 l, and the average for the period studied was 48,236 l (Table 2.).

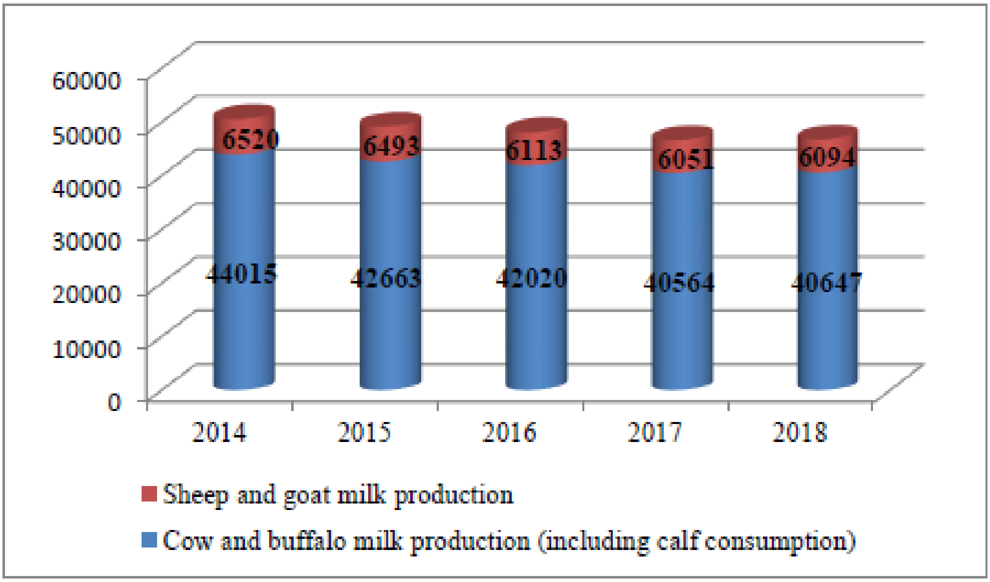
Table 2. Total milk production (in thousands hectolitres)

Year	Total milk production (including calf consumption)
2014	50,535
2015	49,156
2015/2014 (%)	97.27
2016	48,133
2016/2017 (%)	97.92
2017	46,615
2017/2016 (%)	96.85
2018	46,741
2018/2017 (%)	100.27
Average	48,236

Source: NIS, 2019.

The total animal agricultural production is mainly composed of cow's milk and sheep's and goat's milk (Figure 4.). The largest production is cow milk. Regarding cow and buffalo milk, in 2014 the highest production of 44,015 l was registered, and then gradually decreased until 2018 reaching 40,647 l.

Chart 4. Animal agricultural production



Regarding the share of milk production from total, it is found that the highest share is held by cow's milk and buffalo milk, being the most consumed milk, and that of sheep is much smaller (Table 3.). This difference may come from the fact that Romanians are more accustomed to drinking cow's milk, but also because of the more affordable price.

Table 3. The share of cow and buffalo milk and goat and sheep production of the total

Production	2014	2015	2016	2017	2018
Cow milk and buffalo (including calf consumption)	87.10	86.79	87.30	87.02	86.96
Sheep and goat milk	12.90	13.21	12.70	12.98	13.04

Source: NIS, 2019.

Milk production is not regular, the main causes of variations are related to race and species, but also depend on individual factors related to the health, nutrition, and age of the animal (Guetouache et al., 2014). One way to optimize production would be to partially replace current breeds, in a transition period of 3-5 years, with specialized ones (Cazacu, 2018).

The average consumption per year per inhabitant of milk and dairy products remained approximately constant in the period 2014-2017, this being 251.4 kg in 2017 (Table 4. and Table 5.). This milk consumption refers either to milk obtained by small producers or to pasteurized milk.

Table 4. Average consumption of milk per year per inhabitant, in kg

Year	Milk and milk products in milk equivalent 3.5% fat (excl. Butter)
2014	251.5
2015	250.7
2015/2014 (%)	99.68
2016	253.6
2016/205 (%)	101.16
2017	251.4
2017/2016 (%)	99.13

Source: NIS, 2019.

Milk consumption in Romania is lower compared to the European average. Although various programs have been set up at national level to encourage milk consumption, the number of milk consumers is decreasing. Low milk consumption affects the health status of the country, also representing an economic problem.

Table 5. Average consumption of milk per year per inhabitant

Year	Milk and dairy products in milk equivalent 3.5% fat (l)
2014	244.2
2015	243.4
2015/2014 (%)	99.67
2016	246.2
2016/2015 (%)	101.15
2017	244.1
2017/2016 (%)	99.15

Source: NIS, 2019.

The evolution of total milk collection in Romania can be analysed in Table 6. It has an upward trend, as quantity of collected milk from Romanian farms is increasing. In 2015, it was 1,070.42 t, and in 2018 it increased by 29.4% to 1,385.19 t. Although the number of cattle has decreased, milk collecting is increasing, primarily as a cause of improvement of the cattle breeding quality.

In order to make the most efficient use of raw material milk, investments are needed in the re-technologization of the activity required to produce controllable dairy products, with superior quality and guarantee terms.

Table 6. Total milk collection and dairy products obtained - annual data

Year	Milk collected and dairy products obtained (in 000 t)
2015	1,070.42
2016	1,153.83
2016/2015 (%)	107,79
2017	124.,91
2017/2016 (%)	108.33
2018	1,385.19
2018/2017 (%)	110.82
Average	1,214.84

Source: Eurostat, 2019.

The quantity of milk available in Romanian farms had a downward trend in the period analysed, decreasing by 7.5% (Table 7.) in 2018 compared to 2014. Decreases are recorded each year, while slight increase being observed only in 2018.

Table 7. Raw milk total available on farms

Year	Milk available on farms
2014	4,804
2015	4,676.60
2015/2014 (%)	97.35
2016	4,585.70
206/2015 (%)	98.06
2017	4,439.20
2017/2016 (%)	96.81
2018	4,443.30
2018/2017 (%)	100.09
Average	4,589.76

Source: Eurostat, 2019.

The trade balance is a negative throughout the period studied (Table 8.). There is an increasing difference from year to year, so that in 2014 the deficit was -135,157 EUR, and in 2018 it doubled to -302,660 EUR. This is due to the low production from year to year, but also to the imposed marketing conditions.

In 2017, Romania imported a quantity of raw milk of 131,315 tonnes, up 0.9% (1,130 t) compared to 2016, and collected a quantity of cow's milk from agricultural holdings of 1,028 million t, by 8% (1,02 t) more than the previous year (NIS, 2019).

Table 8. Trade balance in value for milk, eggs and natural honey (in EUR)

Year	Exports	Imports	Trade balance
2014	166,223	301,380	-135,157
2015	167,055	322,570	-155,515
2015/2014 (%)	100.50	107.03	
2016	155,824	401,736	-245,912
2016/2015 (%)	93.28	124.54	
2017	189,041	497,252	-308,211
2017/2016 (%)	121.32	123.78	
2018	198,846	501,506	-302,660
2018/2017 (%)	105.19	100.86	
Average	175,397.8	404,888.8	

Source: NIS, 2019.

The main importing countries of dairy products in Romania are presented in Table 9. Their value almost doubled from 2014 to 2018 in most countries. Germany is the country with the largest share of imports, their value reaching in 2018 at 151,994 thousand EUR.

In 2018, the share of imports from Germany was 30% of total imports, and Poland and Hungary had similar weights of 18%. The first three countries account for 66% of imports. Imports from other countries like Italy and Belgium have tripled, while in France have doubled. Among other importing countries are Netherlands, Belgium, Bulgaria, Czech Republic and Denmark with almost similar values during the period studied.

The increase in the demand for milk and dairy products, supported by the increases in revenues, on the one hand, and by the VAT reductions on food, on the other, is mainly covered by imports.

Imports of milk from other countries increased during the reference period, due to several factors such as low purchase prices, political frame. Romania needs a new trade policy and to value its potential in this sector, so the quantity existing in Romania to cover the demand on the market.

Table 9. The value of imports of dairy products, birds' eggs, natural honey in Romania (in 000 EUR)

Region	2014	2015	2016	2017	2018
World	301,312	322,448	401,689	496,993	502,610
Germany	85,189	92,176	110,257	136,691	151,994
Poland	52,928	65,162	77,813	96,445	92,947
Hungary	61,021	61,615	73,755	92,244	91,121
Italy	13,254	18,404	25,105	31,845	37,086
France	10,738	12,379	13,427	16,612	18,638
Netherlands	9,416	8,671	17,573	21,493	17,753
Belgium	5,306	5,244	9,327	13,905	16,038
Bulgaria	12,520	14,221	16,061	16,874	14,913
Czech Republic	14,425	12,496	15,382	17,532	12,766
Denmark	9,966	5,337	7,941	9,692	10,234

Source: ITC, 2019.

Worldwide, the value of exports of milk and dairy products in 2018 was about 200,000 thousand EUR. The partner countries to which Romania exports are mainly those of the EU. Greece is the largest partner of our country, to which Romania exported milk products worth 45,891 thousand EUR, representing 23% of the total value in the world. Other export partners are Italy, Bulgaria, Hungary and Germany, together with a share of 43% of total exports.

Table 10. The value of exports of dairy products, birds' eggs, natural honey from Romania (in 000 EUR)

Region	2014	2015	2016	2017	2018
World	166,214	167,006	155,794	188,906	199,340
Greece	34,094	33,105	25,648	34,664	45,891
Italy	21,347	29,367	24,202	29,232	32,752
Bulgaria	33,510	26,033	26,336	25,894	19,780
Hungary	6,781	9,678	11,535	18,084	18,668
Germany	23,024	23,069	16,280	18,119	15,367
Republic of Moldova	5,245	4,359	6,857	10,752	10,103
Spain	5,614	6,651	7,928	8,423	8,471
UK	3,468	5,213	5,872	6,592	7,466
Poland	4,023	3,108	3,471	3,676	5,468
France	6,144	5,568	4,352	4,651	5,070

Source: ITC, 2019.

Romania has the cheapest raw milk in the whole EU, but despite this fact our country imports milk and cream of more than 97 million EUR annually (NIS, 2019). Among the causes of this situation were the excessive degree of fragmentation of farms, the continuous reduction of livestock, insufficient collection points, storage and transport.

Conclusions

Livestock breeding is a basic occupation in the rural and mountain areas, providing income for breeders. The species that register numerical growth are the sheep and the goats, the cattle being diminished accentuated.

The total milk production in Romania decreased from 50,535 l in 2014 to 46,741 l in 2018, a decrease of 7.5%.

The Romanian consumer milk market registered increases mainly on processed milk products. The trend of milk consumption is decreasing, while cheese and other milk products are increasing.

The average yearly price of cow's milk in 2018 was 1.89 RON, down by 10% compared to 2014, and that of sheep increased by 35%, reaching 2.37 RON in 2018 compared to 2013.

The large area of land favours the breeding of animals, representing a national advantage to generate development in the field of the animal sector insufficiently exploited. To capitalize on all the opportunities in this sector, strategies are needed to support farmers. Thus, the supply of milk and dairy products could be provided, but it would also bring substantial revenues.

An attractive price for milk in Romania could be a sufficient reason to determine factories to increase the level of milk collection locally and to turn Romania from a dairy importer into a major exporter. Also supporting the small farmers to have access to funds, to hayfields and to have more collection points should be some measures to improve the sector.

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RISK OF INVESTMENTS IN AGRICULTURE AND REAL OPTIONS APPROACH: THE CASE OF SERBIA[1]

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Abstract

Agricultural production faces many types of risks (various internal and external risks) which could significantly influence efficiency of agricultural investments. Therefore it is necessary to incorporate risk assessment into evaluation of economic efficiency of investments. There are traditional ways of coping with risk in investment evaluation process, such as the use of risk adjusted discount rate, certainty equivalent approach and sensitivity analysis. On the other hand, it is also possible to use more sophisticated methods such as scenario analysis, Monte Carlo simulation and decision tree approach. Nevertheless, there is an increasing interest in real options approach, which offers more flexibility related to decision making in investment analysis. Real options originate from financial options theory which is applied to evaluate investments in tangible assets. Therefore, possibilities of using real options for economic evaluation of investments in agriculture are analysed in this paper, primarily in Serbian conditions.

Key words: agriculture, investments, risk, NPV, real options.

Introduction

Agricultural production is related to many risks, due to its biological character and high level of dependence on climate conditions. It is usually considered that livestock production is less prone to risks than crop production. This is caused by possibility to control livestock production in confined space, while in crop production it is not always possible (Marković et al., 2014). Nevertheless, close relation and connection between crop and livestock production keep risk of livestock breeding on very high level. All risks in agricul-

1 Paper is a result of the research conducted within the projects of the Ministry of Education, Science and Technological Development of the Republic of Serbia no. 31051 - "Improvement of biotechnological procedures as a function of rational utilization of energy, agricultural products productivity and quality increase" 179028 - „Rural labor market and rural economy of Serbia - diversification of income and reduction of rural poverty".

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ture could influence not only amount of profit of an individual enterprise, but also profit of entire farms, and level of economic efficiency of investments in agriculture. Therefore, it is necessary to discuss types of risks in agriculture, their influence on investment results and decisions, as well as possibility to incorporate level of risk into investment evaluation procedures.

The most important types of risks related to agricultural production in Serbia are described and discussed by many authors. Marković (2013) mentioned two important types of risk - pure risk and speculative risk. Pure risk could have two outcomes – negative (loss) and neutral (without loss). On the other hand, speculative risk also could have two possible outcomes, but they are referred as positive and negative outcome. In addition, author enlisted some other types of risks, such as objective and subjective risk, general and particular risk, constant and variable risk, static and dynamical risk, etc. Ivanović (2018) mentioned general division of risks into following categories - market risk, financial risk, production risks, risk related to changes in laws and regulations, human risk and technological risk.

Similarly, Ivanović and Marković (2018) differentiated risk in two general groups:

- Internal risks (related to farm), and
- External risks (related to farm's environment).

Internal type of risk is usually associated with production risk, financial risk and personal risk while external risks assume market risks and political risks. Generally, it could be stated that farmers in Serbia are primarily concerned regarding accomplishing desired level of yield, level of price for their products, as well as possibility to receive state subsidies for their production. Therefore, attention should be paid to production risk (which is an element of internal risk) as well as market and political risk (which are elements of external risks).

Production risk is related to possibility to achieve appropriate or expected yield. On the other hand, there are many factors which could influence reduction of yield, such as factors related to nature: climate changes, natural disasters, diseases, pests, ecological risks etc.

As one of the most important problems in Serbian agriculture droughts should be distinguished as an increasingly frequent type of natural disasters. At the same time, Serbian producers in recent years also had serious problems with floods, while in some regions problems with hail are rather common. Nevertheless, in fruit production there are regular problems with frost, which should not be omitted. Apart from natural causes there are also technical and technological causes of production risk that have to be taken into account.

Marketing risk is primarily related to variation of prices of agricultural products, as well as prices of inputs for agriculture. Generally, prices of crop products are more susceptible to changes while prices of livestock products are more stable (although there are cases of some livestock products whose prices are changing in regular cycles – for example prices of fattened pigs). On the other hand, variations in prices of crop products influence not only economic efficiency of crop production, but also of livestock production.

While high intensity livestock productions (such as pig and poultry breeding) are very sensitive to variations in input prices (primarily prices of corn and soybean) some extensive production types are more related to pastures (such as sheep and goat production). Therefore, extensive livestock production types are less sensitive to market risks, especially to risk of input price variation. Although extensive production is less exposed to risks, it is related to other negative influences such as low level of productivity, distance from important markets, etc.

Huge variations of prices which are common in Serbia are influenced by many factors. Fluctuations of supply and demand on international market may cause such variations, but the reason could be speculative activities on the market, as well. For majority of crop products in Serbia market prices are not known until the moment of harvest, which increases general feeling of uncertainty among agricultural producers. The most important example is corn production – although corn is extremely important product for Serbian agricultural export and has the higher participation in sowing structure of Serbian farms, there is no way for small farmers (which dominate Serbian agriculture) to predict future corn price.

Risks described as political incorporate range of possible changes in agricultural policy, which could tackle:

- types and amount of subsidies, and
- changes in various regulations (dealing with taxation, foreign trade, food safety, environment protection, wellbeing of animals, quality standards, etc.).

Having in mind frequent changes of agricultural policy in Serbia and variation in level of subsidies, it is hard to predict its development in future with certainty. Therefore, possible changes of agricultural policy in Serbia are very important source of risk for farmers, instead of being an element of stability.

The goal of this paper is to present the most common methods of investment evaluation in risky circumstances. Besides, the goal is to review research related to the use of real options in agriculture as well as to analyse possible application of this method for evaluation of investments in agriculture and processing industry in Serbia.

Investments and risk

Various approaches could be applied to involve above mentioned risks into evaluation of economic efficiency of investments. These approaches are usually applied within calculation of the most important discounting methods such as net present value (NPV) and internal rate of return (IRR), (although it is most common to calculate NPV adjusted for level of risk). Traditional approaches (described by authors such as Weygandt et al., 2002; Kay at al., 2004; Kiš, Jovanović, 2007; Drury, 2004; Hall, Westerman, 2011) used to include level of risk in investment evaluation process are:

- application of risk adjusted discount rate,
- certainty equivalent method (which adjusts net cash flow to the level of risk), and
- sensitivity analysis (which takes into account changes in NPV caused by variations of single important factor, while all other elements are considered to be constant).

More complex methods (described by Dayananda et al., 2002; Hincu, 2002; Hardaker et al., 2004; Arnold, North, 2011) for assessment of economic efficiency of investments in risky circumstances are the following:

- scenario analysis (which usually predicts three possible scenarios and their probability of occurrence - they are the best case scenario, the most probable scenario and the worst case scenario),
- decision tree approach (which also offers possibility for making various predictions of possible scenarios),
- simulation techniques (such as Monte Carlo simulation or Latin hypercube simulation) which are based on determination of the most influential factors, their probability distribution and huge number of iterations (usually up to 100.000 iterations).

In spite of above mentioned techniques it is not easy to predict all the changes which may happen in an unstable business environment (which is usual for agricultural producers in Serbia) and involve them in project analysis in an appropriate way. It refers primarily to investments having long useful life, because it is hard to estimate possible variations of the most important factors for such investments in the long run. Therefore, calculation of NPV using some of the mentioned techniques takes into consideration various types of risks, but there are also some drawbacks of all the existing approaches.

The most important drawback of NPV and IRR calculation is their inflexibility, which means that calculation of these indicators is based on information which is available at the moment of the evaluation. On the other hand, the investment decision is not supposed to be reconsidered at some later stage. Therefore, it is important to consider some other possibilities and approaches which could lead to better informed investment decisions.

The solution could be application of real options approach, which offers certain level of flexibility during the decision making process. It could be mentioned that flexible investments (meaning investments which do not force the investor to be bound by only one business strategy) are more valuable than inflexible investments. Therefore, if the project is more risky its flexibility is more valuable (Brealey et al., 2007).

At the same time, it is necessary to bear in mind that the use of real options does not exclude traditional NPV method. On the contrary, real options present only extension and improvement of regular NPV methodology.

Types of real options

Real options approach originates from financial options theory, but it is dealing with investments in real (tangible, physical) asset, instead of the investments in financial instruments. Such approach is related to similarities between capital budgeting and security valuation. According to Brigham and Gapenski (1997), capital budgeting process and security analysis has exactly the same six steps:

- The cost of the project has to be determined (the price that must be paid for stock or bond has to be found) at the beginning of the evaluation process.
- Expected cash flows from the investment must be estimated, which is appropriate to estimation of future dividend or interest payment stream on a stock or bond.
- It is necessary to determine level of riskiness of future cash flows from investment project (or from stock or bond).

- Determination of appropriate cost of capital at which the cash flows are to be discounted.
- The present value of expected investment's cash flows (expected future dividends of interest payments) should be determined, using previously determined cost of capital.
- Present value which is determined should be compared to the initial cash outlay, so that the decision regarding investment acceptance could be made.

Discussing capital budgeting situations where real options could be applied Bierman and Smidt (2007) mentioned the following:

- The case when the firm has an opportunity to wait before investing.
- The case in which "there will be an opportunity to increase or reduce the scale of the project in the future".
- The case in which "there will be an opportunity to sell a part of the project or to use the project in other way".
- The situation in which "future investment opportunities will be created that would not be available if the initial investment had not been undertaken".

According to Wang and Tang (2010) real options are "treating investment opportunities and the different types of managerial flexibility as options and valuing them with option valuation models". The authors enlist various types of real options, such as:

- growth option,
- defer option,
- switch scale option, and
- abandon option.

Very similar types of real options are presented by Koppl Turyna and Koppl (2013):

- Growth options (option to innovate or to expand production which arise from the situation that market conditions are more favourable than expected) - adequate to financial call option. According to authors „this kind of option can be used whenever a farmer decides to expand his operations".
- Insurance option is primarily used to avoid potential losses, so that farmer could be able to "scale down or abandon certain investments in order to avoid potential losses". Besides, insurance option also describes a situ-

ation to switch production (to change production structure). Such options are adequate to financial put option.

- Learning options (option to defer, meaning option to delay investment) - adequate to financial call option. In this case farmer has the right to invest, but he is not obliged to do so. Such an option assumes situation where farmer is able to reduce uncertainty „by delaying an investment until more information has arrived".

Describing real options Brealey et al. (2007) mentioned the most important possibilities:

- Option to expand ,
- Abandon option,
- Option to wait, and
- Option to adjust.

These authors also mentioned the fact that option to expand is equal to right to buy (call option), while abandon option is appropriate to right to sell (put option). Similarly, Tauer (2006) mentions that decision to enter certain industry can be modelled as a call option while the exit decision can be modelled as a put option.

Among real options in agriculture the most commonly used is real option to defer (option to delay - learning option). But such practice in evaluation of agricultural projects by real options approach could have negative consequences. When discussing various types of real options it is important that some of them could have opposite effects on investor's opinion. In that sense Folta and O'Brien (2004) argued that option to defer (to postpone an investment) indeed discourages firms to enter a new industry in the presence of uncertainty, while option to grow has an opposite effect.

The authors determined that in case of uncertainty the option to defer is mostly used and that "uncertainty has a negative effect on entry, implying that the option to defer dominates growth options in most contexts". However, it was also found out that "the value of growth options outweighs the value of deferment options at high levels of uncertainty" and induces a positive effect of uncertainty on entry. Such conclusion indicates that option to grow could dominate if (despite high uncertainty) some activity offers significant growth options. In Serbian conditions majority of investments in agriculture are related to high level of uncertainty, so that option to defer and option to grow should be taken into consideration.

Discussing the use of real options for evaluation of investments projects Bierman and Smidt (2006) mentioned not only advantages of real options approach, but also its disadvantages. As the most important advantages of real options the following are mentioned:

- The traditional capital budgeting procedure could overlook some important values, such as “strategic values of future investment opportunities that will be opened up by a current project that may not be profitable taken by itself”.
- Real options approach offers better valuation procedure.
- The value of an option takes into account all possible cash flow strategies without a need to consider each one explicitly.

On the contrary, the authors enlisted the following disadvantages of real options approach:

- There is less of standard to guide future operations.
- Sometimes large option value may prevent managers from evaluating all cash flow assumptions (there could be some hidden assumptions).

The use of real options in agriculture

Generally, it could be stated that research related to the use of real options is mostly based on work of Dixit (1989), Dixit and Pindyck (1994), and Dixit and Pindyck (1995), among others. The first significant research of its use in agriculture is related to some important issues in livestock production (Purvis et al., 1995) analysing investment in free-stall dairy barns. Later research directed to livestock production is discussing introduction of new technologies (robotic milking systems) in dairy production comparing it to existing traditional milking system (Engel, Hyde, 2003). Authors determined that the most critical source of uncertainty is useful life of automatic milking system. They also stated that the real options criterion does lead to different decisions comparing to traditional NPV approach “in some cases where the value of waiting is shown to exceed the value of investing”.

Some authors (Hinrichs et al., 2008) discussed application of real options in hog production, trying to explain why production capacities and volume of this production in Germany are stable despite rather high level of risk in this production. Authors determine that uncertainty and flexibility of the decision maker to defer investments "widen the optimal range of inaction". Similar research was conducted by Odening et al. (2005) attempting to determine the "investment trigger and the disinvestment trigger for a pig-fattening barn under German market conditions". Applying real options authors explained reasons for farmer's reluctance regarding investments in hog production.

Tauer (2006) analysed decision of farmers to enter or exit dairy production depending on milk prices. The main idea of approach used in this paper is that "exit decision is viewed as a put option and the entry as a call option, with the farmer as a holder (buyer) of these options". In the paper authors determined lower and upper limits of milk price that causes farmers to enter of exit milk production. According to classical approach farmers would exit dairy production when milk price gets lower than variable costs, and would enter the production when milk price is higher than sum of total variable and fixed costs. But author determined that the use of real options further decreases exit price (because there is an option that milk price would be increasing in future) and increases the enter price (because there is a possibility that high milk price will not last for long, so famers intend to keep their option open).

Recently, real options approach is extensively used for evaluation in investments related to organic production or processing of organic products. Ehmke et al. (2004) used real option approach to decide whether it is economically effective to enter organic production. The process of gaining certificate for organic production lasts for three years. But during that time farmer would have small yields caused by production performed in the organic way while prices of the products are standard market prices (containing no organic premium). After three years transition period farmer would be able to receive premium for organic products, but there is an uncertainty concerning existence and level of premium for organic products. In such a situation authors decided to apply real option approach assuming that final decision could be made later. In other words, organic production will be performed only if farmer can obtain certain premium for organic products, so that authors analysed an option to postpone the investment "option to wait and see". Apart from real option approach (which reflected only one of possible scenarios) authors also analysed three more scenarios applying usual NPV approach, but determined that the use of real options offered the most convenient result. At the end of the research authors suggested that future research should investigate not only option to postpone the investment, but also option to grow.

Authors from Greece (Tzouramani et al., 2010) assessed policy incentives for organic dairy sheep producers applying real options approach. Authors conducted the research considering three typical investment options - “The first refers to an organic dairy sheep farmer who wishes to improve his enterprise, the second refers to the establishment of a new organic dairy sheep farm and the third refers to a conventional dairy sheep farmer who wishes to improve his enterprise.” Authors combined investments options with various scenarios concerning investments subsidies for organic and conventional dairy sheep farming. The results of the research indicated that investments in organic dairy sheep farming are not economically efficient without subsidies for organic production. At the same time, such investments are related to high level of risk. Use of real options in this analysis is adequate because of significance of subsidies and uncertainty related to its future volume.

Kuminoff and Wossink (2010) discussed organic production in the US and the fact that an increase in state support to organic soybeans production is not followed by an adequate increase of number of soybean acres. In the paper authors calculated “the dollar compensation required for widespread conversion of land use from conventional to organic farming”. Authors determined that “the organic price premium, which implicitly defines the optimal conversion trigger, may be much higher than the trigger that would be predicted by the conventional NPV model. A difference in triggers leads to inertia in conversion: farmers will wait until the option value trigger is exceeded before switching to organic”. In such a way authors demonstrated that even subsidies which should act like an incentive for broader introduction of organic farming have an opposite effect. It is especially important considering problems to predict future volume of state support because it “increases the value of waiting to switch, which will decrease conversion rates”.

The question - why only small number of farmers is involved in organic production, although it is more profitable than usual (conventional) production is discussed by Delbridge and King (2016), as well. In the research authors applied dynamic programming approach to model transition to organic crop production in the mid-western United States, while the transition to organic farming is treated as an investment under uncertainty. Authors received mixed results of the research – it was determined that it was attractive for small farms to enter organic production, while the transition to organic production is less desirable for big farms. Having in mind an increasing number of big farms it could be concluded that organic production in the US will not be able to satisfy growing demand for organic products. In the research authors used certain assumption to perform more detailed analysis (decrease of the level of price premiums, reduction of the organic production yield, variation of starting value of conventional revenue). Similar problems related to slow transition from conventional to organic farming in case of Austria and Germany were also addressed using dynamical approach (Musshoff, Hirschauer, 2008).

Recent researches on real options are directed not only towards agricultural production, but also analyse investments in processing of organic agricultural products. This topic was analysed by Pažek and Rozman (2012). The goal of the authors was to analyse alternatives to process organically produced spelt on a farm into spelt grain (for human nutrition) and spelt flour. Authors used not only Black – Scholes but also binomial model to perform more detailed analysis, proving that it is more favourable to process spelt on the farm than to use it in livestock production. Results of the analysis show "more favourable picture from farmers' perspective by binominal model". Similar research addressing spelt production and processing on organic farms in the Northwest Slovenia was performed by the same authors (Pažek, Rozman, 2011), as well.

Similarly, Punantapong (2016) developed an "integrated simulation model combined with multi-criteria decision analysis" for agricultural producers performing organic production. Author also applied real options approach for investment in equipment for fruit processing operation while three production options were analysed (binomial model has been applied). Author established the analysis in a way which takes into consideration number of criteria and offers possibility to rank various farm business alternatives.

Application of real options to evaluate investments in processing activities at the farm was discussed by Hadelan et al. (2009) as well. The topic of this research was investment in plum production as well as in its processing (plum brandy production). Authors created "a call option for investment in plum brandy production which entrepreneur can, but does not have to, exercise in the future". It is determined in the research that an option value significantly depends on plum cultivar. Option value is the highest "when the plum cultivar combines table and processing value". In the analysis authors used Black-Scholes and Binomial model.

Conclusion

Bearing in mind large number of risks they are facing, agricultural producers require new tools for evaluation of economic efficiency of investments. Real options approach, in comparison to traditional methods for investments evaluation, offers more flexibility and provides managers with an opportunity to make better informed investment decisions. Although there are many types of options, the analysis indicated that in practice the most important and the most commonly used is an option to delay investments, which takes into account the level of subsidies. It could be noticed that authors dealing with real options used this method to discuss various investments in agriculture and processing of agricultural products. Nevertheless, this approach is the most frequently performed to evaluate investments related to organic production (concerning crop production) as well as to deal with number of issues related to investments in livestock production. Having all that in mind, adoption of real options could be recommended in Serbian conditions, considering present level of riskiness of agricultural production.

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RISK MANAGEMENT AS AN IMPORTANT PART OF AGRICULTURAL POLICY AND THE CASE OF CZECH REPUBLIC

Vaclav Vilhelm[1], Jindrich Spicka[2]

Abstract

Farming is widely, and more often as other branches, threatened by various risks. It is given by its natural character. The various structures of farms and diversity of types of agricultural activities in various countries are reasons for various approaches to solving risks. The management of agricultural risks is often important part of agricultural policy in many countries in the world including the EU member states and is thus supported to various extents and in various ways from public sources, in the case of the EU somewhere using CAP funds, often using national resources or resources of regions. It makes sense, on the one hand, to study country-based approaches to addressing agricultural risks, but on the other hand, it is not possible to transfer experience and knowledge from other countries with different farms or production structures for optimum risk management in a country's agriculture. This is also the reason for the relatively difficult and, so far, less successful implementation of EU risk management tools under the CAP. The article presents the agricultural risk management tools in Czechia.

Key words: risk management, agricultural insurance, mutual funds, state support, ad hoc payments.

Introduction

The issue of risk management in agriculture and determining the role to be played by the state in this respect has long been in the attention of the OECD (OECD, 2011) and within the European Union (EU) of the European Commission (EC), (EC, 2017). Farming as crop and livestock production is affected by several risks that arise from the biological nature of production, the significant impact of weather and natural disasters, the limited shelf life of products and the seasonality of production as well as a relatively long produc-

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tion cycle, especially for permanent crops and livestock production. It can be concluded from the results of the studies (Palinkas, Szekely, 2008; Zimmer, 2008; Krug, 2009; Hyland et al., 2016) that the weather risks and natural disasters are perceived as the most important determinants in the decision-making process of agriculture subjects. The risk of price volatility and access to foreign capital is assessed in the light of current or expected economic developments on the agrarian market (Barret, 1996). Recent study investigated price risk perceptions and risk management strategies in the food supply chain. "*Agricultural prices in European food markets have become more volatile over the past decade exposing agribusinesses to risk and uncertainty. Price risk management strategies in EU food chains are diverse and well beyond traditional instruments such as futures and forward contracts*" (Assefa et al., 2017).

In terms of price risk, commercial insurance has a limited role within the Europe. In 1998, a private enterprise from the UK has established an income insurance system based on earnings statistics from the Home Grown Cereals Authority and LIFFE commodity futures prices. However, the scheme was abolished the subsequent season. In 2018, the British company re-launched price insurance but effects are not yet known (Meuwissen et al., 2018).

The threats can take the form of production or income outages and the destruction of (parts of) agricultural potential for individual farms. The unfavourable course of weather and natural disasters has a negative impact on the stability of farm incomes. In addition to the frequency and severity of risk, the third attribute of risk is its spatial correlation. From this perspective, we distinguish the unique (idiosyncratic) risks (for example hail) and the systematic risks that affect many subjects at the same time and are not diversifiable (for example draught). There are two groups of systematic risks for agricultural enterprises in the Czech Republic - production risks and price volatility. The systematic risk can be measured. Recent study showed that cooperatives generate higher Return on Equity under lower systematic risk than other farms in Slovakia (Toth et al., 2014).

The weather risks are attributed to less importance in livestock production compared to the crop production from the production point of view. Ito and Kurosaki (2009) investigated the effects of weather risk on the off-farm labour supply of agricultural households in a developing country. The share of off-farm labour supply is positively associated with weather risk. However, in recent years the perception of the weather risk in livestock production has changed with an increase in the frequency and severity of drought, which results in reduction of the animal feed base availability. The more frequent occurrence of drought events is caused by ongoing climate change. Farmers' drought risk perception depends on availability of external water supply, farmers' drought risk experience, crop structure, farm income and perceived control (Duinen et al., 2015).

For farms with predominant livestock production, the risks of contagious animal diseases are perceived as very important. The policy should respond to the fact that farmers are currently exposed to higher economic and environmental risks due to climate change and higher price fluctuations.

The main goal of the article is to present agricultural insurance as an important risk management tool in the Czech Republic. By the way, the article emphasizes differences of agricultural insurance systems in the EU and USA.

Methodology

The review article is based on the relevant professional articles and studies. Professional articles were checked for quality using Web of Science impact factor or Scopus journal rankings. Authors used full-text databases EBSCO, ProQuest and ScienceDirect as well as OECD online library. They searched for the following keywords "risk management", "agriculture", "insurance", "agricultural policy" in combinations. The review was initially time limited since 2010. Articles are up to date in terms of year of publication and timeliness of knowledge. Older articles were selected because of their relevance.

Various agricultural insurance systems in the EU and USA

Support under the Common Agricultural Policy (CAP) is a major part of agricultural support in the member states of EU. The most important of these are direct payments that farmers receive regardless of their current economic results. The EU's CAP 2014-2020 concentrates the most of its financial resources to the first pillar's fixed direct payments which increase farm income. There was limited presence of safety nets characterized by poor financial capacity. The EU's safety nets and risk management tools have been defined, introduced and managed individually under the two pillars of the CAP 2014-2020 (Mathijs, 2017). Unlike the US, farmers are not yet offered insurance coverage for fluctuations in agricultural commodity prices in the EU.

In the EU CAP for 2014-2020, support for risk management tools is placed in the second pillar of rural development (Regulation 1305/2013 of the European Parliament and of the Council, (EC, 2013)). Risk management tools in the rural development pillar are co-financed by Member States and are optional. Instruments include support for crop and livestock insurance, mutual funds support for adverse climatic events, animal and plant diseases or environmental disasters, or income stabilization instrument as a financial contribution to mutual funds (income stabilization tool - IST). All these measures may be applied where the production damage incurred exceeds 30% of the average production over the past three years or the farm income is more than 30% lower than the previous three-year average. The payment could be maximally 65% of the eligible costs, while is limited to 70% of the revenue loss. The current risk management tools defined in Regulation 1305/2013 (EC, 2013) have found relatively little scope for application in practice in the Member States and are only implemented in 13 out of over 100 rural development programs within Member States EU. Total public spending committed for the tools coming over CAP Pillar 2 budget „*represent less than 2 % of the Pilar 2 funds and 0,4 % of the total 2014-2020 CAP budget, which means that CAP support to agricultural risk management continues to be very low*" (EP DGIP, 2016).

Cordier (2014) compared the US agricultural policy with the EU Common Agricultural Policy and its instruments, the breakdown of aid from public sources can be described as shown in Table 1.

Table 1. Estimated budget weights of programs within agriculture policies USA and EU CAP

TYPES OF SUPPORT	US	EU (CAP)
RISK MANAGEMENT SUPPORT	47%	1%
SAFETY NETS	23%	5%
INCOME SUPPORT	0%	72%

Source: Cordier, 2014.

There are very different agricultural insurance systems in place across the EU, which is related especially to the diversity of risks that threaten European farmers. France, Spain and Italy have the largest multi-peril crop insurance programs (EP DGIP, 2016; Santeramo, 2018), while in Germany exists the mature single-peril hail insurance market for crops (Reyes et al., 2017). Differences in agricultural insurance schemes in the EU are rooted in the national culture and history (Meuwissen et al., 2018).

Livestock insurance coverage could be found in the most of the EU member states but there are also differences across the EU. Germany has completely private-based insurance, without public support. Alternatively, Spain risk management scheme is highly centralized and heavily supported by government (Bardaji et al., 2016). Last but not least, the livestock risk management system in the Netherlands is based on private mutual funds (Meuwissen et al., 2003).

Adoption rates of risk management instruments vary significantly across EU Member States and types of farming. "*Larger farms more often adopt crop insurance, occupational accident insurance, price contracts and diversification but are less likely to adopt credit avoidance and off-farm employment*" (van Asseldonk et al., 2016).

South European countries, which are threatened by drought and other extreme weather events, are more at risk. In Central Europe, hailstorms and droughts and torrential rains has an significant role in the context of climate change. Northern Europe, by contrast, is much less vulnerable. State-run compulsory insurance institutions are applied in Greece and Cyprus. In most EU countries, both the private and public sectors are involved in agricultural insurance. Often, insurance provided by private insurance companies is subsidized from public funds. Such systems are used, for example, in the Czech Republic, Slovakia, France, Italy, Poland and Austria.

In Austria, after the Second World War, the Austrian Hail Insurance Company, the Mutual Insurance Association (ÖHV), was set up by an agreement of insurance companies offering hail insurance. Premiums are 50% subsidized from public sources (half of them are contributions from the State Disaster Fund, the other half by contributions from individual Länder). More than 80% of agricultural land is insured, of which more than 60% is insured against multiple risks, which include hail, frost, storm, flooding, drought, overgrowth and some other risks. In recent years, the insurance has expanded to cover the insurance of grazing animals.

A more complicated system of agricultural insurance based on public-private cooperation has been in place since the late 1970s in Spain. The insurance offer is provided by commercial insurance companies, the insurance operation and the settlement of damages is carried out by the AGROSEGURO insurance pool. The development of insurance products, subsidy and tariff policy is determined by the ENESA state organization established by the Ministry of Agriculture. Part of the reinsurance is taken over by the state reinsurance organisation CCS. State financial support for individual products is up to 50% of premiums and is provided by central government and regions. Insurance is voluntary. The sum of insured amounts for crops and animals increased from about EUR 3 billion in 1991 to almost EUR 11 billion in 2008 and premium support increased from approximately EUR 90 million to approximately EUR 450 million over the same period. The share of insured production in cereals, fruit and livestock exceeded 70% (Anton, Kimura, 2011). Without state participation on a purely commercial basis, agricultural insurance is operated, for example, in Germany, the United Kingdom and the Scandinavian countries. In France and the Netherlands, in addition to insurance companies, funds, partly created by compulsory contributions from farmers, also play an important role.

There is a big difference in insurance adoption between the EU and USA. While majority of agricultural land in the USA is covered by federal crop insurance programme, only 20 % of European farmers take part in crop insurance programmes. Recently, there has been a growing popularity of revenue insurance in the USA, partly because of higher price volatility. The two most popular farm-level insurance policies in the US are Revenue Protection (RP) and Revenue Protection – Harvest Price Exclusion (RP-HPE). Revenue is determined by futures prices on the Chicago Mercantile Exchange and farm-level yields (Rawley, 2017). To provide insurance for more diversified farmers, Whole Farm Revenue Protection (WFRP) was introduced in 2015 as a pilot programme. The programme compensates severe income loss. The Whole Farm Revenue Protection could be an attractive option in the EU where on-farm diversification is popular (Santeramo, Ford Ramsey, 2017). Moreover, weather index insurance and revenue insurance could be also considered as more immediate approach how to increase flexibility of national insurance systems (Santeramo, Ford Ramsey, 2017).

Situation of agricultural insurance in Czech Republic

In 2018, agriculture including forestry and fishing contributed 2.2% to GDP and 2.4% to employment. There were 48,700 subjects with utilised agriculture area of 3.537 million ha. Farms of over 50 ha accounted for 92% of the utilised agriculture area but represented just 16% of all subjects. While only 10% of subjects in the Czech agriculture sector are a legal person, in terms of the share of cultivated land they account for 70%.

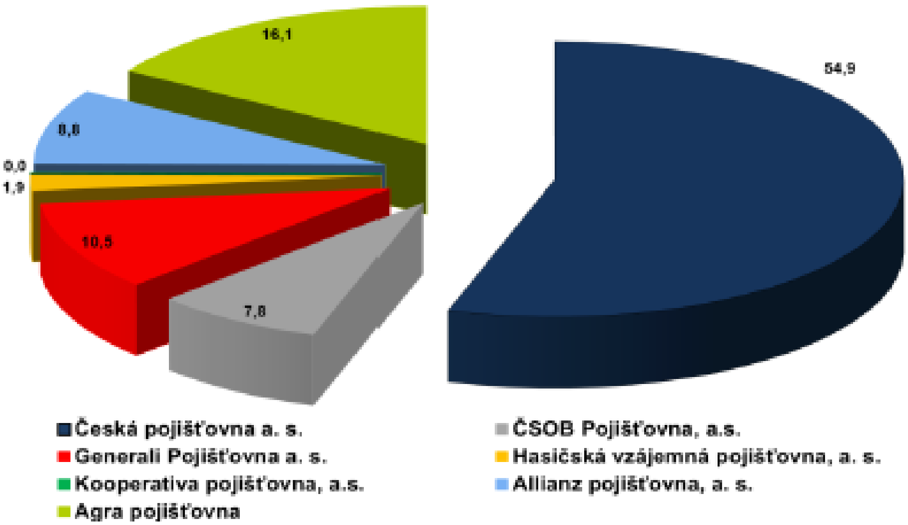
The frequency and severity of risks in agricultural production are largely influenced by the nature of the climate. The Czech Republic is situated in a mild humid climate zone. Its geographical location implies a lower risk for agricultural production than in southern European countries and, on the contrary, a higher level of climate risks than in northern Europe. The basic systematic risk of weather in agriculture is in our conditions especially drought, which causes the most significant losses of yields nationwide. According to the results of long-term CHMI (Czech Hydro-meteorological Institute) observations, enterprises operating in fertile lowlands in South and Middle Moravia and in Central and Eastern Bohemia are exposed to a higher risk of more frequent occurrence of dry periods. Thus, higher crop yields are achieved in a riskier environment, which is also consistent with the general risk theory.

In times of centrally planned economy, agricultural insurance played an extremely important role in former Czechoslovakia. Insurance operated by Czech (or Slovak on the territory of Slovakia) state insurance company was legally compulsory for all state and cooperative farms, which accounted for the decisive share of agriculture, and covered a wide range of risks in crop and livestock production. Between 1986 and 1990, crop insurance took the form of comprehensive crop insurance and covered almost all incidents of production outages (Vilhelm, 1993). Since 1991 was the agricultural insurance operated by commercial insurance companies.

Since 2004 Czech Republic is a member state of EU and the Czech farms are receiving subsidies under the Common Agricultural Policy. In addition to the direct payments that farmers receive, irrespective of their economic results, agricultural insurance and damage mitigation state subsidies are important tools for stabilizing agricultural income in Czech agriculture.

The Graph 1. shows the market share of various insurance companies on crop and livestock insurance in the Czech Republic in 2018 according the volume of premium written for crop and livestock insurance in applications for insurance subsidy.

Graph 1. The market shares of insurance companies in agricultural insurance in the Czech Republic in 2018



Source: PGRLF, 2019.

Farmers and agricultural companies have a relatively wide range of insurance products available to cover the range of risks to plant and animal production offered by several commercial insurance companies. Support and Guarantee Peasant and Forestry Fund (PGRLF) then, under the insurance support program, it provides a subsidy for crop and livestock insurance, as well as forest nurseries and forest stands. In 2018, this subsidy accounted for 55% of the premiums paid for special crops (these are permanent crops including nurseries, i.e. grapevine, hops, fruit and strawberries, potatoes, sugar beet, vegetables, ornamental plants including nurseries, medicinal, aromatic and spicy plants, flax, hemp and the production of grasses and legumes grown for seed), respectively 42% for other crops and 50% for livestock. In 2018, support for crop and livestock insurance from PGRLF funds totalled CZK 532 million.

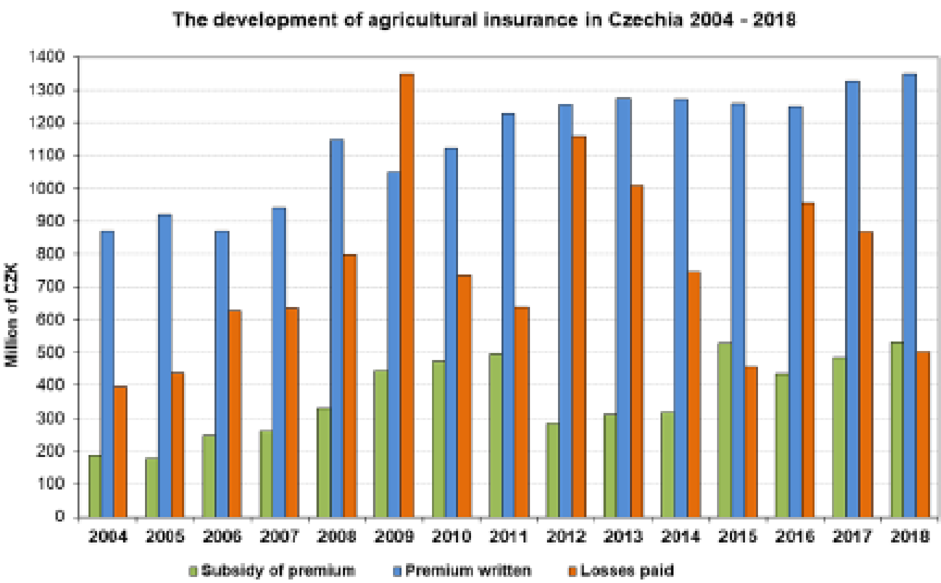
Commercial insurance against drought is almost not offered in the Czech Republic, but at the same time it is a fact that due to drought, individual companies will reduce their yields rather than lose all production, and this decrease in yield in connection with market globalization may no longer be compensated by price increases. On the other hand, some locally acting risks, especially hail, but also floods and other adverse weather events, do not usually cause significant shortages at national level, but can severely affect the production of an individual, particularly small farm. In the event of such risks, commercial insurance is offered.

Similarly, in animal production we can distinguish systematic risks, in our conditions, resulting mainly from animal diseases, and risks of individual damage such as accidents or non-infectious animal diseases. In the case of all these risks, commercial insurance can be taken out. An example of veterinary risk in recent years in the Czech Republic was Avian influenza or African swine fever in neighbouring states.

From the public sector point of view, the problem is the unfavourable ad hoc compensation of damage from the state budget due to the level of premiums in agricultural insurance. The relationship between the volume of insurance premiums and ad hoc compensation is very important, as insurance benefits, particularly from subsidized agricultural insurance, should minimize the need for ad hoc compensation from public budgets.

The development of agricultural insurance (i.e. crop and livestock insurance) in the years 2004-2018 in terms of premium written, losses paid and subsidies of premium in the Czech Republic is shown in Graph 2. and Table 2., show the rate between CZK and EUR in this period.

Graph 2. Development of agricultural insurance in the Czech Republic



Source: PGRLF, 2019.

Table 2. The rate between CZK and EUR 2004-2018 (annual averages)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CZK/EUR	31,90	29,78	28,34	27,76	24,94	26,45	25,29	24,59	25,14	25,97	27,53	27,28	27,03	26,33	25,64

Source: CSO, 2019.

The loss rate[3] of livestock insurance is consistently low in the period under review (43% on average) with minor fluctuations compared to crop production (77% on average). In this respect, crop production is riskier than animal production. The overall trend of decreasing premiums in livestock production corresponds to declining numbers of animals. The share of insured animals in the Czech Republic has been estimated at 80% of the total number of animals kept for a long time.

The average loss rate for both crop and livestock production needs to be monitored over a longer period and in the period 2001-2018 averaged 68 % with fluctuations from 37% in 2018 to 128% in 2009. Over the years, loss rate in plant production exceeded 100% four times (2001, 2002, 2009, and 2012).

Table 3. shows the development of agricultural insurance from 2004 to 2018. It captures the overall impact of the whole system of agricultural premium subsidies on the income within the entire agricultural sector (column 5).

The Table 3., column 5 shows the overall financial impact of agricultural insurance on the financial situation of the agriculture sector, the whole cash flow was for the last 15 years -323 million CZK, i.e. approximately 12 million EUR, which means in average cost for agricultural sector 0.8 million EUR per year. At the same time, it appears that in years of high damage, such as in particular 2009 or 2012, the financial contribution to agriculture was generally significant. It can be assumed that agricultural insurance, which often means the only financial rescue for the affected farm, is in the conditions of the Czech Republic easily accessible for agricultural holdings due to the subsidies provided.

3 The loss rate is defined as the ratio of insurance benefits (paid losses) to the volume of written premiums.

Table 3. The impact of subsidized agricultural insurance on the agricultural income

Million CZK	1	2	3	4	5
Year/Indicator	premium written	paid losses	premium subsidy	paid losses and premium subsidy	difference 4-1
2004	870	396	187	583	-287
2005	919	436	178	614	-305
2006	870	628	249	877	7
2007	940	636	260	896	-44
2008	1150	797	331	1128	-22
2009	1050	1348	445	1793	743
2010	1123	753	306	1041	-82
2011	1226	638	459	1097	-129
2012	1255	1160	499	1659	404
2013	1274	1009	309	1318	44
2014	1273	754	359	1113	-160
2015	1258	447	445	892	-366
2016	1249	955	443	1397	148
2017	1327	869	497	1366	39
2018	1347	502	532	1034	-313

Source: MACR, 2019.

Larger agro-businesses with an area of over 100 ha of utilised agricultural area are a major part of the crop insurance clientele. In total, crops with an area of more than 1.6 million ha are insured in 2018, while in 2001, the area of insured crops slightly exceeded 1 million ha. The share of insured areas with respect to LPIS land register data, which is the basis for granting agricultural policy support, is 60%. Prior to the start of premium support in 2000, insurance coverage[4] in plant production was around 30%. The increase in insurance coverage can be attributed mainly to support for premiums from public sources.

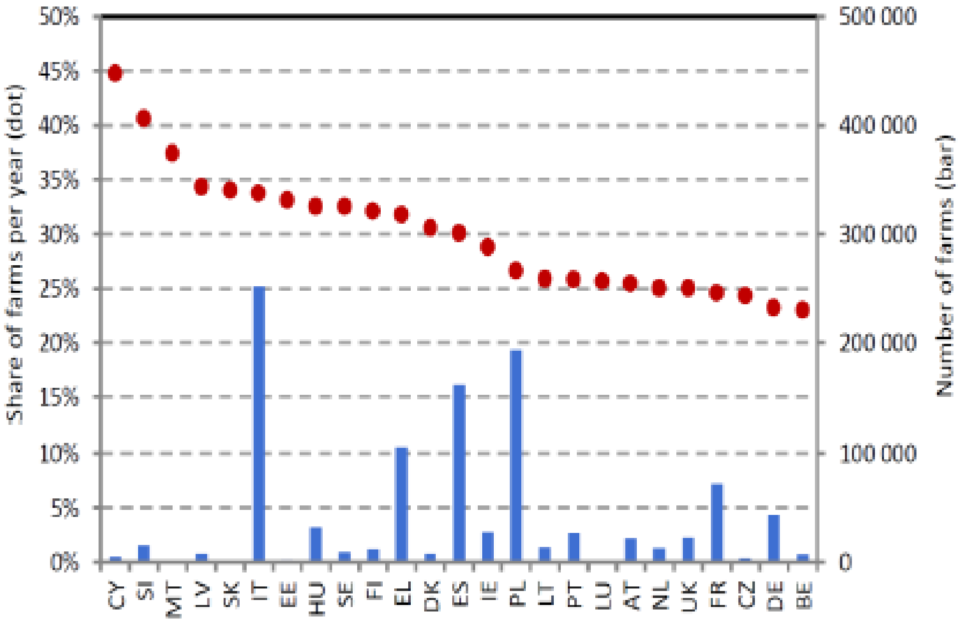
Crop and livestock insurance offers are linked to selected natural hazards, contagious diseases risk and some other risks to plant and animal production. Towards the price risks, in the Czech Republic certain risks stay uninsurable, especially the risk of drought, the risk of spring frost on fruits and the risk of rain that makes it impossible to harvest.

Therefore, in the event of these risks, the state grants ad hoc aid to affected farmers under specified conditions. In 2018, more than CZK 1.3 billion was paid in this way, mainly as part of subsidies to mitigate the damage caused by spring frosts on fruit and forest nurseries in April and May 2017 and grants to growers to mitigate the damage caused by drought on agricultural crops in 2017.

4 The ratio between area of insured crops and whole utilised agricultural area.

The extent of the risk of the destruction of agricultural potential in Czech conditions hasn´t been precisely quantified. In particular, the loss of topsoil as a result of flooding or the need to eradicate permanent crops (orchard trees, vines or hop plants) in cases of disease or pest infestation may be considered. The calculations from the study Risk management schemes in EU agriculture - Dealing with risk and volatility (EC, 2017)[5] can be used for orientation. Study estimates the share of farms affected by more than 30% loss in agricultural income calculated as a difference in income risk based on FADN EU data.

Graph 3. Proportion and number of farms with more than 30% drop in agricultural income in the EU-25 compared to the 2007-2013 average



Source: EC, 2017.

Farms in Italy, Spain, Greece and Poland are most vulnerable to income slump. The riskiest in this respect are holdings with predominant field production, holdings specialized in pig and poultry breeding and holdings specialized in fruit and vegetable production. On the contrary, mixed-animal holdings and combined crop and livestock holdings are relatively least at risk. The Czech Republic has one of the lowest proportions of farms sensitive to income slump, mainly due to the specific farm structure. Therefore, the risk

5 https://ec.europa.eu/agriculture/sites/agriculture/files/markets-and-prices/market-briefs/pdf/12_en.pdf

of destroying more than 30% of the agricultural potential of such an affected farm can be considered very small in the Czech Republic. However, if the loss limits are reduced to 20%, the share of affected enterprises will be higher, but official international comparisons are not available.

It is necessary to realize that the first pillar instruments, namely direct payments, influence (stabilize or improve) the income situation of the whole agriculture and individual enterprises. However, this does not apply to Pillar 2 risk management instruments (in CAP 2020+ under Article 70 of the proposal for a Regulation), such as insurance support or mutual funds support in case of loss of income. These instruments support only the affected enterprises and, for non-affected enterprises, represent only a reduction in the amount spent on insurance premiums or mutual fund participation, but in fact (for those not affected), additionally issued without direct effect. Therefore, such instruments cannot be compared to the income situation of the whole agricultural sector, but always only to the affected enterprises. Indeed, these affected enterprises can save such instruments economically when needed, thus creating a positive effect for the whole of agriculture, given that even the affected enterprises can continue to be economically active in agriculture. Importantly, a company cannot know in advance that it will or will not be affected in a given year, and the probability of being disabled in a particular year is usually much higher than the probability of loss (and we don't consider that 30% or 20% condition for the application of supported instruments under the CAP).

Throughout agriculture, insurance benefits from the impacts of insured risks represent on average less than one percent of total production (i.e. relatively little with annual fluctuations of between, approximately 0.3%-1.5%). This corresponds to the required premium amount, which is always higher than the indemnity in the long term so that it is possible to compensate both, the indemnity, insurance company costs and their calculated profit. Insurance subsidies then significantly reduce premiums for agricultural holdings as they return a significant portion of the premiums paid.

Risk management tools, such as insurance support or mutual fund participation, help to reduce the volatility of farm incomes by enabling businesses to take out insurance by making it more affordable and thereby offsetting outages as a result of the realization of insured risks if they are affected by the insured risk and businesses represent a tolerable (even as a result of a subsidy against premiums paid), a cost item that lowers their income levels only a little. The prerequisite for the effective functioning of such a system is the involvement of a sufficient number of companies in insurance (see our insurance coverage) or mutual funds (this is not yet the case in the Czech Republic). In the absence of an insurance subsidy, it can be expected that a large proportion of companies would remain uninsured, especially those that consider their level of risk rather lower. Only companies with a high level of risk would remain in the insurance business, forcing insurance companies to raise premium rates and making the insurance unacceptable to other businesses, which could lead to its extinction.

Ad hoc compensations as a complementary tool of agricultural insurance

In particular, ad hoc payments should aim at mitigating the effects of uninsurable damage. Compensation for the consequences of damage is provided from the state budget often on the basis of extraordinary legislation (most often in the form of a government order). Since 1995, ad hoc compensation has been provided mainly to eliminate damages due to devastating floods (most extensive in 1997 and 2002), prolonged drought (2000, 2015), severe frosts (winter 2002/2003) and damage caused by voles (1998). Compensations were often paid to mitigate damage following local floods. On average, CZK 600 million was spent annually, CZK 14.400 billion in total (1995-2018).

In terms of the speed of compensation, it can be stated that the insurance benefit from the insurance contract is significantly faster than the ad hoc compensation of damage from the state budget. This is due to the administrative burden and processes needed to mobilize funds from public budgets. Ad hoc compensation is therefore also paid in the year following the realization of the damage.

To complement the ex-post risk management tools, it should be noted that there is no mutual fund or calamity fund in the Czech Republic to which farmers would contribute when co-financing from the state budget.

Conclusions

If we are considering further development, it remains open for the future whether and how to further adjusts the risk management system in Czech agricultural conditions. The aim should be to minimize the need for ad hoc state aid to address the impact of risks. The use of CAP instruments, where the possibility of compensation is preconditioned by a loss of at least 20% of the total farm production or income compared to the previous three-year average, remains problematic regarding to the size structure of the decisive part of Czech farms with the hectare weighted median of 1,000 ha utilised agricultural area[6]. The probability of such a failure is significantly lower than that for small and especially small specialized farms in other EU countries. At the same time, a production shortage of less than 20% of the three-year average can cause a big business a problem, so it is preferable to provide appropriate insurance for such cases. Therefore, it is more likely to consider maintaining the existing system of subsidized agricultural insurance with a possible widening of the range of insurable risks, as demonstrated, for example, by the latest development of agricultural insurance in neighbouring Austria. Another possibility would be supplementing the existing agricultural insurance with a long-considered but still unrealized fund for the cases of uninsurable losses. It could also be considered the possible as an alternative for support such a fund to use CAP resources.

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CHINA'S AGRICULTURAL TRADE WITH EASTERN EUROPE: A FOCUS ON FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

Vasilii Erokhin[1], *Gao Tianming*[2]

Abstract

With the world's biggest population, China now accounts for a major part of global food consumption and a quarter of total global food production. During the past decades, China has been opening its food market for imports and at the same time, increasing its share on the global market as an exporter of agricultural products. So far, despite their huge agricultural potential, Eastern European countries have not been much involved in food trade with China. This paper empirically analyses the dynamics and structure of China - Eastern Europe agricultural trade in 2010-2018. The authors attempt to explore the opportunities for Eastern European countries to increase their role in China's agricultural imports with value-added food products, as well as discuss how the countries of Eastern Europe and China may secure their food chains and ensure the sustainability of food supply by diversifying trade channels.

Key words: agricultural production, agricultural trade, China, food security, sustainable development.

Introduction

Since the 2000s, China has gradually emerged as one of the essential partners of Eastern Europe in agricultural trade, however, the volume of agricultural trade turnover still remains low compared to those between Eastern Europe and the EU, Russia, or the USA. The portion of food products in China-EU trade has been increasing, but mainly by means of the countries of Western Europe. China is self-reliant in securing its own food supply, but for some products, the country still depends much on agricultural imports. In an attempt to optimize its supply chains, diversify the sources of import, and improve food security and sustainability of domestic food market, China is

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now looking for new partners in the global food market. The countries of Eastern Europe may use their huge agricultural potential and increase their role in China's food purchases.

So far, few studies have focused on agricultural trade between China and the countries of Eastern Europe. Song (2017) looked at economic and trade ties between China and Central and Eastern Europe and examined China's bilateral relations with particular countries of the region, but not specifically studied trade in agricultural products, food security, and sustainable development issues. Ella (2018) discussed the future of China-Europe relations based on the expansion and deepening of trade relations, but not individualized the potential contributions of the countries of Eastern Europe to this process. Zhao (2016) studied China-Europe trade relations through the lens of the Belt and Road Initiative (BRI), but not specifically outlined the perspectives of deeper trade relations between the sides for food security of China and development of agricultural sector in Europe.

The authors attempt to bridge the existing gap in China - Eastern Europe trade studies by analysing the dynamics and structure of agricultural trade in 2010-2018. This study explores the opportunities for Eastern European countries to increase their role in China's agricultural imports with value-added food products, as well as discusses how China may improve its food security and ensure the sustainability of food supply by diversifying import channels.

Materials and Methods

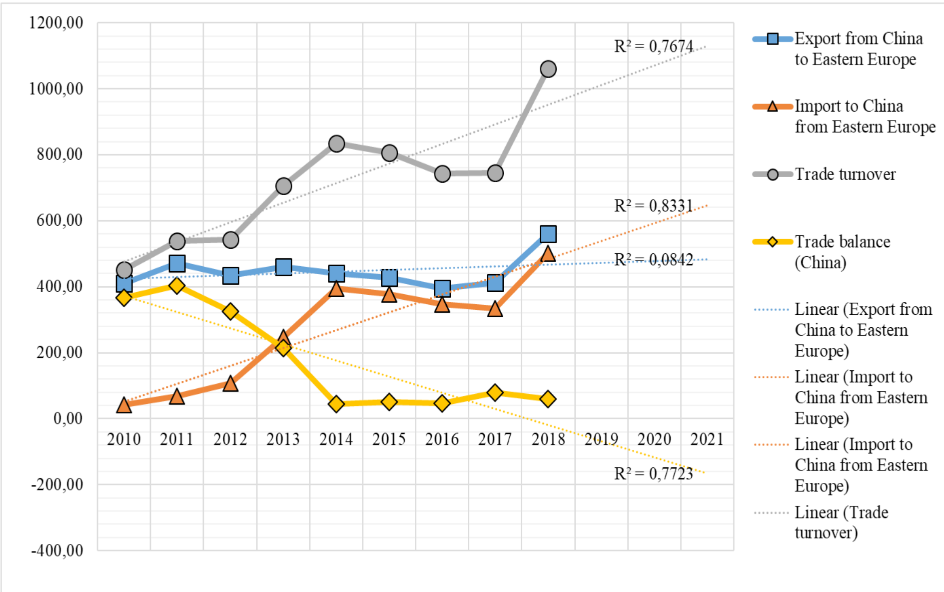
In previous studies, there have been used various techniques to analyse and forecast trade volumes based on comparative advantages (Donaldson, 2019), various dimensions of competitiveness (Javed et al., 2018), factor analysis (Choi, Krishna, 2004; Kancs, Ciaian, 2009; Erokhin, 2017), and performance of countries and specific commodity groups (Aksoy, Ng, 2010). In this study, the authors employ linear forecast to predict export, import, and aggregated trade flows between China and the countries of Eastern Europe. Forecasting is a special technique of making predictions for the future by using historical data as inputs and analysing trends. This method is commonly used to make educated guesses on trade flows.

For the purpose of this study, under the term "Eastern Europe", the authors understand the extended array of thirteen countries of Central, Eastern, and Southeast Europe, namely Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Montenegro, North Macedonia, Poland, Republic of Serbia, Romania, Slovakia, and Slovenia. Trade data are obtained from the United Nations Conference on Trade and Development (UNCTAD). SITC Commodity classification is used. Total volume of agricultural trade in both exports and imports is generalized as SITC "All food items" (SITC 0+1+22+4). Detailed lists of import and export products are built along 37 positions and include major food and agricultural commodities traded between China and the countries of Eastern Europe in 2010-2018.

Results and Discussion

Since the early 2000s, agricultural trade between China and the countries of Eastern Europe has been emerging. In 2018, agricultural trade turnover increased almost twofold compared to 2010 and exceeded USD 1 billion (Figure 1.).

Figure 1. Agricultural trade between China and the countries of Eastern Europe in 2010-2018, USD million

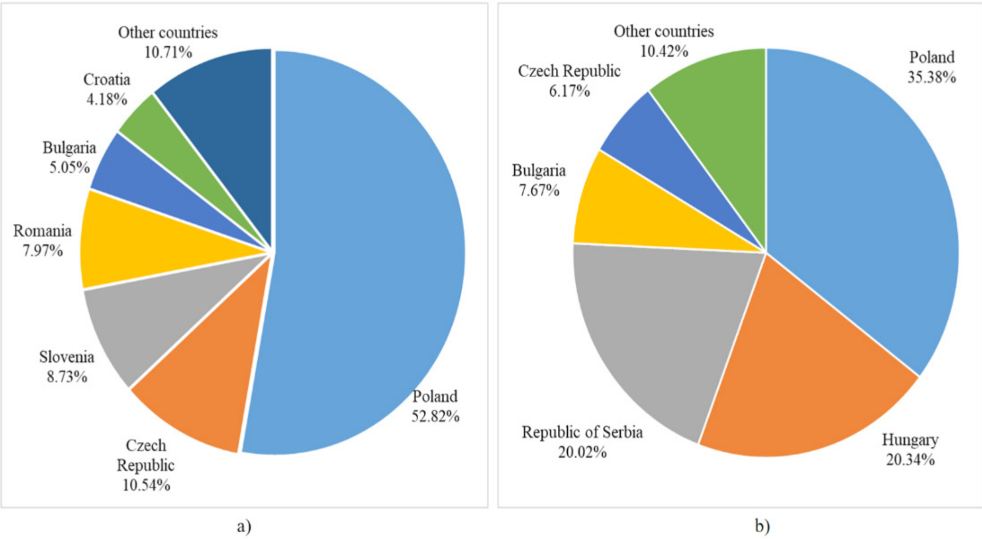


Source: authors' development based on UNCTAD (2019).

China's import from Eastern Europe, insignificant before 2010, increased to USD 400 million in 2010-2014, stabilized on that level in 2014-2017, and then peaked to over USD 500 million in 2018. In general, China keeps positive balance of agricultural trade with Eastern Europe, but imports almost came up with exports in 2014 and since that time have been going hand in hand with each other.

In terms of trade in food and agricultural products, China's major partner among the countries of Eastern Europe is Poland. In 2018, Poland accounted to almost 53% of total China's export to Eastern Europe and provided over 35% of aggregated food supply from Eastern Europe to China (Figure 2.). Other export destinations for China are Czech Republic, Slovenia, Romania, Bulgaria, and Croatia. Other major suppliers to China are Hungary, Republic of Serbia, Bulgaria, and Czech Republic.

Figure 2. China's top five (a) export destinations and (b) import sources in Eastern Europe in 2018, percentage in overall exports to and imports from the region, respectively

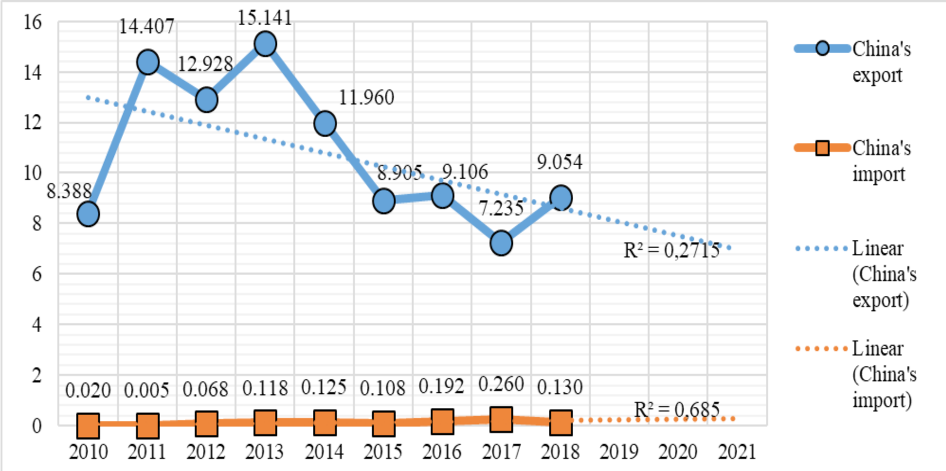


Source: authors' development based on UNCTAD (2019).

In general, the countries of Eastern Europe supply to China vegetables and roots, fruit, cereals, and various edible products. Agricultural imports from China to Eastern Europe is much more diversified: fish, crustaceans, fruit, spices, roots, edible products, and tea.

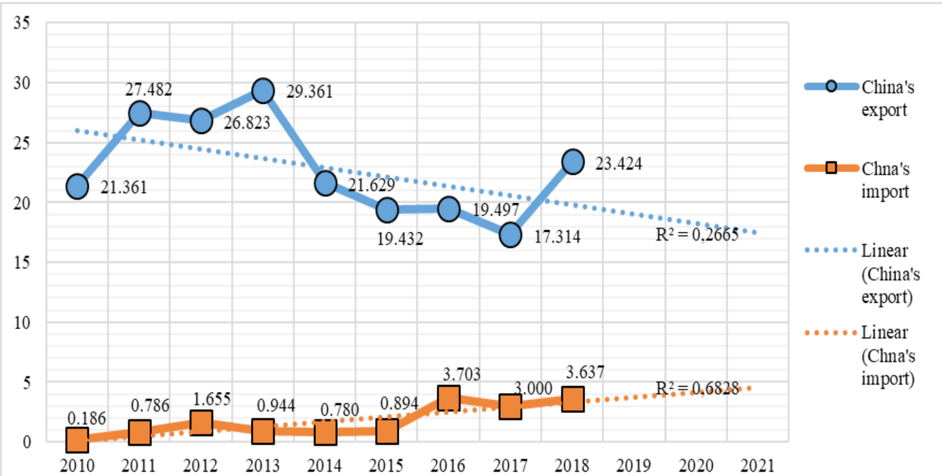
Among the countries of Eastern Europe, there are net exporters to and net importers from China, Albania (Figure 3.), Croatia (Figure 4.), and Slovenia (Figure 5.) being the most demonstrative examples of the latter.

Figure 3. Agricultural trade between China and Albania in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

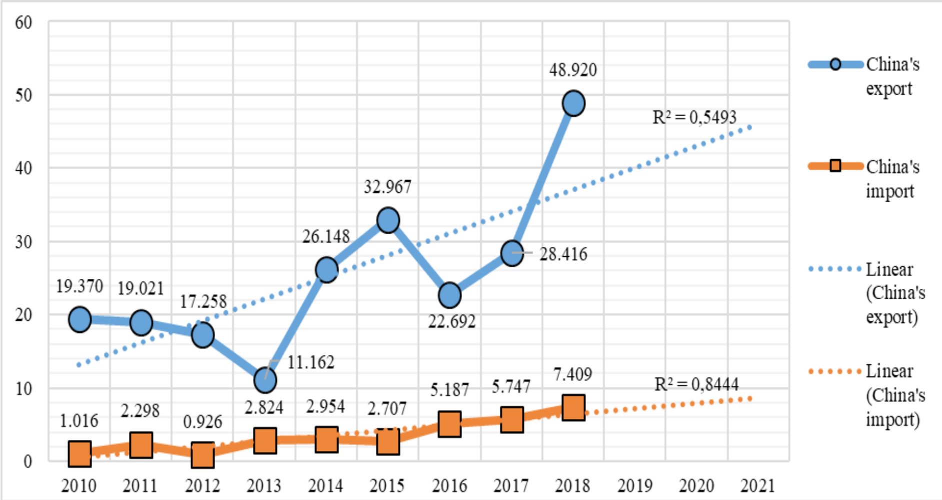
Figure 4. Agricultural trade between China and Croatia in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Albania supplies to China vegetables and fruit and imports crustaceans, fish and various edible products, Croatia's major export item is edible products, while Slovenia export vegetables and roots. In all three countries, the structure of agricultural import from China is much diversified and includes many positions, primarily, high value-added foods and processed agricultural products.

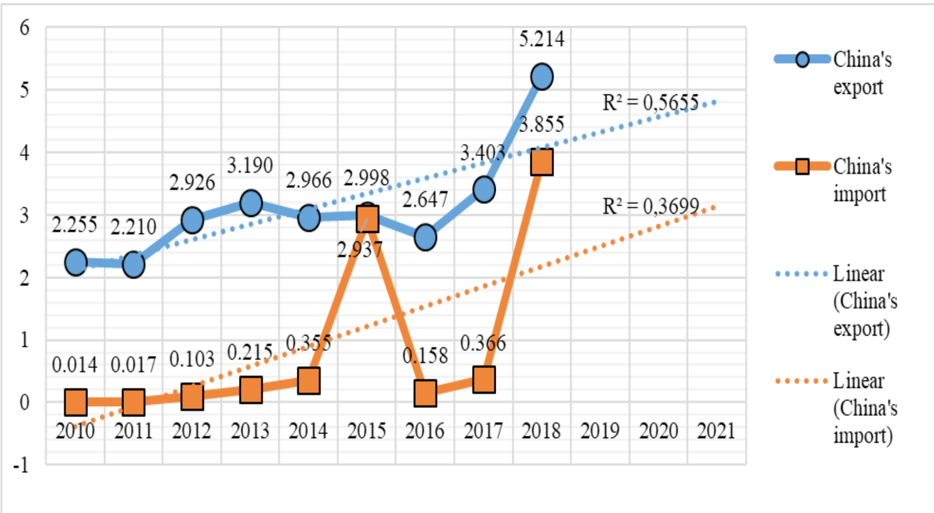
Figure 5. Agricultural trade between China and Slovenia in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

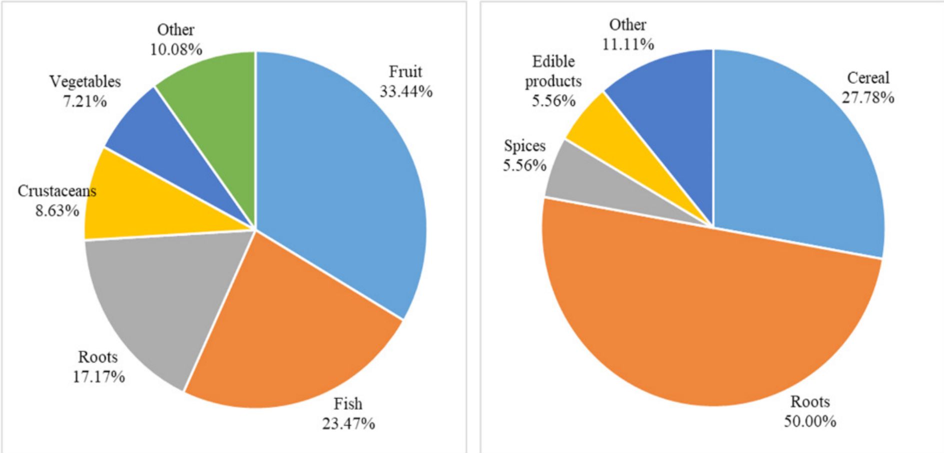
In Bosnia and Herzegovina, the structure of agricultural trade with China is more balanced (Figure 6.). In 2018, the country particularly emerged as a supplier of roots and cereals to China (Figure 7.) and a market for Chinese fruit, fish, crustaceans, and other food produced of higher value.

Figure 6. Agricultural trade between China and Bosnia and Herzegovina in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Figure 7. Structure of agricultural trade between China and Bosnia and Herzegovina in 2018, percentage in total exports and imports

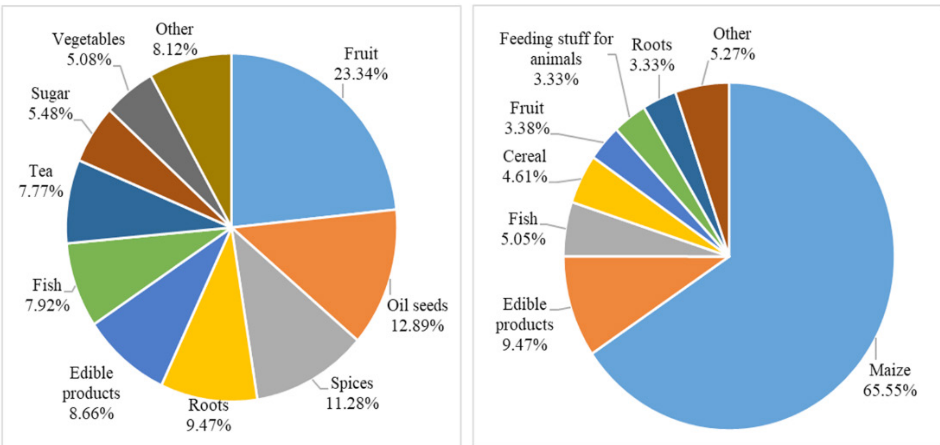


a) China's export to Bosnia and Herzegovina b) China's import from Bosnia and Herzegovina

Source: authors' development based on UNCTAD (2019).

Among the countries of Eastern Europe, Bulgaria is one of the few cases of positive agricultural trade balance with China, specifically, by means of increasing import of maize by China in the recent years (Figure 8.).

Figure 8. Structure of agricultural trade between China and Bulgaria in 2018, percentage in total exports and imports

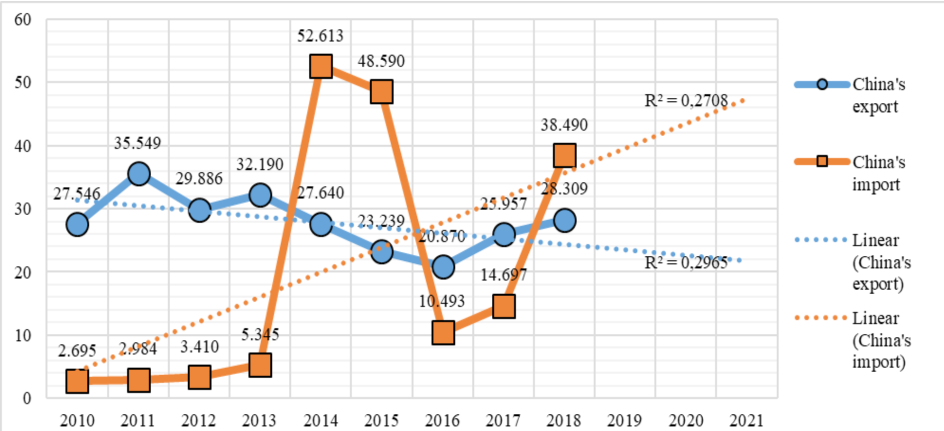


a) China's export to Bulgaria b) China's import from Bulgaria

Source: authors' development based on UNCTAD (2019).

Authors' forecast predicts the growth of food exports from Bulgaria to China to USD 50 million and the decline of agricultural import from China down to USD 20 million in 2021 (Figure 9.).

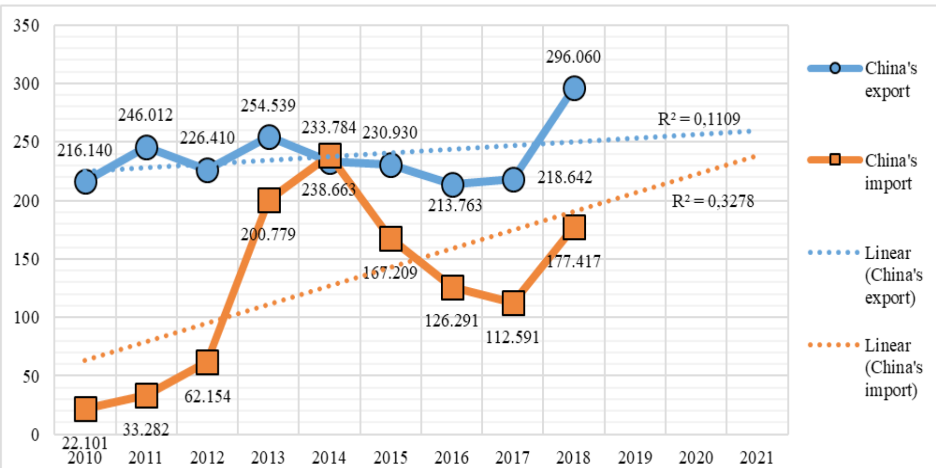
Figure 9. Agricultural trade between China and Bulgaria in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

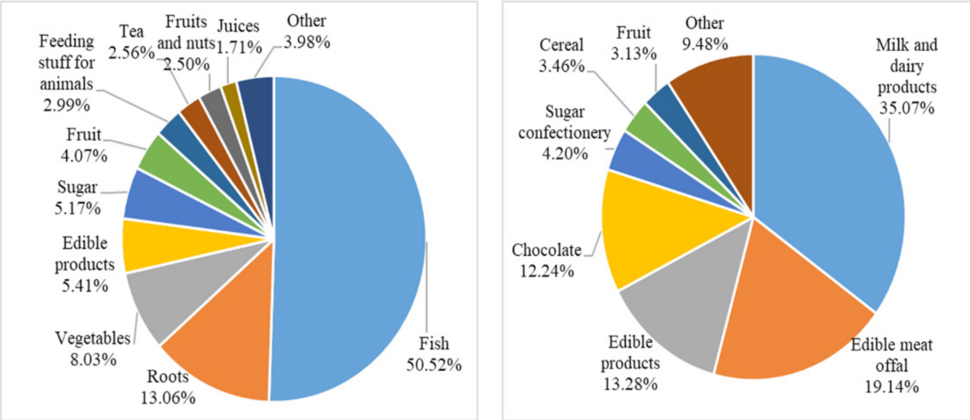
The biggest trade partner of China in Eastern Europe is Poland with trade turnover over USD 473.5 million in 2018 (Figure 10.). Poland's export to China is diversified and predominated by high-value goods - milk and dairy products, edible products and preparations, and confectionery (Figure 11.).

Figure 10. Agricultural trade between China and Poland in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019)

Figure 11. Structure of agricultural trade between China and Poland in 2018, percentage in total exports and imports

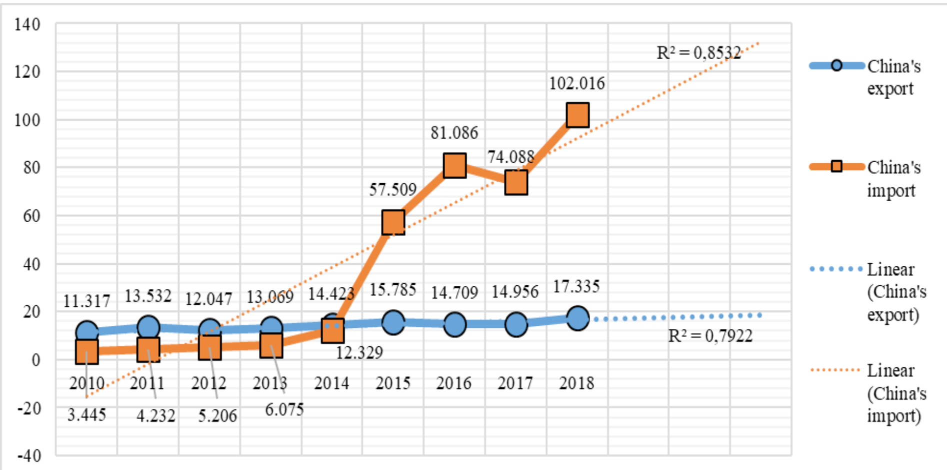


a) China's export to Poland b) China's import from Poland

Source: authors' development based on UNCTAD (2019).

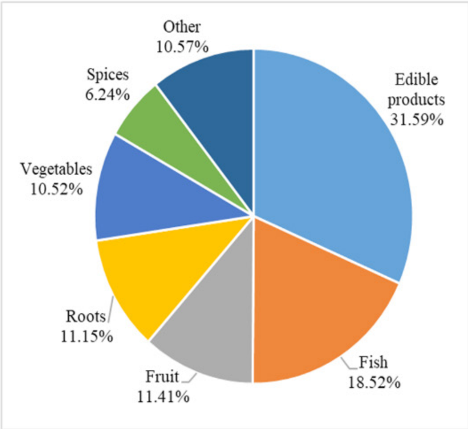
The second-largest trade partner is Hungary (trade turnover is USD 119.3 million in 2018). In contrast to most of the countries of Eastern Europe, Hungary has been enjoying a positive agricultural trade balance with China since 2014. The prediction for Hungarian agricultural export to China is to grow up to USD 130 million by 2021 (Figure 12.), mainly by means of processed meat products and edible meat offal (Figure 13.) which currently substitute the bulk of export supplies from Hungary to China.

Figure 12. Agricultural trade between China and Hungary in 2010-2018, USD million

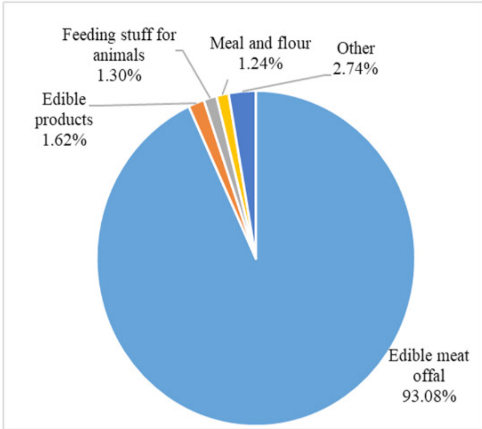


Source: authors' development based on UNCTAD (2019).

Figure 13. Structure of agricultural trade between China and Hungary in 2018, percentage in total exports and imports



a) China's export to Hungary

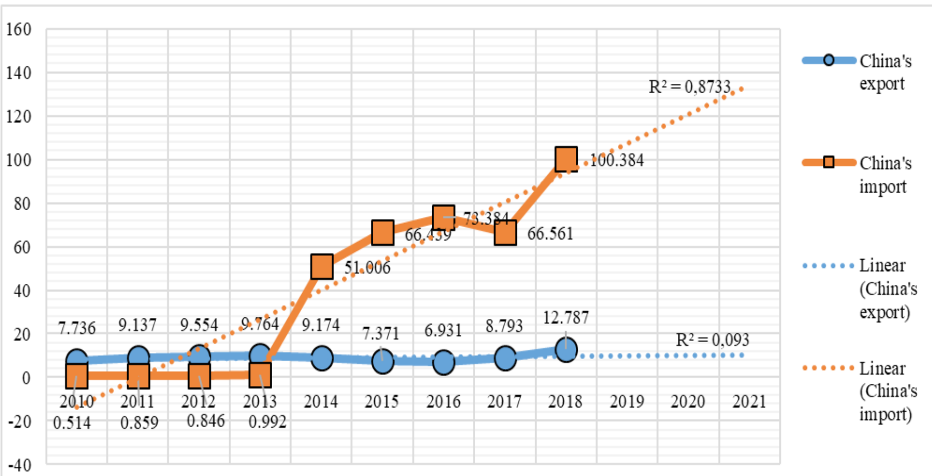


b) China's import from Hungary

Source: authors' development based on UNCTAD (2019).

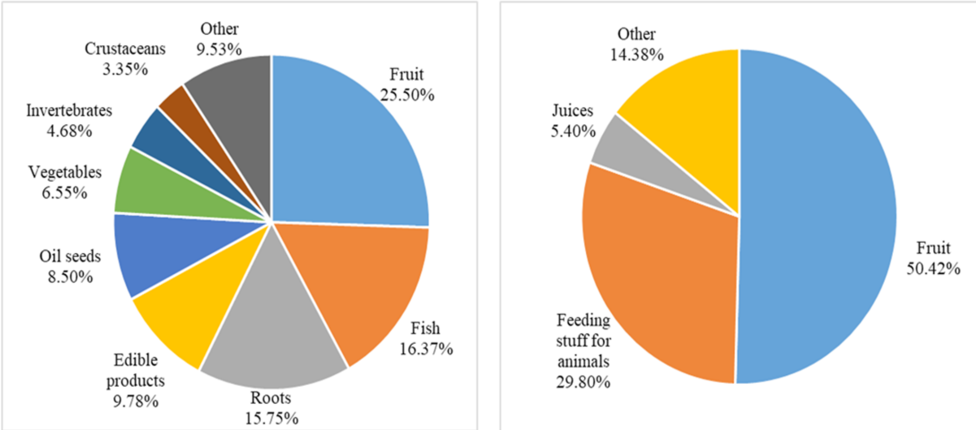
Alike Hungary, the Republic of Serbia is another case of positive agricultural trade balance with China. Serbia-China trade turnover exceeded USD 113 million in 2018, out of which USD 100.4 million accounted for exports. The authors estimate export volume to exceed USD 130 million in 2021 (Figure 14.). The challenge to sustainable growth, however, is that Serbia's export is limited to fruit, feeding stuff, and juices (Figure 15.)

Figure 14. Agricultural trade between China and Republic of Serbia in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Figure 15. Structure of agricultural trade between China and Republic of Serbia in 2018, percentage in total exports and imports

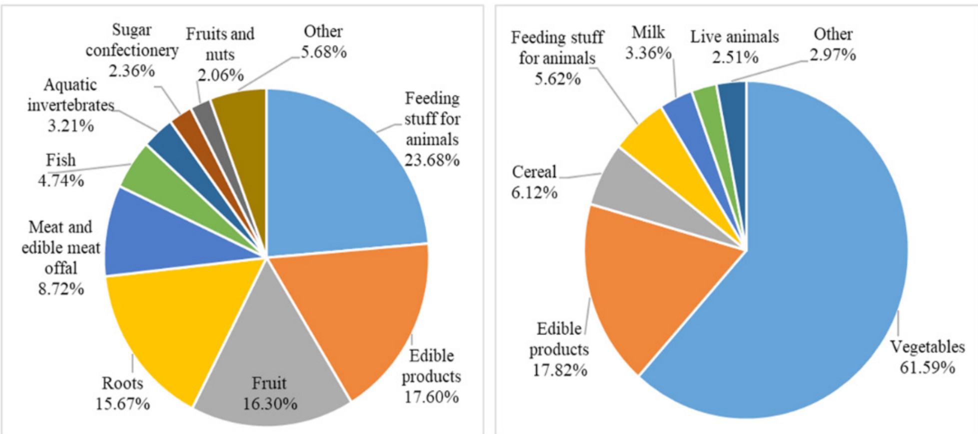


a) China's export to Republic of Serbia b) China's import from Republic of Serbia

Source: authors' development based on UNCTAD (2019).

Czech Republic is in similar endangered position since its export to China is predominated by vegetables (over 61% of total export in 2018), (Figure 16.). The opportunity to Czech Republic is to increase the export of high-processed and high value-added edible products and preparations (17.8% of export in 2018), milk and dairy products (3.4%), as well as cereals, feeding stuff for animals, and live animals.

Figure 16. Structure of agricultural trade between China and Czech Republic in 2018, percentage in total exports and imports

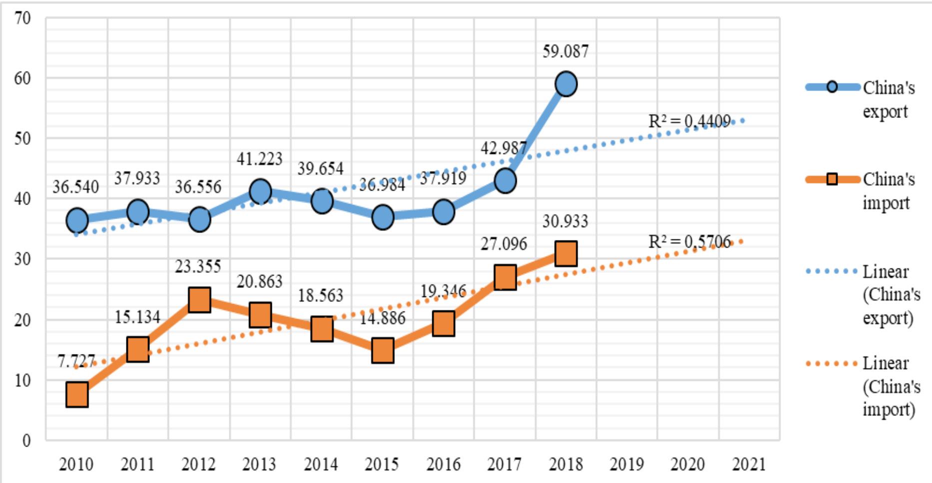


a) China's export to Czech Republic b) China's import from Czech Republic

Source: authors' development based on UNCTAD (2019).

The projection is that the stake on high value-added good may allow Czech Republic to increase its export supplies to China up to USD 60 million by 2021 (Figure 17.) while keeping agricultural import below USD 40 million.

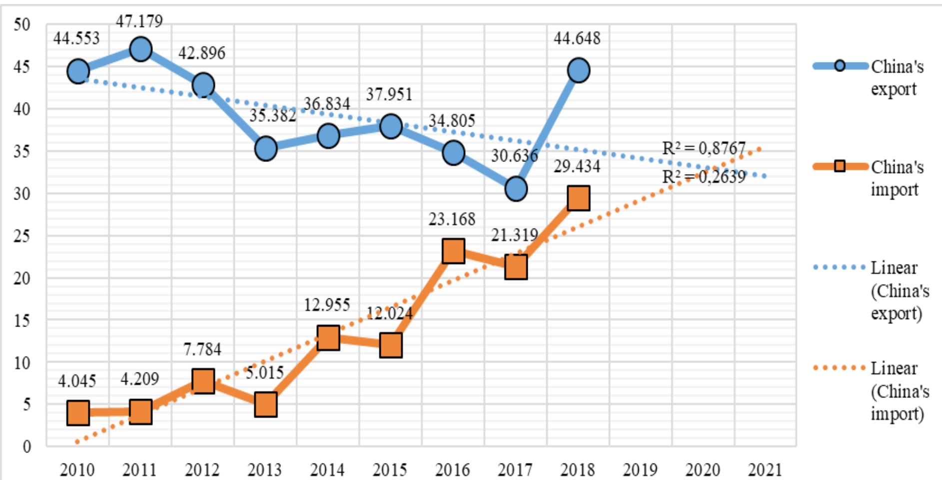
Figure 17. Agricultural trade between China and Czech Republic in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Romania is a big supplier of meat and edible meat offal to China (Figure 19.). Its export volume has been increasing steadily since 2010 (Figure 18.).

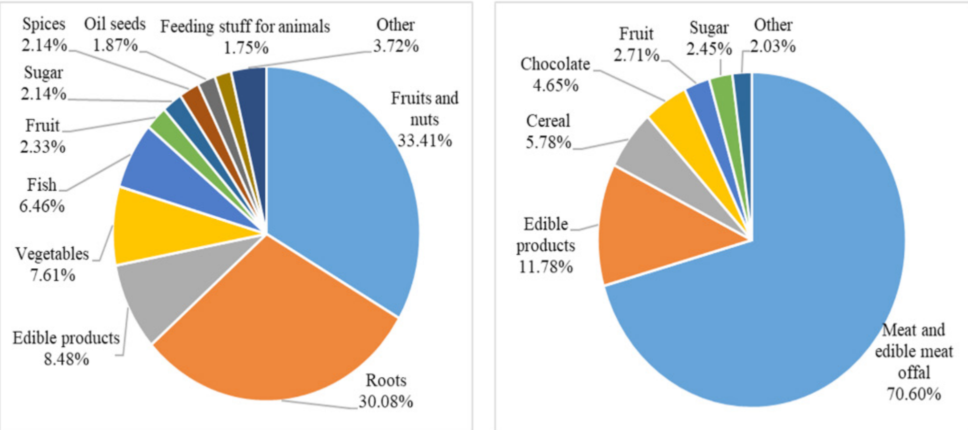
Figure 18. Agricultural trade between China and Romania in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Increase in the supplies of processed meat preparations and edible products may allow Romania to achieve positive trade balance with China in 2020-2021.

Figure 19. Structure of agricultural trade between China and Romania in 2018, percentage in total exports and imports

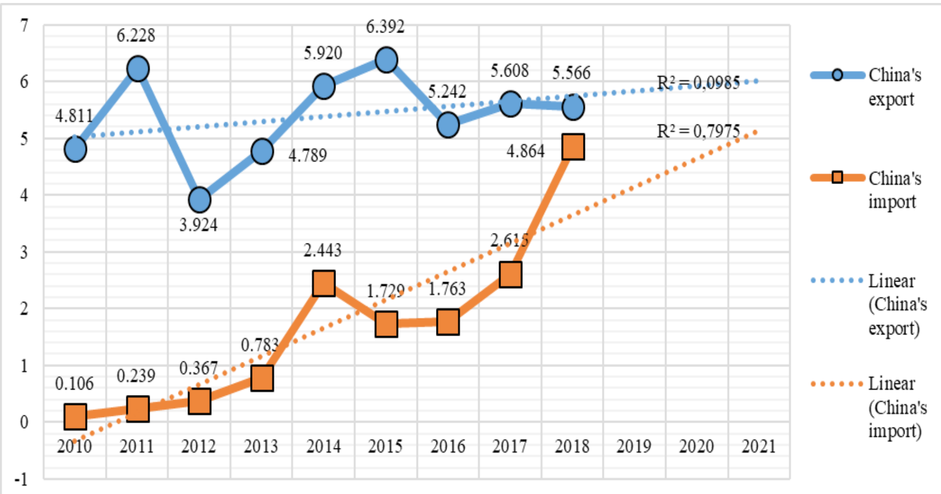


a) China's export to Romania b) China's import from Romania

Source: authors' development based on UNCTAD (2019).

Slovakia is also approaching a status of net agricultural exporter to China, however, will hardly reach it in the nearest years (Figure 20.). Its import from China has been steadily higher and more diversified than export.

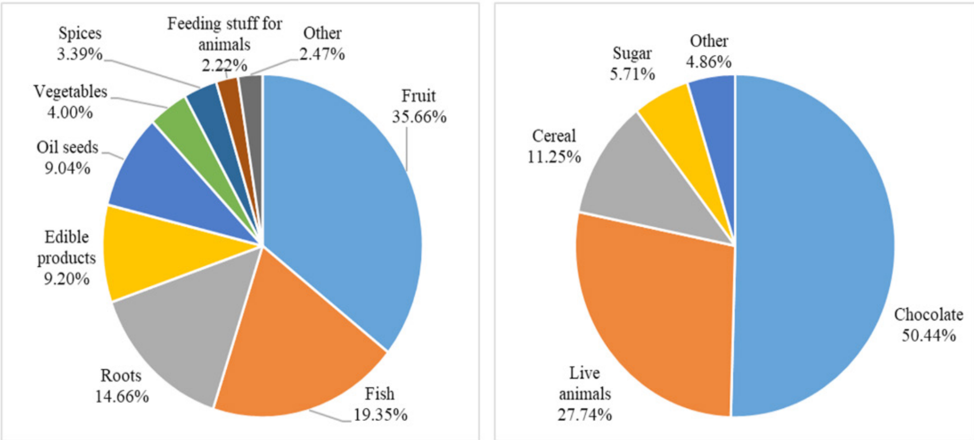
Figure 20. Agricultural trade between China and Slovakia in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Slovakia's major export items in trade with China are chocolate, live animals, and cereals (Figure 21.). The country strongly needs diversification of export structure to be able to ensure sustainable growth of export supplies by means of meat products and preparations, milk and dairy products, feeding stuff for animals, and oilseeds, all of which are in high demand in Chinese market.

Figure 21. Structure of agricultural trade between China and Slovakia in 2018, percentage in total exports and imports



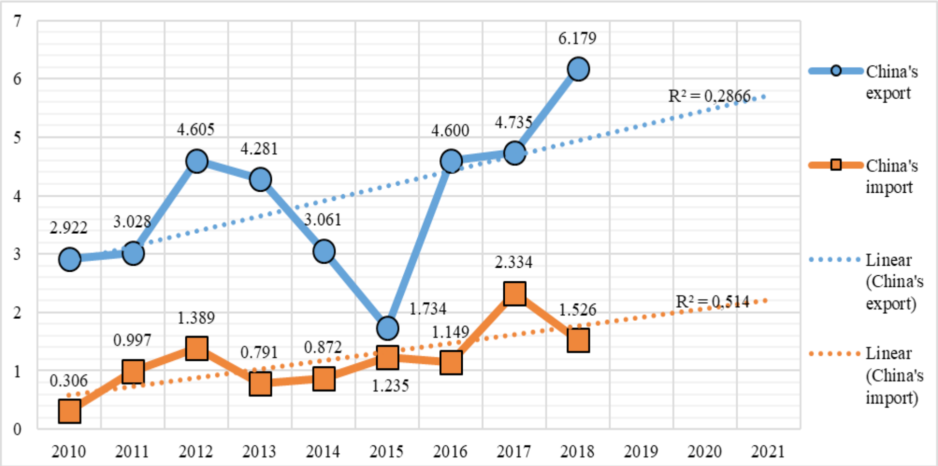
a) China's export to Slovakia b) China's import from Slovakia

Source: authors' development based on UNCTAD (2019).

The two smallest trade partners of China in the region of Eastern Europe are Montenegro (trade turnover is USD 7.7 million in 2018), (Figure 22.) and North Macedonia (USD 5.3 million, respectively), (Figure 23.). The export of Montenegro to China is limited to vegetables, roots, and tubers, and the country does not possess substantial competitive advantages to change that situation and breakthrough on Chinese market with value-added food and agricultural products. North Macedonia relies on a wider range of export products, including cereals, fruit and vegetable juices, feeding stuff for animals, vegetables, roots, and tubers. Still, agricultural trade turnover with China is very small and has been decreasing in recent years.

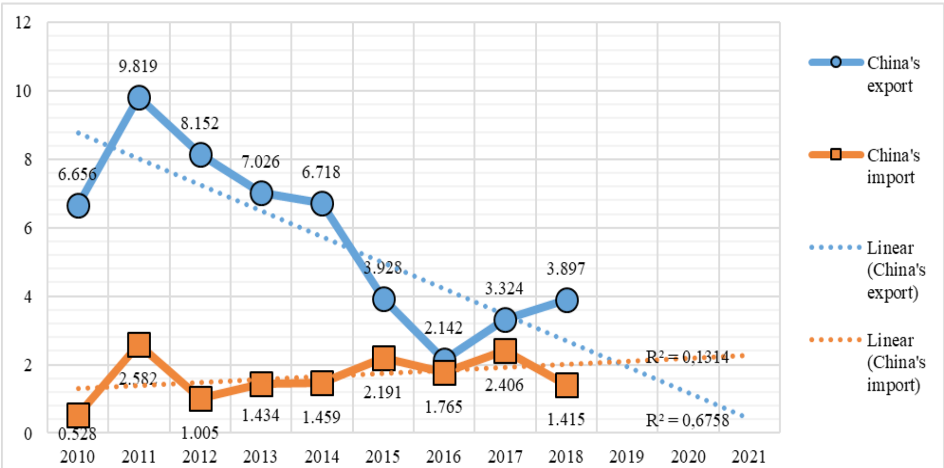
The World Bank (WB, 2018) estimates that positive population growth along with growing incomes in China will result in a shift in the structure of food consumption. Between 1980-2018, economic growth and urbanization in China caused the growth of consumption of higher quality, nutrient value, and price food products (Tian et al., 2018; Gao et al., 2018). Zhou (2010) and Zhou et al. (2014) attribute the growth in the consumption of meat and meat products, milk and dairy products, and seafood to the prejudice of cheaper and fewer nutrient crops. According to Güneysu, Atasoy (2019), traders and policy makers should be more circumspect to maintain profitability in agricultural trade with China due to increasing price elasticities of fish and meat products.

Figure 22. Agricultural trade between China and Montenegro in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Figure 23. Agricultural trade between China and North Macedonia in 2010-2018, USD million



Source: authors' development based on UNCTAD (2019).

Following this trend, consumption of cereals, vegetables, roots, and tubers (the major export items of Eastern European countries to China) will continue to decrease, which will negatively affect the sustainability of Eastern European exports to China. The key to successful growth of export deliveries from Eastern Europe to China is high value-added (meat and meat products, milk and dairy products) and processed food products (edible products and preparations, meat offal, chocolate, and confectionery products). Due to the ongoing shift in domestic consumption, Chinese meat and dairy producers demand more crops as fodder for agricultural animals - this is another opportunity for Eastern European producers to increase supplies of feeding stuff for animals to China.

Conclusion

In this study, the authors analysed the dynamics and structure of agricultural trade between China and the countries of Eastern Europe. The linear forecast built on generalized and country-individual data allowed to estimate the tendencies of export, import, trade turnover, and trade balance.

The authors conclude that smaller countries of Eastern Europe (Montenegro, North Macedonia, Albania, Slovenia) do not trade much with China, have narrow structure of agricultural exports, do not enjoy distinct competitive advantages to be able to contribute to, on one hand, the development of domestic agricultural sectors, and, on the other hand, the diversification of food supplies and improvement of food security in China.

Bigger countries (Poland, Hungary, Romania, Czech Republic, Republic of Serbia), on the contrary, have been increasingly involved in agricultural trade with China since the early 2000s. Their trade portfolios with China are more diversified compared to those of smaller economies and include such higher value-added products as meat and edible meat offal, milk and dairy products, feeding stuff for animals, and confectionery.

In general, to ensure competitiveness on transforming Chinese market along with sustainable development of domestic agricultural sectors, countries of Eastern Europe should continue diversification of their export portfolios by means of meat products and preparations, milk and dairy products, feeding stuff for animals, and oilseeds, all of which are in increasing demand in China.

For its part, China cannot rely on agricultural imports from Eastern Europe as a significant source of supporting its food security due to the currently minuscule volume of trade compared to the overall China's demand in food and agricultural products. Nevertheless, China should continue encouraging the development of agricultural trade with Eastern Europe to be able to diversify import channels and thus secure food supply chains.

Acknowledgment

This study is supported by the Fundamental Research Funds for the Central Universities, China, grant no. HEUCFJ170901.

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INNOVATIVE APPROACH IN THE PRODUCTION OF VALERIAN (*Valeriana officinalis* L.) USING ORGANIC PRODUCTION METHODS[1]

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Abstract

Valerian (*Valeriana officinalis* L.) has been used as a medicinal plant since ancient times, being extremely important for traditional and official medicine. It is grown as an annual culture. For medicinal purposes, dry root with rhizome (*Valerianae radix et rhizoma*) is used to extract the essential oil (*Valerianae aetheroleum*). In official medicine, it is most commonly used as a mild sedative for the treatment of the symptoms of anxiety, stress, insomnia and during menopause. Due to its positive characteristics, most of it is grown in the Netherlands, Belgium, France, Germany, Austria, Slovenia, Eastern Europe, Japan and the USA. As the requirements for obtaining high quality raw material are becoming increasingly stricter year by year, the manufacturers in the above listed countries have started to use production methods that meet the required standards when it comes to cultivating this plant species. One of these is the organic production set of methods prescribed by our Organic Production Act and its accompanying regulations. The paper presents the authors' knowledge regarding the possibility of using certain methods suitable for the production of valerian, its uses and the cost sheet that shows the investments made during its cultivation.

Key words: valerian, *Valeriana officinalis* L., methods of organic production, use, cost sheet.

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1 The paper represents a part of the research results within the Project of Integral and Interdisciplinary Research no. III 46006 “Sustainable Agriculture and Rural Development in the Function of the Accomplishment of 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.

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Introduction

The Valerianaceae family encompasses 13 genera with 360 species. The species of the *Valeriana* genus differ by their morphological appearance and chemical composition. The most significant of these is *V. officinalis*. There is self-seeding valerian (*Valeriana officinalis* L.) around rivers, on wetlands, on wet meadows, on sandy and ruderal habitats, by the roadsides and similar habitats. However, through the irrational exploitation of self-seeding valerian on many habitats, the amounts of it have alarmingly been reduced due to anthropogenic activity, which is why it is protected by law. The collecting of valerian in Serbia has been under legal control since 1993 by statutory control, which is carried out by determining the permitted quantities for collecting. When collecting, care must be taken not to mistake this plant for poison hemlock (*Conium maculatum* L.) or any similar one. For the purpose of the preservation of natural resources, as well as for obtaining a greater quantity of quality raw material, this medicinal plant is increasingly being grown in plantations. The growing can only begin only when the opinion has been obtained from the Institute for Nature Conservation of Serbia or that of Vojvodina Province (Panjković, Stojšić, 2001). In this regard, over the past period, the Institute for the Research of Medicinal Plants "Dr. Josif Pančić" from Belgrade has paid special attention to this medicinal plant species. Through research and practice, its morphological, agronomic, chemical and pharmacological properties were examined. The opportunity for the scientific public to get acquainted with the results of the past work on valerian was used at the seventh subsequent "Days of Medicinal Plants" event, organised by the Institute in Belgrade, from 17-19th October 2001. The presented papers were published in the monograph "Valerian (*Valeriana officinalis* L.)" in March 2003, published by the Institute.

The cultivating of medicinal plants in our region dates back to the beginning of the 20th century. Their more intensive plantation growing dates back to the 1950s, and since the 1970s, some medicinal and aromatic species have been fully introduced to the list of cultivars, such as *Valeriana officinalis* L. (valerian), *Satureja montana* L. (winter savory), *Helichrysum arenarium* (L.) Moench (dwarf everlast), *Scopolia carniolica* Jacq. (henbane bell), *Borago officinalis* (borage) and others. Due to its positive useful properties, valerian is one of the most sought-after plantation-grown medicinal plants in the Republic of Serbia (Filipović, Popović, 2014).

Chemical composition and use

Valerian is a perennial plant species (*Valeriana officinalis* L.) belonging to the Valerianaceae family. Valerian is grown as an annual plant culture. It is also commonly known as garden valerian, garden heliotrope, set-wall and all-heal. In the Serbian language, one of the common names for valerian is *mačja trava* (which corresponds with English common names of Cat's love or Cat's valerian. However, the same Serbian name goes for another medicinal species, too, which is white horehound or common horehound (*Marrubium vulgare* L.). The very name of cat grass or cat grass originates from the presence of valeric acid derivatives, which have a pheromone effect on cats, so they are literally hypnotised. They can smell the plant for hours, and literally fall into a trance state. Since ancient times, valerian has been used as a medicinal plant. Its medicinal properties were already known to the ancient Greeks, who referred to it as *phu*. In the Middle Ages, it was named by the Latin word *valere*, which means "to be healthy". By doing so, it was intended to draw attention to the remarkable medicinal properties of this plant. The Greek physician Galen used valerian in healing because of its aromatic and diuretic properties, and for as long as two centuries (1733-1936) this sedative species was among the six most prescribed medicines in Europe and North America. In the First and the Second World War, tinctures of these plants were used to treat soldiers who suffered so-called *shell shock*. For medicinal purposes, dry root with rhizome (*Valerianae radix et rhizoma*) is used to extract essential oil (*Valerianae aetheroleum*). In official medicine, it is most commonly used as a mild sedative (EMEA, 2016) for the treatment of the symptoms of anxiety, stress, insomnia and during menopause. It is used in case of high blood pressure, mild migraines, cramps, intestinal colic, rheumatic pain and painful menstrual periods. Valerian-based preparations have proven to be some of the most effective herbal remedies to beat insomnia. Valerian root contains over 150 chemical compounds and most of them are physiologically active. There are variations in chemical components in plants from different sources and with different treatment and storage methods. Rhizome and crushed root contain 0.5–1.0% of essential oil on average. Most pharmacopoeias prescribe standards that the drug must contain at least 0.5% of essential oil, and not less than 0.17% of valeric acid and its derivatives. It also contains tannins, starch, proteins, carbohydrates, phenolecarboxylic and organic acids and others.

The described drug - valerian root - is mainly obtained from cultivated plants nowadays. It is used in three ways: in case of generalised anxiety disorder

(GAD) and nervousness (which can be further aggravated by irritation), for insomnia resulting from nervousness, for heart problems accompanied by palpitations and a feeling of anxiety in the heart area. Valerian products can be found in the form of tea, tinctures, oils, drops, capsule pills, extracts in pharmaceutical and herbalist's shops, and some can be prepared as homemade herbal remedies. Valerian tea and drops should not be used for more than three weeks, and a five-week break should be taken. It is not recommended for use during pregnancy and lactation, or for drivers and persons operating hazardous machines. Valerian lowers hypertension and causes one fall asleep. The method of preparation and use of the tea is as follows: Pour over one teaspoon of ground root with 150 ml boiling water, and strain after 10 minutes. As needed, drink a cup of tea several times a day. At the Institute for Medicinal Plant Research "Dr Josif Pančić", a large number of tea blends are prepared, namely: Tea Number 2 - the tea in anxiety, fear and mental tension; Tea Number 22 - the tea for high blood pressure; Tea Number 25 - the tea for nocturnal enuresis in children; Tea Number 54 - the BC Tea - the tea for better circulation; and Tea Number 77 - the UJ Tea - the tea for relief of pain caused by ovarian inflammation. The Institute for Medicinal Plant Research "Dr Josif Pančić" also prepares a number of tinctures such as: the valerian tincture "Valerianae tinctura", sleep drops "Tinctura insomnia", soothing drops "Tinctura nervine" and drops for better circulation "Tinctura dillatatoria". Another product from the Institute's product range is "Odoval S®", a capsule-based herbal preparation used to better withstand daily stress (Đorđević et al., 2013). Valerian tea, alone or in a blend, can be used in smoking cessation. Resistance to tobacco smoke and disgust for nicotine have been identified by using resisting drugs, which facilitates smoking cessation. In organic and biodynamic production, it is the above-ground part of the plant that is mainly used to make various types of preparations for plant nutrition and protection. Essential oil is used in the cosmetics and perfumery industry. Valerian root is also used in veterinary medicine. The valerian is a honey plant species. Two types of tea are often used, and they are:

Tea for insomnia - Mix the same amounts of valerian tea, mint, lemon balm and hops. A tablespoon of this mixture is pored over with 2 dl boiling water. Cover and allow standing for 30 minutes. Then strain and drink a cup of tea before bed.

Soothing tea - A mixture is used of valerian, lemon balm, mint and bitter clover. Pour over a large spoonful of tea with boiling water in the amount of

2 dl, cover and allow standing for half an hour. It is then strained and drank, one cup after breakfast and another in the evening before bed.

Morphological properties

Valerian is a perennial herbaceous plant that has a long-lasting root with rhizome and a hollow bare stem, only covered with small hairs at its bottom. Its rhizome is short, cylindrical, pungent and bad-smelling. The smell produced by the root particularly attracts and excites cats, hence the name of catgrass, another name for this plant. The subterranean organs consist of a rhizome 5 cm long, from which descend many roots that are over 30 cm long, pale yellow in colour and with a specific smell. The essential oil in the underground valerian parts is housed endogenously in the secretory cells. In its first year, it forms a leaf rosette, and in the second, a blossom stem. The plant stem is erect, slightly hairy, ribbed and branched with peltate inflorescences that reach a height of 20 to 120 cm. The scented inflorescences are grouped in peltates, red to light red, or pink to white in colour. The leaves are varied, the lower ones having opposite arrangement, odd-feathered, split, petiolate, pointed, with a serrated rim. The lower leaves are on leaf petioles and the upper ones are sessile. The closer to the top, the upper leaves have shorter petioles and fewer leaflings, while the leaves at the very top resemble spines with few hairs on the reverse side. It usually blooms in late spring and early summer. The fruit is a slightly flattened nut. The seeds are small, dark brown in colour, up to 3.5 mm long and 1.2 mm wide. The mass of 1,000 seeds ranges from 0.4 to 0.6 gr.

Agro-ecological conditions

Valerian is believed to have originated in Europe and Western Asia, where it can still be found self-sown. It is usually found in wetlands and wet meadows, moist forests and on their edges, along ditches, on slopes, on riverbanks and river islands, and has been cultivated in recent several decades. In our country, it can be found, mostly in the mountains (Šarplanina, Veliki and Mali Jastrebac, Kopaonik) up to 2,000 m above sea level. Various studies have shown that as the altitude increases, the percentage of essential oil increases in the plant as well, and vice versa (Stepanović et al., 1989; Stepanović, Vukomanović, 1995). Valerian can even be found in some peat habitats on surface levels, along with different species of peat mosses (*Sphagnum sp.*), as well as: *Menyanthes trifoliata* L. (bitter clover), *Mentha arvensis* L. (wild mint), *Ranunculus flamula* L. (lesser spearwort) and *Drosera rotundifolia* L. (common sundew). It grows best in areas with an annual precipitation of 600-

700 mm and an average annual temperature of 8 to 11°C. If these conditions are not met, valerian grows poorly. It can withstand low temperatures, even up to -22 °C.

What suits valerian are loose, deep, humus soils with a favourable water and air regime. In our conditions it grows best on light chernozems, fresh alluviums, black soils and on agricultural limes soils. The plant does not tolerate heavy and compacted soils. It is suitable for lands with a neutral to slightly acid reaction (pH = 6–7) on which large communities can form in some cases.

Production technology

Place in crop rotation

Since it does not tolerate monoculture, valerian can only be grown successfully in a one-year bio-cycle. The species that leave the soil un-weeded should be used as pre-crops because weeds present a great problem in cultivating valerian. With respect to the previous crop, valerian is not specifically demanding. Therefore, in crop rotation, valerian can occur following whole grains, row crops, industrial plants and a large number of representatives of medicinal, aromatic and spice plants. It is also successfully cultivated in freshly ploughed natural meadows and pastures, with good soil preparation and adequate fertilisation. However, the best results in production practice are given on those plots on which the manure is fertilised with burnt manure. It returns to the same surface only after 4-5 years.

Soil cultivation

Basic cultivation depends on pre-crops. In case of whole grains or a plant species that leaves the field early, shallow tillage takes place immediately after harvesting, at 10 to 15 cm. At the end of September or in October, the soil is ploughed at full depth, which should not be less than 30-35 cm due to the fact that this perennial species remains in the same place for several years. If the crop is established on leas and meadows, shallow tillage starts as early as the beginning of summer, and repeats several times. In this way, weeds are almost completely destroyed, especially those perennial ones that are extremely undesirable in valerian crops (creeping thistle, sorghum, couch grass, Bermuda grass). Light soils are ploughed to a slightly smaller depth (22-25 cm). However, on extremely light soils, tillage is necessary to be carried out in spring, when sowing or seedling planting is also planned. All field operations, including surface levelling, should be completed by the end of October at the latest if valerian is planted in autumn. Pre-sowing preparation is carried out just before valerian planting, and above all, it should provide a loose surface layer up to 15 cm deep. This will create better conditions for root development.

Fertilisation with organic and mineral nutrients

Valerian is fertilised with mineral fertilisers, and the use of manure is possible. Valerian gives the best yield if it is grown on a plot that was fertilised with manure (20-30 t/ha) the previous year. In addition to manure, which is unfortunately less abundant, it is also possible to use compost, herbal preparations for soil nutrition and protection, green-stuff fertilisation, and others. Phosphoric and potassium fertilisers have been found to influence the yield increase and the amount of essential oil in the root. The amount of a fertiliser depends on the fertility of the soil. One variant of basic fertilisation under deep tillage is to apply about 60-80 kg/ha of phosphorus and about 80-100 kg/ha of potassium. These quantities should be adjusted in keeping with the results of soil fertility control. The basic tillage uses all the amount of phosphorus and potassium and 30% of nitrogen, while the rest, comprised of 70% of nitrogen, is used in pre-sowing soil preparation. In spring, the plant feeding is carried out with 60-70 kg/ha of nitrogen. Increased doses of nitrogen and phosphorus fertilisers have a positive effect on the formation of roots and aboveground parts, whereas higher doses of potassium have almost no effect on yield increase.

The assortment

For a long period, there was a registered domestic population of valerian in our country under the name "Vojvodinian Valerian", and this variety is still the most commonly grown one nowadays. This variety is produced and sold by the Institute for the Research of Medicinal Plants "Dr Josif Pančić" from Belgrade (Filipović, 2016). There are many registered varieties in the world, but the most common are "Podravčanka", "Anthos", "Arterner Zuchtung", "BLBP 19", "BLBP 20", "Lubelski", "Stamm Phasa", "Trazalit", "Maun", "Cardiola" and others.

Sowing/planting

Valerian can be produced by direct sowing of seeds, dividing older clusters and producing seedlings in cold or hot beds. In practice, crops are most commonly established with seedlings in cold beds (Stepanović, Radanović, 2011). If seedlings are produced in cold beds, sowing is carried out in the last decade of July and the first decade of August, because properly nurtured seedlings obtained from this sowing term are ready for transplanting when the seedlings reach a size of 15-17 cm at the end of October or in spring (Bernath, 1997). If the seedlings are established and produced in warm beds (in practice, seedlings are produced in heated greenhouses), they need to be sown in late February or early March, and are transplanted in May. Sowing for seedlings is carried out in rows at distances of 15-20 cm. It takes 3-4 gr of seed to sow a square meter of a seedbed. If the seed is of lower germination, it is possible to pre-cool the seed. The seeds are cooled to a temperature of 5-10 °C, most commonly for 3-5 days. To do this, the seeds are placed in damp cloth, paper or sand, then in the bottom section of a refrigerator or in a cool place. It is best to use "young" seeds, that is, the seeds that were produced and post-processed the year before. As the valerian seed germinates in the sunlight, it is necessary to saw it on the surface. If it is not sown on the surface, the seed will not germinate and sprout. After sowing, it is desirable to gently press the seeds into the ground to initiate germination and sprouting. After the sowing is completed, the beds should be watered regularly. This is especially important due to the fact that valerian is a species of humid climates, that is, the species that requires larger quantities of water for its growth and development. The germination and sprouting period lasts for about three weeks on average. By the end of that period, visible plant rows are expected to be formed. During that period, it is of the utmost importance to "preserve" and produce quality seedlings, capable of forming a crop of highly productive and high quality potential. Damping-off is the most dangerous disease in the production of seedlings in warm beds. It attacks all plant species grown from seedlings. The occurrence of damping-off is the most common cause of seedling decay, and this phenomenon is caused by several soil-dwelling parasitic fungi (*Pythium debarianum*, *Fusarium spp*, *Sclerotinia spp*, *Phytophtora spp*, *Rhizoctonia solani*). The fungi are transmitted through infected seeds and plant residues. When it occurs in young dense seedlings, damping-off has clearly identifiable symptoms. As these fungi attack the ground part of the stems, which turns brown, softens and rots very quickly, the plants wither and disappear; they virtually melt. The disease is concentrically transmitted to healthy plants and as a result, "bare" or "bald" spots appear in the plant beds. In case of severe soil infestation, seedlings decay over the entire surface of the beds. The emergence and spread of the agents that cause seedling damping-off is affected by cloudy weather, as well as increased soil and air humidity. To prevent seedlings from damping-off, changing production sites, disinfection of seeds and soil, bed or greenhouse ventilation and moderate watering are recommended as preventive measures. Seed disinfection in conventional production is done by sprinkling with fungicides, and provides seedling protection during the sensitive emergence phase. In order to prevent the occurrence of this disease, it is necessary to use a healthy, disinfected substrate in the beds and to start protection on time after sowing, continue after sprouting and before transplanting. To successfully protect seedlings from damping-off, conventional agricultural producers use the following preparations: Balb, Rival 607 SL, Previcur 607 SL (the active substance being propamocarb hydrochloride). These preparations are used through watering warm beds after sowing to allow normal emergence of plants, through watering newly emerged plants, through watering plants before transplanting and through watering plants after transplanting. They also improve the rooting of the seedlings and reduce their stress due to the transplanting, and they promote plant growth and resistance, too. They are used in a concentration of 0.15-0.20% (15-20 ml of the preparation in 10 l of water), using 200 ml of the prepared solution per plant. The preparations can be added to the drip irrigation system because they are completely soluble in water and do not clog the sprayer. They do not suppress mycorrhizal fungi that are very important for root growth. Recently, biofungicides have been increasingly used based on a predatory fungus (*Gliocladium catenulatum*), for example the Prestop preparation, containing the mycelium and spores of *Gliocladium catenulatum* fungi of the J1446 fungi species: 108 cfu/g (cfu = number of individuals in a colony). Farm-made herbal preparations can also be used for this purpose, particularly the following: different preparations based on field horsetail (*Equisetum arvense* L.), fermented nettle and cabbage extract, and macerated tagetes.

Often, in the course of seedling production, a great damage can also be caused by European mole cricket (*Gryllotalpa gryllotalpa*), which feeds on the small roots of young plants, as well as by many inhabitants of the soil horizon (earthworms, wireworms, cockchafer larvae, snails), which can be considered a useful feature to some extent. However, in the situations where their abundance is high, the economic damage it causes in some cases can call into question the entire planned production. In addition to finished traps and baits to control these harmful insects, plastic containers and wide opening bottles are often used, which can serve as traps for trapping a European mole cricket. A fresh potato bark of is placed on their bottom, and the bottle is buried so that the edges remain on the surface level. The traps should be inspected regularly, the trapped European mole crickets destroyed and the potato bark replaced. The second bio-measure is the use of edible oil, of which one spoon is poured in 3–5 litres of water, thus filling each active hole. With an amount of 0.5 l of this mixture per hole, the oil coats the European mole cricket, so it cannot breathe, and dies. The third bio-measure acts repellently in two ways. One is by applying pieces of salted fish, for example, that we push into the hole made by a European mole cricket, which makes the pest escape. As to the other way, we can sow plants that repel European mole crickets, such as tagetes and spurge. These plants should be sown round the protected areas, such as greenhouses, to prevent European mole crickets from entering them. The fourth bio-measure is the use of vibration-producing accessories and tools. Many of them are used in mole and lesser mole-rat protection, as well as against European mole crickets. This species also has many natural enemies. Birds need to be attracted by setting up birdhouses and feeding them during winter. Moles, hedgehogs and cats are also useful allies in the fight against European mole crickets. Also, ants attack their young larvae.

The seedlings produced in this way, be it autumn or in spring seedling production, are transplanted to a permanent place in late October or early November, depending on the pre-crops and the climatic conditions during autumn. It can also be transplanted in spring, but through years of testing and experience it has been established that the spring (late) transplanting gives up to 30% less yield than the autumn one, and that difference can reach as much as 50% (Filipović et al., 2015). When it comes to mechanized cultivation, the distance between rows should be greater, minimum 50 cm. A larger row spacing of 70 or 80 cm row to row is desirable, since it enables better crop care, better weed control and better quality of the raw material obtained.

Care measures

Valerian crop care includes hoeing with weeding, inter-row cultivation, plant feeding, irrigation, possible filling in emptied spaces, and, as a specific care measure, pruning floral stems when needed. Inter-row cultivation and hoeing should be carried out at least two to three times a year. The first hoeing is done as soon as the first weeds or crusting appear, and the second one takes place 15-20 days after the first one. Hoeing is performed as needed, or in keeping with the state of weediness on the plot. Regarding nutrition, most commonly, one nourishment is done with nitrogen fertiliser in the amount of 30 kg ha^{-1} N. When growing valerian, one should choose sandy but moist soils. If soils are not suitable for the cultivation of this species, it is necessary to create suitable conditions for its cultivation through meliorative and agro-technical measures (Filipovic, Kljajic, 2015). As valerian is a species characteristic of wetlands, it is advisable, if necessary, to carry out a large number of irrigations, which would be equivalent to a total watering norm of about 200 mm of water. If the water conditions are satisfactory, and if necessary during the growing season, the crop is most often irrigated with 40-60 mm of water. If, for any reason, the transplanted seedling does not take root or the formed plant has dried, these empty spaces must be filled with new plants. One of the risks of valerian production with seedlings is that there is the possibility of floral stems to appear. As they emerge, the plant transports assimilative from the root to the stem, thereby losing its root yield and quality. Therefore, the pruning of floral stems must be given special attention since this measure is considered to be an important factor in increasing the yield of root with rhizome. In the studies carried out in the region of Trento (Italy), 95% of the plants that were transplanted in the autumn term bloomed, while the plants that were transplanted in the spring term did not bloom. In the studies by Filipović et al. (2015), the autumn transplanting term had 3.57 times higher number of floral stems than the spring transplanting term. If sown earlier than the above mentioned sowing date, the produced plants give a large percentage of floral stems next year, which adversely affects the yield of underground valerian parts. Later sowing may cause the seedlings not to reach the desired size by autumn, so we cannot use them as planting material that autumn. In the studies by Mortez et al. (2010), starting from the earliest sowing date (10 August), through the middle (01 September) to the last, or third, sowing date (20 September), the number of floral stems decreased from 7.11, through 6.42 to 5.27. Floral branches are pruned with a sharp knife when they appear at the base of the stem.

Of the diseases to which valerian is susceptible, the most common are powdery mildew (*Erysiphe polygoni* D.C.), (Dynowska et al., 1999) and valerian rust on leaves and stems, caused by the fungus *Uromyces valeriane* (Schumacher) Fuckel (Sharma et al., 2010). They can slow down the growth of the plant to some extent. In particularly humid years, *Ascochyta valerianaceae* occurs. Over the last few years, significant damage to crops has been caused by the *Alternaria alternata* fungus (Fr. ex Fr.) - Keissel. It occurs on valerian seeds, all herbaceous parts of the plant and on the root (Skorska et al., 2005). In the European Union, some countries use the Switch preparation (Fludioxonil 250g/kg + Ciprodinil 375g/kg) to combat fungal diseases on valerian.

Soil pests (cockchafers, wireworms) can cause damage by biting the roots. Therefore, the soil should be checked before planting. On valerian blossoms, there may appear black bean aphid (*Aphis fabae* Scop.), which can cause a decrease in seed yield. In the EU, the preparations based on active matter lambda cyhalothrin (the Karate Zeon preparation and similar) are used for these purposes, which is in accordance with the norms of good agricultural practice. In the last few years, the presence of phytoplasmas in cultivated and self-seeded valerian plants has been detected. The damage caused by the appearance of phytoplasmas in a cultivated crop can be economically considerable. The typical symptoms of phytoplasma appearance are yellowness and redness on their aboveground parts. The suppression of phytoplasmas, as well as of other obligate pathogens, should be mainly based on preventive measures. These measures are all the more justified when it comes to the protection against the diseases of medicinal species, in which the use of chemicals is restricted or prohibited. For those reasons, biological action remains the only direct measure of pest suppression. Recently, commercial herbal-based preparations have been increasingly used. By preventive spraying on the basis of natural fungicides such as “Vegard AS” (0.5% physcion) and “Chitosan” (the homeopathic product based on marine shell extract), with the addition of the best biological moisturiser (to better adhere to the leaf), a satisfactory effect is achieved, protecting and conserving the environment at the same time. They are applied foliarly as a feed at a concentration of 0.1% (“Vegard”, “Chitosan”) or for fertigation (“Chitosan AS”) at a concentration of 0.05%. In addition to the above mentioned ones, “Kingbo AS” (an aqueous solution of plant extract made from oxymatrin, an alkaloid of the medicinal plant *Sophora flavescens*) is used in the concentration of 0.15–0.2%, and is excellent in suppressing mites, and in the concentration of 0.2–0.4%, it is very effecive against greenhouse whitefly, different types of leaf lice and tobacco thrips. “Vegard” and “Chitosan AS” at a concentration of 0.4% work great against major pathogens such as: *Alternaria alternata* (Bautista Banos et al., 2006; Chen et al., 2014; Živković et al., 2018), *Phytophtora sp*., *Botrytis sp.*, *Monilla sp.*, *Peronospora sp.* and others. The best effect is obtained by applying these products from the very beginning and before the occurrence of symptoms, i.e. since transplanting, and as long as the production lasts at intervals of 7 to 10 days. The best effect is achieved by applying the aforementioned preparations combined.

Harvest

In order to obtain high quality drugs, among other things, it is necessary to take into account the time, as well as the method of root extraction. Valerian root is extracted at its maturity for pharmaceutical use, when it has ceased to accumulate active substances, at which time it contains the most of the essential oil. The extraction is done at the end of October with a plow without a moldboard. Exceptionally, the root can be extracted in spring, but a worse drug is obtained then. The root can be extracted manually, or with a plough without a moldboard, or with a potato extractor. On smaller areas, it can also be removed by hand - with a spade. After the extraction, the root is cleaned and its green parts are removed, and then, if it is larger, it is cut into 6–8 parts (Adamczyk, Jankiewicz, 2008). This is followed by root washing under strong cold water jet, then drained (Neumaier, Frohlich, 2014).

Drying

Drying is generally done artificially in thermal dryers. In this part, special attention should be paid to the drying temperature which should not exceed 40 °C, because at higher temperatures, the essential oil evaporates, and such valerian is devoid of value, because it loses its smell and healing properties. By drying, the amount of essential oil decreases, and the smell (which is derived from isovaleric acid) becomes more intense and stronger with the long standing of the drug. Root moisture is reduced to 10%, which provides suitable conditions for its further storage and use. At the end of drying, the valerian root should have a characteristic and penetrating smell, reminiscent of valeric acid and camphor. At first, its taste is sweet, and then, aromatic and slightly bitter.

Yield

Root yield is varied and depends on many factors. One of the factors is the number of plants per unit area. The optimum number in lowland areas is considered to be 57,000-66,000, and in the mountainous ones, it is 80,000-120,000 plants per hectare. On the area of one hectare, there can be a yield of over 2,000 kg/ha of dried root. If irrigation is applied, the yield increases by 30-40%. The yield of essential oil per unit area can very easily be low, and the content of the active substances varies depending on the characteristics of the variety, the characteristics of the climate and the soil, the applied agro-technics, and so on. The content of essential oil in the *Valerianae radix* drug amounts to 0.2-2.5% relative to dry matter. The recalculated essential oil yield from fresh valerian root can range from 4 to 50 kg/ha.

Packaging and storage

Well-cultivated and quality root is whitish-gray and brown in colour, covered with long and thin brittle roots, with the penetrating smell of isovaleric acid, typical of this drug, aromatic and slightly bitter in taste. The drug must not contain residues of the aboveground parts of the plant. The dried root is packaged in 50 kg sacks made of natron paper or jute, and lined with multiple papers and stored in a dry place, separate from other drugs due to its sharp and strong smell. The dried and packaged valerian root is stored in clean, ventilated warehouses on wooden stands or on pallets, taking care that the height of the stacked goods does not exceed 2 m. It is kept at a cool, dry, translucent location. It is important that not to store it next to other aromatic drugs, because otherwise, they will acquire the valerian root smell. The goods stacked in the warehouse must be secured against the presence of harmful insects and rodents. The oil is stored in aluminium containers, in dry and cool rooms that are fire-protected.

Required quality for valerian root

Regarding the quality standards, the required quality standards for valerian root (*Valerianae radix*) according to the European Pharmacopoeia (Ph Eur 5.0., 2005) for the Valerianae radix drug are as follows (Table 1.).

The *Valerianae radix* drug is an official one according to the Yugoslav Pharmacopoeia V (Ph. Jug. V, 2000). In the Monograph 1997:0453, it is defined that the drug is made up of subterranean valerian organs, including rhizomes, roots and stolons, which are carefully dried at a temperature not exceeding 40 °C. The drug should contain at least 5 ml/kg of essential oil. For extractable substances, the residual mass is prescribed to be at least 75 mg (15%). The Valerianae radix drug should contain a maximum of 15.0% of moisture and a maximum of 7.0% of ash insoluble in hydrochloric acid.

Table 1. Quality standards for valerian root

Criteria	Contents for the required quality
Contents of essential oil: - for the whole drug - for the cut drug	 minimally 5.0 ml/kg minimally 3.0 ml/kg
Content of total sesquiterpenic acids expressed as valeric acid $C_{15}H_{22}O_2M_r234$	minimally 0.17% dry matter
Foreign matter: 1.1. stem residues 1.2. other foreign matter	 maximally 5.0% maximally 2.0%
Loss by drying	maximally 12.0%
Total ash	maximally 12.0%
Ash insoluble in HCl	maximally 5.0%

Indicative list of expenses for valerian root production

The following section provides Table 2., which shows an indicative list of expenses for valerian root production projected for an area of one hectare.

As it can be seen from next table, almost half of the expenses of valerian root production are related to seasonal workforce participation. By reducing its participation, more profits are made. In practice, it is most common for a valerian root producer to engage household members, relatives and friends. This primarily refers to the business of seedling establishment, preparing seedlings for planting, or just transplanting in some cases, handling extracted roots, which includes cleaning, washing and putting them to dry. Compared to conventional production, in organic production, which is increasingly in demand, mainly preventive measures are used for protection, and during the growing season, it is mechanical measures, less frequently biochemical ones, which are implemented, and which involve the use of a commercial bio-pesticides or farm-made preparations. For basic mineral nutrition, mainly organic fertilisers are used, such as manure and compost, and one of the plants that can be composted is valerian. Due to its large root mass and aboveground mass, gets it on averages about 4 t of fresh root (if submerged = 100% residues) and 10–12 t ha^{-1} of total above ground mass (Filipović, Ugrenović, 2013).

Table 2. Indicative list of expenses for valerian root production for area of 1 ha

Variable production costs	EUR
Mineral fertilization: starting and in the supplemental feeding	160
Preparations for plant protection	40
Manure	225
Seeds	70
Tillage up to 30 cm	90
Fertiliser application 2x	26
Manure loading	15
Manure export and spreading	30
Harrowing	20
Pre-sowing land preparation	20
Seedling production	380
Watering	80
Seedling planting	28
Inter-row cultivation 2x	35
Treatment with preparations for plant protection	25
Mowing	40
Transport to the dryer	60
Seasonal workforce	1,650
Expenses for drying	420
Drying	150
Total expenses (E)	**3,564**
Income	
Root yield (2,000 kg) x price 3,4 (€) (Y)	**6,800**
Total Income	
Profit (Y - E)	**3,236**

Note: The middle exchange rate of the National Bank of Serbia on 9th October 2019 amounted to 117.6036 RSD for 1.0 EUR. The expenses of mechanical services are quoted on the basis of the price list of the Cooperative Union of Vojvodina for the year 2017. Part of the presented data was obtained from the production department of the Institute for Medicinal Plant Research "Dr Josif Pančić" from Belgrade, located in Pančevo.

Conclusion

The production of valerian is a set of agro-technical and technological measures that must be carried out within a given time frame under given agro-ecological conditions. Since the need for this raw material is increasing year by year and the quality standards are stricter, the production of this plant species requires greater biotechnological engagement and less involvement of human workforce. In this regard, it is necessary to innovate existing valerian production, and apply more intensively those methods that have not been present in production to date or those methods that have not been sufficiently and adequately used.

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OIL PUMPKIN SEED PRODUCTION TOWARDS SUSTAINABILITY: HUNGARIAN EXAMPLE

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Abstract

The changes in new CAP reforms' regulations modify the earlier practice of production based support to rural development supporting focusing on biological diversity, conservation of land and environment. By these changes make producers facing new challenges in economic, environmental and territorial field of their production. To achieve the basic aim of all business companies: the possible reliable profit, farmers have to be consistent in forming the right crop production system to meet CAP measures, instruments and also their profitability. The last and the next CAP reforms are requires more efforts from farmers to ensure the competitiveness of the agricultural sector and at the same time its sustainability over the long term, next to decreasing direct production support and decoupling policy issues. Accordingly there is a great need to reduce the use of chemicals and fertilizers by restructure the traditional cereal based crop rotation and to offer new alternative crops as food industrial crops and vegetables. These aspects require special investment in assets with higher capital use and a developed precise input-restructuring with using environment friendly materials, technologies and handling, and in some cases: manual work. This article serves as a case study based on a certain, but also average middle size farm from north-east of Hungary. The study based on the introduction of oil pumpkin seed as an alternative industrial crop into the crop rotation and the technological and economic analysis of this 109 hectares farm. The aim of the introduction of the new crop was as to give a possibility answer of meeting the requirement of diversification aspects under the new CAP policy of greening, biodiversity and sustainability, and to keep the long term profitability of farm. To confirm the reliability of the new crop we make a 10-year economic analysis of production based on used crop rotation. Previous version of this article analyzed the first 5 years (2010-2014) of

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production of the same company was published by Nabradi et al. (2015). This article has been improved and completed by data of the years (2015-2019) of the company's production.

Key words: greening, oil pumpkin seed, sustainability.

Introduction

For the EU budgetary period of 2014-2020, 30% of direct agricultural supports were used for agricultural production to assist farmers introduce and apply technologies which are beneficial for the diversity, climate and the environment. According to EPRS (2019) for the new 2020-2027 period it will be increased up to 39% of the budget. Within the newly introduced CAP reform in Hungary one of the possible practices was greening**,** which covers the most easily applicable element of plant production: so called diversification. In Hungary oil pumpkin as an alternative plant for greening is also involved in the enclosure list of applicable plants for diversification and it was also a traditional crop for oil production. The rate of crops for food industrial use covered 26% of domestic arable land in 2019. Oil pumpkin planted only a 0.5% of the total area (20-25,000 ha/year). Given the special production technology (equipment, post-harvest technics, sensitivity, high input level of micro element and basic nutrients) pumpkin production requires capital, skills, experiences, and good growing conditions and long-term planning of production structure. For the analyzed farm, oil pumpkin was successfully integrated plant in the rotation system also suits to the technology and the economy of the operation. The exported quantity of pumpkin seed gives the 90% of the total yield which supports importance of this plant in Hungary coming from. Hungarian pumpkin seed exported mainly to Austria, Germany and the Nederland. Pumpkin producers have two large groups in Hungary: manufacturers so called small-scale producers of oil pumpkin that cultivate 1-2 ha of production surfaces and larger producers that cultivate over 30-40 ha, producing pumpkin seed for food industry. Producers at premium size are able to produce relevant quantity and quality seed for the market, because they have the required skill, information, expertise and machinery, and they also able to integrate smaller producers. These producers have the average area for pumpkin is about 60-70 ha, given the rotation requirement, their average total area as large as 200 ha or more. If the climatic, land quality and market conditions satisfy the needs of this plant, its production is advisable and profitable in a long term. Being familiar with beneficial agro-technical influence on soil flora, fauna and structure oil pumpkin is an excellent green crop. As a well marketed crop, with high income conditions it could be an important part of farm financial management as compensation of the production and selling problems linked to usual crop. Revenue on oil pumpkin seed can be improved by eco-production and selling as bio-food. Usability of highly invested machinery and technology it's advisable to apply a large scale production and in that case, oil pumpkin seed could be seen as competitive, alternative food industrial plant for certain farms with good soil and climate conditions, as it is certainly validated by achieved yields and profitability indicators in the examined 10 years practice of our farm.

Research data and methodology

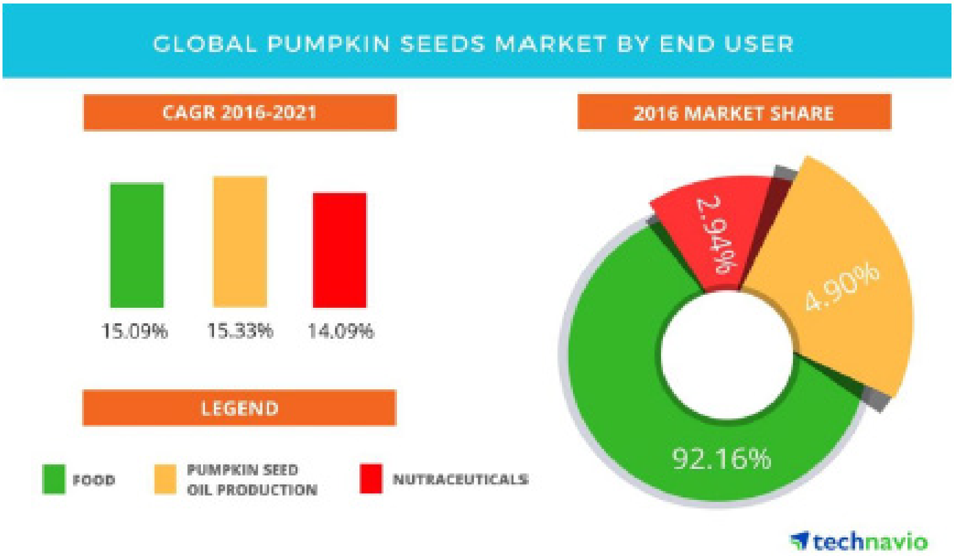
To reveal the world, European and Hungarian situation of pumpkin seed production and market we collected the some possible reached statistical data bibliographic review. As primary source of data was the precise 10 years of written farm record files, as well as technological and economical documentation of observed crops. Secondary data set was much more difficult coming from the different interpretation and consideration of pumpkins, pumpkin seed and oil seed categories, especially in the examination of export/import quantities. The overall and most widely used official FAO and EUROSTAT databases have not give comprehensive and practicable data in English. The use of official Hungarian databases for agricultural products KSH (Central Statistical Office) and MVH (Agricultural and Rural Development Agency) was also inconsequence and serve highly deviated data about the planted and harvested area of oil pumpkin (5,000-17,700 ha in certain years), Territorial data served by traders also differed from the official ones. Oil pumpkin is listed in different statistical records sometimes as industrial crop, or horticultural crop (as the squash or courgette) coming from the interests of farmers regarding to the agricultural support system.

Main reasons of wide raging of pumpkin and its seed

Numerous varieties of *Cucurbitacea* have been cultivated for almost 10 thousand years. They are multi-purpose plants, useable as food source for human and animal and as also traditional tools. The good nutritional composition and positive digestive effect of them was recognized in the early ages by our ancestors. Accordingly the widely known pumpkin and its varieties played important role in the people's diet and life. Pumpkin seed has become appreciated as medicinal food source and also a functional super food in the everyday diet (Madai, 2008). Nowadays we are using more than 800 pumpkin varieties in the world also for human and animal consumption, and for purposes (tools, dishes, carpets, etc.). Primary production territories of pumpkin were in Mexico, and warmer parts of America. It was revealed that the ancient Inka, Maya and Aztec societies known and produced different pumpkins altogether with other well-known plant cultures such as maize and bean. In a linguistic consideration the Mexican roots also are also possible from the word form of "pepita de Calabaza"from which the "pepita" means tiny pumpkin seeds (GMF, 2019). The first European appearance was detected after the discovery of the American continent. The sailors have been taken the seeds and the fruit into the Mediterrain harbors. In the Asian region it has been used as medicinal plant and also high value food source. Today, we can meet different pumpkin varieties and their products all over the world, but finding of exact statistics about the production and trade is quite problematic. According to a useful American study published in 2004 revealed that the Austrian region (Styria), is marked as the primary base of European pumpkin production. Related to reported data, it was cultivated at 10,376 ha in 2000, and enhanced to 15,450 ha up to 2003 (GAIN, 2004), which is equl to 1.5 million liter of pumpkin seed oil. Surrounding areas of this Austrian region are also suitable for oil pumpkin seed production, so Slovenia and western parts of Hungary also mentioned as production areas. Some region of the former North-Yugoslavia, Romania and Ukraine and in certain areas of the former Czechoslovakia was also mentioned in the above study. According to another information source the Technavio's Global Market Report 2017-2021 (Technavio, 2017) most pumpkins and pumpkin seeds in the world are produced in China. The market for pumpkin seeds (due to its special use due to its content values) is growing and its trade is highly fragmented. Consumption at world level is dominated by around 92% of food sales, followed by oil (5%) and pharmaceuticals (3%), (Figure 1.). India, Russia, Ukraine, USA, Iran and Mexico also have significant sown areas. In the United States, California, Ohio, Pennsylvania, Michigan, and New York produce the most oilseeds on more than 50,000 ha (RIRDC, 2012). Commercially, pumpkin seeds from outside Europe are priced lower than Hungary, but have quality and residue problems. China is the main supplier (56%) of EU imports. Next to it are Paraguay (7%), Ethiopia (6%), Ukraine (5.5%), Bolivia (5.5%), Argentina (4.8%), Peru (4.1%), Myanmar (4.1%) and India (2%) are also mentioned as the main and cheaper competitors of the Hungarian pumpkin seeds. Within the EU, the main exporters are Germany, Austria and Hungary, with

REWE a major retailer. Although pumpkin seed oil is used today for special gastronomic purposes, such as salads, due to its pronounced taste and high price, oilseed production is expected to grow in the future as people turn to natural healing ingredients. The need for pharmaceutical companies to use natural sources of raw materials may also increase production potential, and if the production practice returns to contract-based production, it will also increase domestic production and the financial security of production. In spite of the sensitivity and moderate endurance pumpkin has about 800 varieties, so production of their fruit and seeds is popular worldwide. From this point of view is interesting to list the main producers of different types and seeds like: China, India, Russia, Ukraine, Mexico, USA, and South Africa.

Figure 1. World market situation for pumpkin seed



Source: Technavio, 2017.

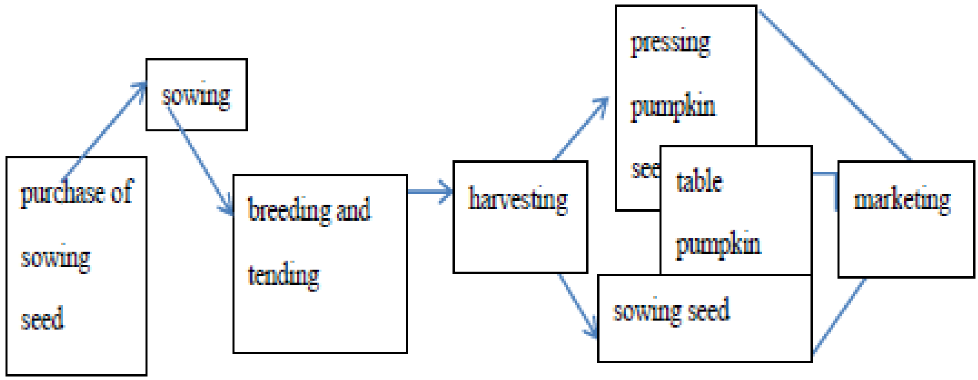
Production of Oil Pumpkin Seed in Hungary

The no-shell oil pumpkin may have been evaluated by a spontaneous mutation, becoming popular and pilling in Hungary from the 50s of the previous century.

"No-shell pumpkin production in Europe has a more than 100 year history, which was determined by the World Wars and the political structures after the 2nd World War especially in Hungary. Oil pumpkin was produced in Hungary in the 30s, especially for the purpose of oil extraction. In some places it was an important source of plant oil" (Agrar Bazis, 2012). It was also proved the by the article that production of mentioned crop product in Hungary was an important industry before and under the Second WW. After the war, the political and the farm structure transformed, so the situation of oil pumpkin production also changed due to the collectivization and cooperative and state farming system. The traditional production technology has been survived in a small scale, while the upcoming domestic and international demand gives a new possibility to the pumpkin seed production. In Hungary during the 70s and 80s as production has become a significant sector again due to the western market demand, which was important for the socialist government.

Within the EU the major oil pumpkin producer, processor and consumer is Austrian Styrian region, from where we also received some remarkable pumpkin variety and production technology. Austria and Germany are also important buyers of Hungary. The Western Transdanubian region has a long tradition of pumpkin seed production. Nowadays the eastern part of Hungary the North part has become the most significant place of production. The Styrian type oil pumpkin is a mutant with a non-woody seed coat, derived as a product of spontaneous mutation. Other researcher claims that a recessive gene might have initiated the modification. In last 10 year in Hungary, (according to distributers) production area is deviated between 20-25 thousand hectares, which a little change year by year depending on the climate and market conditions. Bio and traditional production of oil pumpkin seed has become relevant factor of income condition farmers and exporters involved in this business. Given the changing climate long term production practice show the harvested and dried seed of oil pumpkin per hectares in Hungary is 0.4-1.2 t (Kovacs, 2003). As it is seemed in the traditional Hungarian crop structure, cereals are dominant, reported by the KSH (Central Statistical Office), covering 66% of arable land in 2019 (KSH, 2019). While the primary industrial plants take up to 25% of the arable land, while oil pumpkin is planted at less than 0.5%. The value chain of observed production has been operated in many years in Hungary, the ration of the certain elements are not harmonized because of the majority of exported raw materials (Figure 2.).

Figure 2. Structure of shell-free pumpkin seed value chain



Source: Author's own elaboration, Nabradi et al., 2015.

Oil pumpkin seed is produced at certain level, domestic procession and consumption is at a quite lower level compared to production of oil pumpkin. Sowing seed requirement comes from import, mainly from Austrian sources because of the lack of domestic production and variability. Processing of the seed and marketing activities also operated by foreign firms, at international level.

Benefits of pumpkin seed oil

It is also true that oilseeds are of paramount importance for health and disease prevention due to their beneficial nutritional content. That is why oil pumpkin seed is referred as super food. They contain important bioactive substances such as polyunsaturated vegetable fatty acids, fat soluble vitamins (mainly vitamin E), alpha, tocopherol beta, selenium, magnesium, iron and antioxidants. The composition of pumpkin seeds is extremely medicinal and healthy as it is one of the richest sources of the above ingredients. It contains more than 80% unsaturated vegetable fatty acids, which are cholesterol free. Vitamin E in it has a beneficial effect on heart and brain function, and is particularly important in the prevention of vascular diseases. As a source of iron it's of great benefit to children and pregnant women in particular. It is also rich in magnesium and has a beneficial effect on the nervous system. Pumpkin seeds are also diuretic, anti-inflammatory, and bowel cleansing (which contributes to weight loss). Its unsaturated fatty acids have been proven to slow down atherosclerosis. Antioxidant content reduces the risk of developing cancerous diseases. It also plays an important role in the treatment of prostate disorders through its nutrients.

Market, processing and by-products of pumpkin seed

In Hungary, the processing of pumpkin seeds for oil is solved only on a small scale made by manufacturers. The large scale processing as an industry is partly supplied from the Hungary to Austrian and German processors. In addition, a small quantity of seed processed by domestic manufactures along with other natural oils and kernels, not only pumpkin seed. The Őrség region is the most famous as a traditional growing and processing district of Hungary and it has its own trade mark, which is very famous in Hungary. The most important production region and traditional European market is Austria, so there is a primary demand there that dictates prices. The disadvantage of the Austrian market is that they supply their demand primarily from local production and only turn to Hungarian producers in case of shortages or lower prices. As a result, prices fluctuate quite hectically under free market laws. In the spring of 2015, customers would have paid 4 EUR/kg of pumpkin seeds had there been enough to buy. When harvesting, the price is usually around 2.3-2.5 EUR, but in 2016 pumpkin seeds were bought for less than 1.5 EUR. If the seed comes from organic production, the price can be double the conventional price. The added value of the processed product is also significant for pumpkin seeds. The price of protected Styrian pumpkin seed oil in London can be as high as 90 EUR/l, as this product is protected in the EU. Austria is the most important exporter in the EU. Domestic buyers say Germany, South America and the Netherlands are the main target markets of seed besides Austrian processors. The most common type and healthy way of processing is cold pressing, whereby the extracted oil is of high quality and rich in content, thus providing an excellent food source. Other pressing technologies are also known for better yield and more pleasant taste. In one case the seed is warmed up and lightly toasted and then pressed more easily than the cold seed. Development of processing and enriching are also important in research especially for medical and dietary use. Hot pressing is a conventional processing method that works mechanically and thermally and has a better oil yield than cold pressing. Basically cold and hot pressing are the two main processing methods, but in but there are other utilization and processing of culinary practices e.g. pumpkin seed flour or cream.

Possible use of by-product

Today's mechanical harvesting technology leaves pumpkin pulp and skin on the soil while putting the seed in a collecting bin of the machinery. Thus, 40-

60 t/ha of pumpkin pulp, as a by-product, could be used as an organic source of nutrients which is extremely rich in various minerals by plaughing under after harvesting. By this we also partly recycle the applied manure into soil which was accumulated in the harvested product. Many years of experience and the result of soil analysis have shown that after the production of oilseeds, due to the already mentioned mineral and trace element content and loosing the soil structure by organic plant residues, higher wheat yield of 0.5-1.8 t/hectares can be expected. In earlier production practices, when there was higher farm animal population density in Hungary and the weather was favorable after harvest, young animals were driven to the harvested land, where they practically collect and eat the pumpkin pulp with the nutritive seeds remaining. Thus, due to its excellent nutritional properties and good nutrient content, this by-product of pumpkin was a useful feed mainly for ruminants. Pumpkin meat mixed with absorbent material (such as drying, screening by-products) is also well suited for silage, which in mixed farming businesses can mean reducing the forage costs an production area and producing valuable winter mass forage. If it is possible to combine pumpkin pulp and residues with corn or silage maize, so it is possible to make high value excellent silage fodder for ruminants. In addition to reducing land consolidation, this also results in a reduction in feed costs. The problem usually is that there is not enough ruminants (beef, cattle or sheep) where there is pumpkin pulp production taken place, or that there is no established experience and skill of practice and proper technology and equipment for harvesting pumpkin pulp and residues.

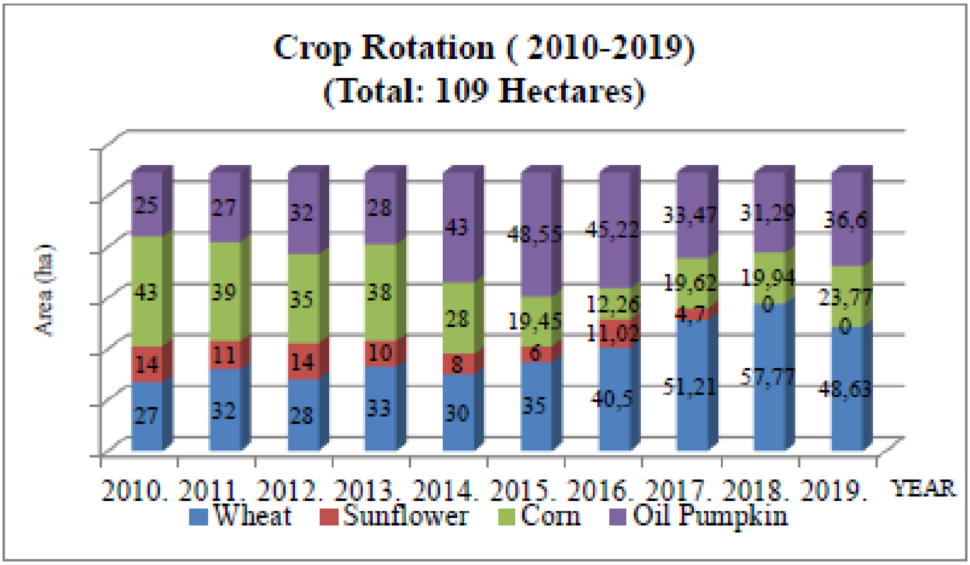
General cost - revenue conditions

Given the Hungarian climate and production conditions, annual oil pumpkin seed yield varies between 5-6,000 kg, but in excellent years 8-9,000 kg of dried, shelled seed production is also possible at 1 ha. Average price for 100 kg of pumpkin seed was 90 thousand HUF at the starting year of production in September 2014, with further growth to 120 thousand HUF at the same year. Total production costs/ha are 300-350 thousand HUF, and towards selling price, returns could achieve 500 thousand HUF/ha. In years with unfavorable conditions, revenue of minimum 250 thousand HUF could be gained which is still competitive with the traditional crops in Hungary. Requirement of technological parameters expect a quite high invested asset requirements and turnover suppose a long term oil pumpkin seed production. Investors' practice is to form a special integration and cooperation with regional producers by the service process of harvesting, post-harvesting and input buying and seed selling activities. Seasonal utilization of equipment together with the high investment and maintenance need of machinery, makes the operation rather expensive, than in case of traditional crops so practically the integration of other producers advance machine utilization and boost the returns. The investment and the turnover of the entire technology from sowing till post-harvest are reliable for at least 200 hectares of oil pumpkin seed or other pumpkin seed production. It is main reason for producer to enhance the area of oil pumpkin in crop rotation (Figure 3.), but because of the limited owned area and the importance of crop rotation the examined farmer is also pressed to integrate other producers and keeping services for them within a reliable production area.

Research results

The results of oil pumpkin seed production analyzation through the recorded data of a private, sole enterprise with a limited arable land of 109 ha. As many other this farm had been produced traditional crops: corn, wheat, and sunflower, barley until 2009 and from the year 2010 the owner introduced a new crop oil pumpkin on his better lands (Figure 3.).The new crop rotation was more profitable during the last 10 years (in spite of the 2016 low yield of pumpkin seed). Given the plant production practice of long standing the best previous crop of oil pumpkin is wheat. It is generally followed by corn or sunflower in some year wheat because of the shortage of land and sensitivity and technological requirement of pumpkin. Corn and sunflower could be the previous crops to corn, advancing the the positive impacts of previous crop (wheat) on pumpkin and partly bypassing the monoculture. The sowing area of sunflower is the lowest, related to common diseases with pumpkin it is hard to set it within the crop rotation system and also the 5 year sowing back time. Accordingly the sunflower production was terminated in the 2018 season, because of the technological, land and market problems and enhancing service requirement of pumpkin production.

Figure 3. Crop Rotation (2010-2019)

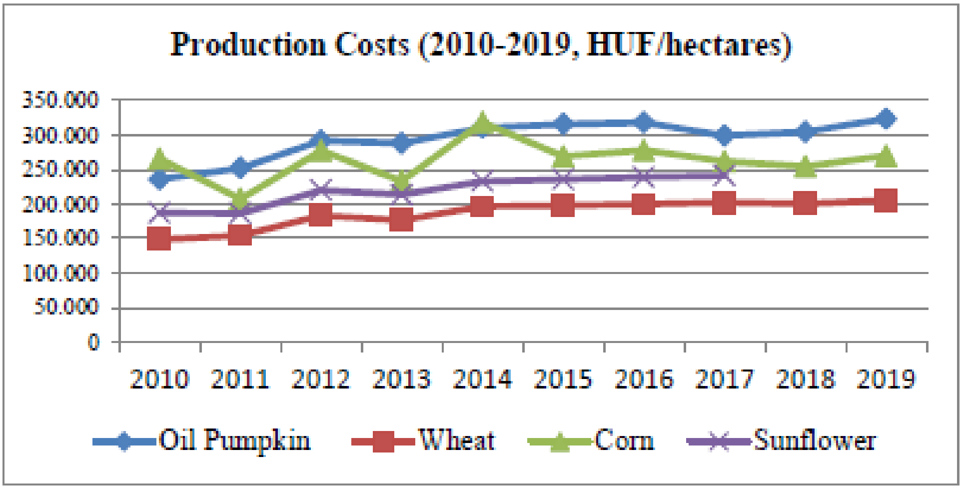


Source: Author's own elaboration based on Lapis, 2019.

Results of cost analysis

Overall cost analysis results that in comparison with traditional machinery based crops production costs for oil pumpkin per 1 hectare were the highest every year, except the first one. Compared to other crops in rotation cost are highly influenced by manual work and energy prices. During the 2014, production costs of corn were increased by rainy weather at harvesting and also by sudden trouble in gas transport conditions and rising energy prices. Due to them the plant and seed drying prices were 40% higher, causing a remarkable growth of drying costs. Specific production cost is the lowest for wheat in generally, because of the low input-demand of its plant (Figure 4.). Given the last years costs, manly of the natural inputs (seeds, manures, fertilizers, fuel, labour...) are increasing generally in the last 10 years. The summary of production cost (net cost) analysis sowed on Figure 4 where the net cost of oil pumpkin, covering all other production costs, enhancing by about 25% except the starting year. In 2014 the weather was quite rainy, so corn production costs are raised exceptionally highly, because of the increase of drying cost, and bad weather conditions.

Figure 4. Production cost (net cost) of plants (2010-2019)

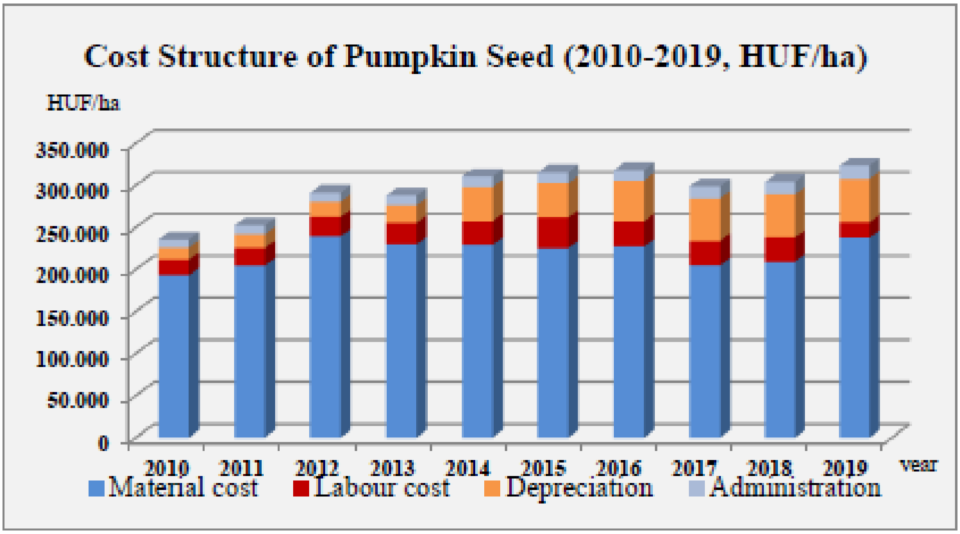


Source: Author's own elaboration based on Lapis, 2019.

Cost Structure

Naturally material costs give the most of costs in the crop production industries. This is the same in traditional and alternative cultures as well to reach an expected yield level. Analyzing the cost structure, the rate of material costs give about 80% for pumpkin production cost, 85% for sunflower and corn, or around 70% for wheat production cost (as the machinery and equipment are owned by the farmer we do not have to calculate with the machinery cost individually. Instead of that we calculate with depreciation and materials used for machinery in operation). Labour costs was at about zero in case of well-equipped cultures, excepted the pumpkin were manual activities are quite cost effective. Demand for manual labour of oil pumpkin emerges at harvest and post-harvest activities. Its share in total costs is 8-10%, which seems to be quite high in relation to other crops, where it is virtually about zero. During the studied production period labour costs of pumpkin varied between 18-36 thousand HUF, which shows much higher values in relation to grains or sunflower with their highly equipped production technologies. All other costs have not expressed such big differences. Depreciation was also high and rising cost type in all the examined production years for oil pumpkin, as its profitability made possible to invest new and more effective machinery and equipment. From the first production year of oil pumpkin given its reasonable revenues moderate technological development has been continuous. But from 2015 a more significant investment had taken place for reducing labour costs, and the higher demand for services and at same time there was an increase in depreciation coming from new investment (Figure 5.). In material costs, input-type raw materials take the largest share (seeds for sowing, special microelements manures, chemicals, water). Operation of special equipment of oil pumpkin production, material cost could be higher due to the input demand of washer-drier plant, and energy costs in comparison to other traditional crops.

Figure 5. Cost Structure of Pumpkin Seed (2010-2019, HUF/ha)

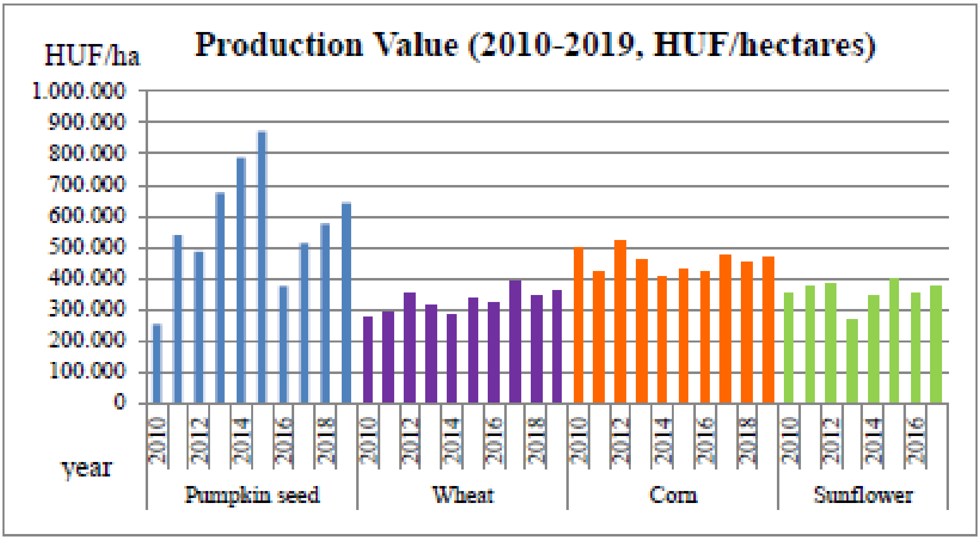


Source: Author's own elaboration based on Lapis, 2019.

Revenues

Crop production industries are exposed to the market especially price changes and also the weather conditions. We can experienced these kind of exposures in case of oil pumpkin with its extreme price change in 2015-2016, but in long run data shows a moderate upward in prices following the rising costs, which are emphasized in the production value (Figure 6.) and net income conditions (Figure 7). Despite the relatively good production and market condition the cold and wet climate caused a crisis in prices in the certain years: 2015 (4 EUR/kg) and 2016 (1.5 EUR/kg) (Figure 6-7.) That bad season had been causing a dramatic decrease in production value and net income in 2016. From the year 2016 oil pumpkin seed prices are constantly increasing, while the prices of traditional crops are relatively stable also in the long run. Together with the price increase a demanding market trend were emerged again in the European pumpkin seed market. The largest deviation in prices was revealed in the case of corn, (24.86%). In 2012 the sales price of corn was extremely high (63.000 HUF/t), in relation to other years: 45.200 HUF/t in 2010 and 23.000 HUF/t in 2009. From the 2013 corn sales prices started to a moderate increase again. This kind of price fluctuation makes sales revenues, and production plans uncertain, and inspires farmers try to find similar crops with less risk.

Figure 6. Production Value (2010-2019, HUF/ha)

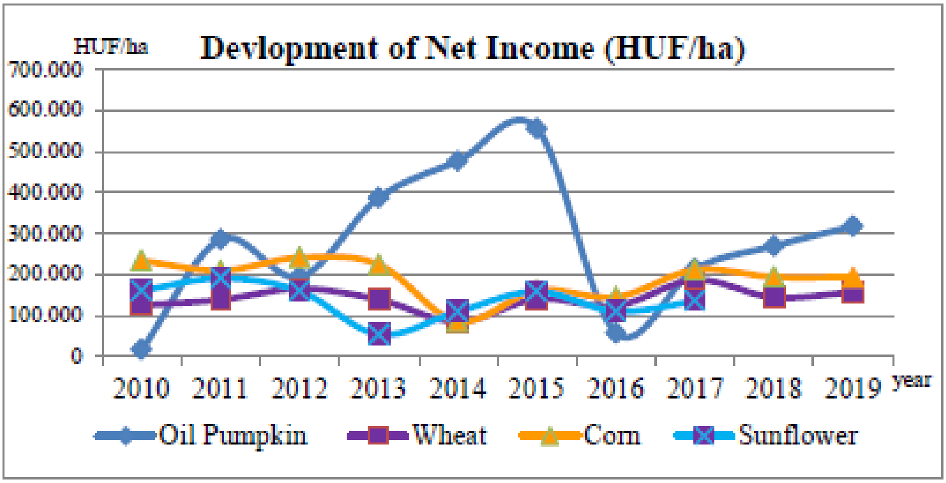


Source: Author's own elaboration based on Lapis, 2019.

The covered 10 year of examination revealed that the relative good price and market conditions make oil pumpkin production profitable and safe in the long run (except the critical year of 2016). The years under review proved to be higher production value and profit without losses in relation to the safe and outstandingly high net income from pumpkin sales in the given crop structure (Figure 7.). Net revenue of pumpkin seed gave an exceptional 765.000 HUF/ha in 2014 caused by the lack of pumpkin seed in European market. In the given year prices were much higher (4 Euro/kg) than the average (2-2,5 Euro/kg) because of the bad weather conditions all over the production regions. The year of 2016 was quite cold and there was also an oversupply on the market of pumpkin seed with poor prices due to the exception high prices of the previous year. 2012 and 2017 were droughty years and as a result of corn shortage, the price of fodder corn was relatively high, whereas the specific yield of oil pumpkin was low. We can follow the effect of also the climate and the market conditions in each year by analyzing the revenues and net income

(Figure 7-8.). Wheat and sunflower show less fluctuation in revenues due to the limited yield growth and the stable market conditions.

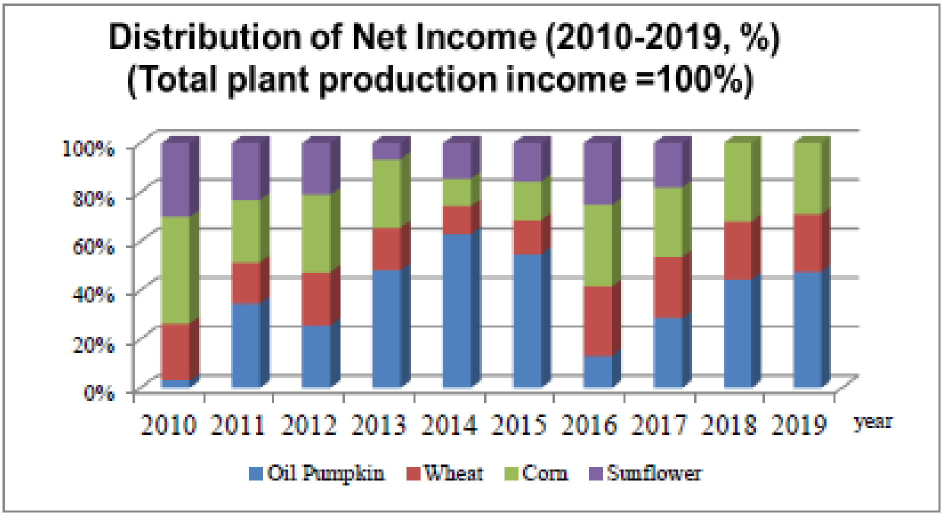
Figure 7. Development of Net Income (HUF/ha**)**



Source: Author's own elaboration based on Lapis, 2019.

The traditional arable crops do not play a dominant role in the farm income, but in the point of land use they are important in the crop rotation, because of the sensitivity and high input demand of oil pumpkin.

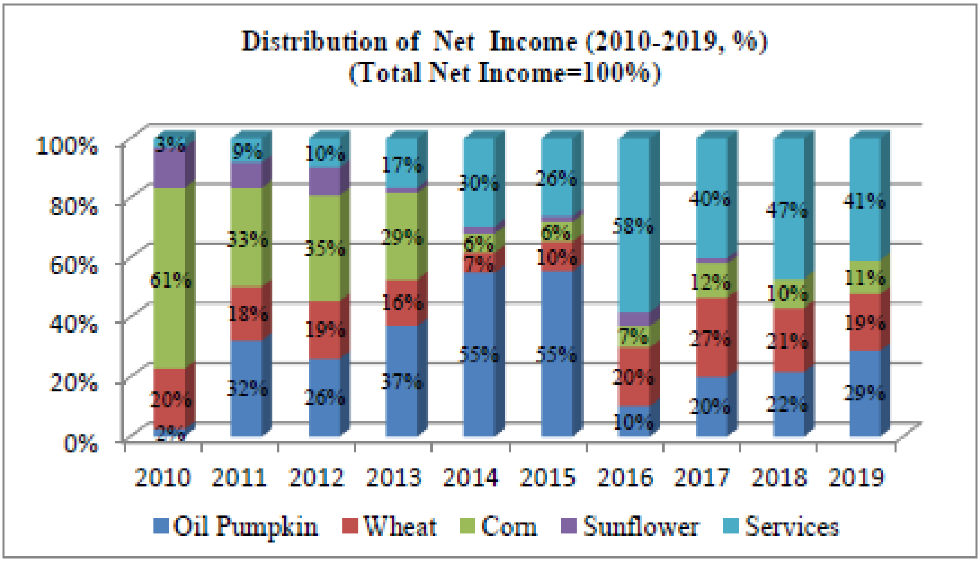
Figure 8. Distribution of Net Income by Plants (HUF/ha)



Source: Author's own elaboration based on Lapis, 2019.

Production of pumpkin seed is quite reasonable in the area of the examined company so other producers were also inspired to do this business. It was the reason the development of new machinery of pumpkin production in case of the examined company, and by this to reach the economies of scale of 200 ha pumpkin harvesting area by supplying services to other producers. Sales of seed and purchasing of inputs especially seed for sowing became more safe and favorable for the owner of the examined farm, because of this special integration. It is showed on Figure 9 that during the last four years income from services has higher rate in the income structure of the company.

Figure 9. Distribution of Total Net Income of the Company (HUF/ha)



Source: Author's own elaboration based on Lapis, 2019.

Summary and Conclusions

The analyzed technological and economic results of the certain farm prove the prosperity of oil pumpkin seed production in our region. The EU agricultural frame and regime also support the introduction and production of oil pumpkin seed and similar plants for food industrial use, functional or healthy food purposes. These kinds of plant cultures also serve the restructuring of crop rotation under the need of diversity and sustainability of agricultural production. On the other hand these plants with the higher turnover play a considerable part in the financial management (taxation, trading practices) and competiveness of farms with good endowments. Despite the disadvantage of high investment of assets, oil pumpkin production gives opportunities in many other fields: soil improvement as previous plant, silage for ruminants as a by-product, cooperation and special integration for producers. Better market positions for integrators and added value of the product (developed post-harvest technology results better financial conditions for farmers.

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Народна библиотека Србије, Београд

631:502.121.1(082)
005.591.6:631(082)
334.75:631(082)
338.432(082)

SUSTAINABLE agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region : science and practice in the service of agriculture : thematic proceedings / [editors Jonel Subić, Marko Jeločnik, Jean Vasile Andrei]. - Belgrade : Institute of Agricultural Economics, 2020 (Novi Sad : Mala knjiga). - XIII, 630 str. ; 25 cm

"...result of the scientific research on the integrated and interdisciplinary project no. III 46006: Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region." --> preface. - "Thematic Proceedings includes selected papers presented at the International Scientific Conference - Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region: Science and practice in the service of agriculture, which was hold in Belgrade on 12-13th December 2019." --> preface. - Tiraž 300. - Str. XIII: Preface / editors. - Napomene i bibliografske reference uz tekst. - Bibliografija uz svaki rad.

ISBN 978-86-6269-081-4

1. Subić, Jonel, 1964- [уредник]
а) Пољопривреда -- Научно-технолошки развој -- Зборници б) Пољопривреда -- Одрживи развој -- Зборници в) Пољопривредна производња -- Зборници г) Пољопривредна предузећа -- Удруживање -- Зборници

COBISS.SR-ID 282866188