

# BOOK OF PROCEEDINGS

AgroSym

*VIII International Scientific Agriculture Symposium  
Jahorina, October 05-08, 2017*



AGRO 2017  
sym

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## FOREWORD

### A Word from the Editor

The successful implementation of the 2030 Agenda for Sustainable Development and the achievement of the Sustainable Development Goals depend on progress in agriculture. Agriculture has far-reaching implications in terms of poverty eradication, food security, health and wellbeing, biodiversity, climate change and economic development.

The most important goal of the 8<sup>th</sup> International Agriculture Symposium “AGROSYM 2017” – held in Jahorina on 05-08 October, 2017 – was to promote sustainability principles in agriculture. Sustainable agriculture is an important element of the overall effort to make human activities compatible with the demands of the earth's eco-system. Thus, an understanding of the different approaches to ecological agriculture is necessary if we want to utilize wisely the planet's resources. One of the goals of the sustainable agriculture movement is to create farming systems that eliminate, or at least mitigate, environmental harms associated with industrial agriculture. That aim can be realized only with context-specific agro-ecological practices; these depend on regional characteristics, climate conditions, soil types as well as socio-cultural, institutional and political settings.

AGROSYM 2017 made an important contribution to agriculture science and practice. Symposium themes cover all branches of agriculture and are divided into seven sessions: 1) Plant production, 2) Plant protection and food safety, 3) Organic agriculture, 4) Environment protection and natural resources management, 5) Animal husbandry, 6) Rural development and agro-economy, and 7) Forestry and agro-forestry.

During the four-day Symposium approximately 250 papers were presented orally and 1030 as posters. The contributions, representing the current research in different countries, were presented to more than 1300 participants from more than 85 countries. We are encouraged by the great success of this year's edition of AGROSYM 2017.

This publication is comprised of an edited selection of over 400 papers submitted to AGROSYM 2017. Each paper included in the present Proceedings was positively reviewed by two referees. Full texts of the submitted communications are also available online (<http://www.agrosym.rs.ba>). Some selected papers will be published in AGROFOR International Journal (<http://www.agrofor.rs.ba/>), International Journal "Agriculture and Forestry" ([www.agricultforest.ac.me](http://www.agricultforest.ac.me)) and EcoPersia ([www.ecopersia.modares.ac.ir](http://www.ecopersia.modares.ac.ir)). Many thanks to all the authors, reviewers, session moderators and colleagues for their help in editing the Proceedings. The results reported here will contribute to the dissemination of knowledge to the wider audience about the importance of agri-food science; one of the most important areas of research strategies in Europe and beyond.

AGROSYM 2017 was made possible through the commitment and contributions of a wide range of partners and sponsors. I take this opportunity to thank all of them and I look forward to a successful joint organization of AGROSYM 2018.

East Sarajevo, 23<sup>rd</sup> October 2017



Prof. Dušan Kovačević, PhD  
Editor in Chief

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## **AGRICULTURE - A BASE FOR ECONOMY IMPROVEMENT**

Anja ROSANDIC<sup>1</sup>, Danica MICANOVIC<sup>2</sup>, Vladimir Yu. YUSHKOV<sup>3</sup>, Adriana RADOSAVAC<sup>4</sup>, Snježana GLUMAC<sup>5</sup>, Srdjan ATANASIJEVIC<sup>6</sup>, Desimir KNEZEVIC<sup>7\*</sup>

<sup>1</sup>University of Novi Sad, Faculty of Economics, MSci., Segedinski put 9-11, Subotica 24000, Doktora Sime Miloševića 16, Novi Sad 21000, Serbia;

<sup>2</sup>Serbian Chamber of Commerce and Industry, Resavska 15, Belgrade, Serbia;

<sup>3</sup>Perm State Agricultural Academy, Russia;

<sup>4</sup>University Business Academy, Faculty for Economy and Engineering Management in Novi Sad, Cvecarska 2, 21000 Novi Sad, Serbia;

<sup>5</sup>Secretariat for Environmental Protection, City of Belgrade, Serbia,

<sup>6</sup>Technical College of Professional Studies, in Kragujevac, Dept Informatics, R. Domanovica 12, Kragujevac, Serbia

<sup>7</sup>University of Pristina, Faculty of Agriculture, Kosovska Mitrovica-Lesak, Kopaonicka bb, 38219 Lesak, Kosovo and Metohija, Serbia

\*Corresponding author: deskooa@ptt.rs

### **Abstract**

Agricultural production is a main resource for food products and prevention of malnutrition of world population. Arable land is a limited resources for agricultural production - 0.4 ha per capita in the world. This requires attention for rational and optimal use of natural resources for agricultural production, particularly because of the fact that the rise of world human population in the future is predicted, over ten billions citizens. In previous century progress in agricultural production was achieved by developing conventional agriculture and industrial revolution, particularly from the beginning of „Green Revolution” which was characterized by growing technology with a greater use of fertilizers and pesticides. Agricultural resources are under pressure of spreading urbanization, and arable land used for developing factories, towns, industrial buildings, landfills, roads, railways etc., from the period of the Industrial Revolution, up to nowadays. Another problems that disrupts agricultural production is pollution from metal and chemical industry, towns, while in the future a new challenge is climatic changes. Since the beginning of the Industrial Revolution, the concentration of carbon dioxide in the atmosphere has increased by 30%, the concentration of methane has doubled and the sodium oxide increased by 15%. These increases affect the retention of heat in the earth's atmosphere on the principle of the greenhouse effect. The influence of unfavorable condition on agricultural production requires intensive work on resolving adaptive and efficient model(s) of agricultural production under the global climate changes and trend of increasing human world population.

**Key words:** *agriculture, production, economy, rural development, technology*

### **Introduction**

Agriculture is an important branch for production food to the human population, as well as provides a various of raw materials for the textile, tobacco, leather industry, etc., Also, agriculture realizes a surplus of products, which are exported to the world market and creates profit. In Serbia, agriculture is important for the economic, social, environmental and rural development, that in this decade participates about 10% of GDP, while in the previous decade, its share in GDP was higher (25%). The high share of agriculture in GDP confirms its importance for the overall progress of the national economy, although it is necessary to



establish a balance between the value of primary agricultural production and processing of food industry (Mićanović and Zecevic, 2012). The improving productivity in agriculture is directed particularly through efficient water and soil management practices, crop nutrition and protection from pests and diseases. This program needs support from national and International organization in food and agriculture. The average rate of growth of agricultural production in Serbia, at the beginning of the 21st century, is 1.3% of net worth, with dominant plant production. This trend in agricultural production in Serbia is in agreement with global prediction that meet of needs of the world population for food in 2050 will be necessary to increase crop yields by 1.3% per annum (Fischer et al., 2014). The basis for intensive agriculture has remained the selection of new cultivar and hybrids of plant species and breeds of domestic animals, which had greater potential productivity. Today, the main task is the creation of high-yielding varieties and hybrids, which are the basis for increasing food production (Fridman and Zamir, 2012). However in developed Country within agriculture production, the dominant role is production of domestic animals and better market linkage.

The statement of agriculture production is the reflection of statement of overall economy and the degree of technology in processing industry as well level of integration with the institutions and programs of socio-political system.

Climate change is one of the disturbing problems that is currently happening, and already expected global warming in the future is greater than previously predicted. Prevailing view of scientists that we now face an inevitable increase in global temperature and that is great probability that climate change has already occurred. With the threat of climate changes, more and more regions of the world are also at risk of drought and desertification. In order to mitigate the negative effects of climate change, it is necessary to take advantage of current scientific knowledge and develop new ones (Lin et al., 2005). Improved irrigation practices will help conserve water and protect vulnerable land. Stable and radioactive isotopes can be used as “tags” at the molecular level to monitor how plants use essential nutrients as well as to study crop growth and nutrient requirements to increase yields, while conserving water and preventing further degradation of marginal lands.

In economically developed countries, agriculture is characterized by high productivity, which is based on modern technical and technological means and methods of production, then a high degree of organization adapted to the type of agricultural production and integration with modern systems of processing and the appearance on the market of finished products, a further and product placement and income and profit (Knezevic and Micanovic, 2013).

This paper aimed at estimating agriculture’s role on economic growth and its impact on poverty reduction.

### **Agriculture influence to economic and social development**

Agriculture can contribute to growth of economy and modernisation of society, because of its abundance of resources and its ability to transfer surpluses to the industrial sector. Crop production as well livestock production need to be more intensive in the purpose to satisfy demand of increasing world population for food, what require additional investments of 80 billion Euros every years for reducing poverty. Agricultural investments can generate benefits as increasing productivity and food availability, employment of people, reducing poverty, introducing and transfer modern technology and access to capital and markets. In agriculture most resources are used for food production and have role as a one way flow of resources towards the industrial production, because of weak possibilities for trade. For developing economy agriculture is important for food production for different purposes as well

population with different incomes. Agriculture represents source of accumulation for new investment in industry and contributes to the enlarging market for industry products. In addition agriculture supply primary products for processing industry. Also, agriculture earnings in export provide for payment of imported goods (Timmer, 2002).

However, industry produce modern machine and equipment which contribute to improving technology of agricultural production and increasing production per hectare and per worker what significantly modernising economy. In the purpose to commercialise products, producers in cooperation with service sector and partly substitute chemicals and machines for their labour and for remain products receive lower price, in return, their spend less time on the market. This indicate that added values falls over the time, from labour, land and capital of agricultural producers as a share of the gross value of agricultural output. The increasing of purchased intermediate inputs and services can influence to decline of production in agriculture as well in GDP and employment.

The linkages between agriculture and industry is not simple, and share of agriculture to industry and services varied in dependance of level of agricultural and industrial development. For modernisation of agriculture and getting income is necessary supply incentives to realize agricultural goods without rising prices and resources in agriculture need toward industry centres (Rosandic and Knezevic, 2014). On the base of primary production we can estimate demands of industry and urban centres, as well potential agriculture. General estimation is that agricultral production is main base for economic growth and contribute to generate income in agricultural (rural) and urban areas and results of increasing incomes increasing of investment. Agrculture provides tax revenues and supplies materials to agricultural-based manufacture which contribute to lower price of products and have positive impact to economic development.

The impact of agriculture in GDP depends from linkage of agriculture and technology, human resources which directly support to farm productivity and reducing costs, as well connection agriculture and technology. The significance of agriculture share in GDP also, connected with macroeconomic policies through measue of taxation of food producers, traders and exporters, by investment in producing technological innovations and investment in rural incomes to generate social progress and infrastructure.

However, the industrialized management of agriculture refers to the management system that established agricultural bases with enterprises involved in agricultural product processing, sales or technical service as leading force and lead farmers in the agricultural production bases to embark on specialized production of agricultural products. This management can effectively solve the linkage problem between agricultural households of small-scale operation and domestic and foreign big markets, increase the value-added of agriculture by elongating the industrial chain, and improve the management efficiency.

### **Role of science in agriculture developing**

The increasing of agricultural production based on aplication scietntific measure of farming and growing high yielding and quality cultivars and hybrids which were created through breeding by using scientific methodology (Knezevic et al., 2016). The aim of breeding is creation genotypes with enhancing nutritional components and residue as a reason to be performed for the purpose of improving the yield and quality as well resistance to biotic (viral infections, mycoses) and abiotic stresses (drought, cold, salinity). In breeding program were created cultivars and hybrids with double and more increased yield, protein contents, content of fat, carbohydrates (Knezevic et al 2013), eg. in barley and oat content of antioxidants,  $\beta$ -glucan content, in sunflower specific fatty acids (oleic acid), in cotton cellulose extensibility characteristic, in wheat contents of essential amino acids, antioxidants

etc. (Menkovska et al., 2015). The biological quality have great importance for human health, to prevent certain diseases occur due to lack of the presence vitamin D (rickets), an amino acid (e.g., phenylalanine, is created from dopamine and two hormones adrenaline and noradrenaline, which lack in certain cases causes Parkinson's disease). This progress is achieved in a relatively small number of plant species, mainly in species which are the most use in the diet.

At the beginning of the Green Revolution, i.e. in the time of application of new scientific farming measures, creation of new hybrid and cultivars the production of food was increased. This progress based on increasing yield thanks to the introduction of new genotypes and increased application of fertilizers and pesticides in plant production practice. However in all developed and developing economy the significant effect on increasing of agricultural production had introduction of agricultural machinery (tractors, seed, combines, mowers) and than authomation of processing production (mills, processing plants, milking cows and sheep) which contribute to decline manual labour. The strong interdependence between agriculture and science and industry, through which agricultural growth supports overall economic growth and reduce poverty.

Human population rise is imposed by the production of large quantities of food. The required food production can be realize by conducting production on larger metering surfaces or through increasing yield per unit area (Fischer et al., 2014). Increasing of agricultural productivity can increase farm incomes through introduction new technical equipment for transport, processng and marketing and satisfiying demands of consumers and services. This is associated with economic growth and poverty reduction (Rosandic and Knezevic, 2014).

Climate change is estimated on the base of increasing of temperature in some area 5-6 °C, approximately; ice sheets in the Arctic melt significantly, increasing of carbon dioxide in the atmosphere etc., as a consequence of natural disasters (earthquakes, floods, hurricanes, cyclones) non-rational exploitation non-renewable and renewable energy resources, increasing of indusry pollution (Jolánkai and Birkás, 2007). Pollution is a very important factor of extinction, and the consequences of which are present in the agricultural practice after the use of toxic chemicals. Use of toxic hydrogen chloride, dihlor-difenil-trihloretan (DDT) and polychlorinated biphenyl (PCB) has a negative impact on the species that are at the top of the food chain (soften and distort the eggshell will develop a bird, disrupt reproduction carnivores, cause cancer in animals and are probable human carcinogens). This suggests that is need to maintain the coexistence of crops and weeds by application adequate herbicide, otherwise it disrupts soil microfauna, food chains and disappearance many insects, invertebrates and other species in the ecosystem (Pachepsky et al., 2007). Survival depends on ecosystem biodiversity, so that eviction or the loss of one or more species can disrupt ecosystem to decay and brought into question the survival of man, if it is known that over 40% of new drugs in medical pharmacy obtained from plants and animals.

A more economical aspect is to produce plants with an increased yield wherein the significant role had accomplishment in biotechnology through the creation of transgenic plants. The transgenic plants have higher yield, as well as resistance to pests, diseases and tolerance to herbicides, insecticides, etc. However, the occurrence of adverse effects of the use of food from genetically modified plants, aroused caution to the opposition and rejection of the newly plants, as well as due to the risk upsetting the balance in the ecosystem and the negative impact on communities biocenoses (Fridman and Zamir, 2012). It came to initiate a new approach to the growth of plants in natural conditions for food production. In contrast, very intensive requirements present for organic production. The areas for production of organic wheat in 2002 were the largest in Australia 7.7 million ha, in Europe 4.3 milion ha, in Central and North America 3.6 million ha, in North America 1.3 million ha, and at least in

Asia (94.000 ha) and Africa 60.000ha (FAO, 2002). There is a trend of increase in area under organic production. In fact, based on a harmonized ecosystem simulation wants to produce biologically valuable and safe food.

The perspective in agricultural production is in recognizing the importance of innovation, knowledge and education. The registration, acceptance and implementation of innovation can contribute to launching the economic development in all Countries. The transfer of knowledge in economy is not simple, but can contribute to improving technological development of the country, and as well as to accelerate progress of modern economy, particularly agriculture as well improve rural livelihoods, protect biodiversity and environment.

### **The perspective of the rural economy development**

The one of the former form of organization of agricultural production based on cooperatives farm, today is less and less present. The reasons for this are varied, and among them manifested unprofitable existence, emphasized trade and administration functions, unjustified borrowing for investment, low productivity results and others. On this basis, the cooperative could not fulfill its primary function in the interest of members. Also, the complex ownership structure of assets in cooperatives aggravated their renewal. Instead arise new forms of organization of small and medium-sized enterprises, which have an impact on the development of social relations and economic development.

It is certain that the necessary association of producers in order to strengthen production safety, contribution to meeting the demands of the market for the quantity and quality of products. Whether the small land holders are merged and enlarged in the future so the plot or to larger companies buying or renting land plots enlarged in the future production, to creating better adopted for higher productivity. Small producers themselves can hardly meet the criteria of competitiveness in agricultural production. All farms according to their capacity to perform the production and control as in plant and animal production, which is a function of a higher level of consumer protection and food safety. The key for food and nutrition security is agricultural investment by farmers or the public sector. The investment can contribute to increasing productivity at the farm production and can increase quantity and quality of food on the market, decline price and stronger connection between rural and urban consumers.

The introduction of technical-technological innovation in agriculture can contribute to its development, which is based on the concentration of technical means and enlargement of land areas, whereby the developed new agricultural and manufacturing relations (Knezevic and Micanovic, 2013). To cooperative could operate successfully, it is necessary to their establishment on a voluntary basis, in which all operations of the cooperative must have the ability of control operations, economic investment in the development of cooperatives, private education, modernization of equipment. Also, it is necessary to contribute to the strengthening of the independence of cooperatives, strengthening its own budget, and have an impact on the development of the environment and society. Cooperatives could autonomously decide on the structure of production in line with available resources and market needs within the business environment. Achieved by integration of small agricultural areas in larger systems (cooperative farms, combines, mixed holdings) and also all stronger connections agriculture and industry such as agricultural products were used as raw materials for industrial production. These dynamic changes in the organization, structure and modernization of agriculture were present in Western Europe, the United States, the former Soviet Union, etc.

The future progress of agricultural production will based on using of new technologies in farmers production and developing an open market environment to make the resulting production as profitable to producers as employment opportunities in other sectors. In

environment where agricultural development is not possible, rural poverty will only be solved by migration to urban areas (Rosandic and Knezevic, 2014).. Too little public and private capital was invested in rural areas as well in raising rural productivity. The improving of public investments and favorable policy stimulate growth in the agricultural sector is possible achieve through the opportunity for farm investment without financial intermediaries, and the potential to earn high rates of return on public investments that correct for urban bias (Timmer, 2002). The agriculture growth have share in economic growth and direct contribution to growth in GDP.

The scientific potential that we have put into operation improving the level of technological development of the economy, above all, bridging the gap between science and economy (Mićanović et al., 2011). Incentives should be provided for according to the foreseen quotas and applicable standards in manufacturing, whether it is a plant species or species of domestic animals as well as products from them. Also, the stimulus should be reinforced in case the diversification of production, which is required for proper disposal of waste (fertilizer in growing animals), biomass (in the cultivation of cereals, etc.). Thereby manure produced can be used in the nutrition of the plants, which can not be greater than 170 kg ha<sup>-1</sup> per year.

Labeling throat domestic animals, bee colonies increases the level of protection of the environment and human health. In order for Serbia to be recognized on the EU and world market, it is necessary to protect the originality of agricultural products, the geographical origin of the product or process in the manufacture of a product, especially a product of the grapes (wine), dairy products (cheese, cream), bee products (honey, royal jelly, propolis) and fish products.

### **Agricultural production and poverty reduction**

The high level of production and export of agricultural products, achieved in developed countries, thanks to the use of modern technology and encouragement of the European Union. Agriculture in the European countries, after a period of protectionism, the deflection in the single market, on which it freely without customs costs, makes the sale of agricultural products on the one hand, while also implementing protective tariff rates on imported products. This approach was developed in the EU in order to protect the single market of goods produced in the European Union, as well as assistance for the export of goods to other markets in the world. Strengthening agriculture in the European Union is based on: improving the competitiveness of the agricultural sector, improving the quality of agricultural products and environmental protection, development of farmland diversity, and justification for spending the EU budget for agriculture.

In the European Union, of the total agriculture, the production of 75% is achieved in 7 countries as follows: France (18%), Germany (14%), Italy (13%), Spain (10%), the UK (8%), the Netherlands (7%) and Poland (5%). France has become a leading producer and exporter thanks to the effect of incentives of agricultural production eg., in 2007 year. The France, after export of agricultural products was the third in the world, of which the most important export products were wheat, poultry, dairy products, beef, pork, champagne burgundy. In France, the 3.8% of the active population is employed in agriculture and the food industry had a share of 4.2% of GDP. France after export of agricultural products was the third in the world, of which the most important export products were wheat, poultry, dairy products, beef, pork, champagne burgundy.

In the structure of the agricultural production in the EU, the production of cereals represent about 13% of the total production (330 million tons). The largest increase in cereal production was recorded in Slovenia (over 40%), similar in Slovakia and in Austria, Hungary, the UK and Estonia is ok increase of 20%.

The production of pigs, cattle and sheep represents around 17% of total agricultural production in the EU. In France, it is grown around 22% of the total production of about 88 million cattle heads in the EU, followed by Germany 14%, UK 11%. Of the total production of sheep in the EU (84 million head), about 23% is grown in the UK, 15 million in Spain, Romania and Greece, with more than 9 million head. The EU has grown about 148 million pigs, of which more than a third of the products together in Germany (26 million individuals) and Spain (24 million individuals). In production of livestock in Serbia, is dominated production of pigs (3.2 mil. Individuals) which is higher than in neighboring countries (11th place in Europe), than are bred cattle around 920000 and 1.7 million sheep. The Serbia need focused on improving economy with reducing food imports and by increasing food production in agriculture and processing industry. In Serbia present resources to support agricultural based economy.

In the model of the EU agricultural provided market intervention for products that are important to food security and revenue producer, such as sugar, wine, olive oil, etc., Wherein is carried out foreign-protection intervention buying and other forms of product withdrawal from the market, and support consumption and production of certain products. Agriculture and food industry in the EU play an important role in ensuring the health of the population, in rural development and environmental protection. Some 500 million EU consumers spend nearly a quarter of their earnings on food. In the agricultural production is employed about 2% of the labor force, which contributes to more than 4% of the GDP of the EU, and the food industry are employed, about 3% of the labor force, which contributes to more than 3% of the GDP. The potentials of the food sector are significantly higher in the EU for employment (20%) and thus a better share of GDP (about 10%). In terms of the current economic situation establishes a system of organization of agricultural production, transport, and joint technologies of launch of agricultural product (Latacz-Lohmann and Hodge, 2001)

Today's volume of agricultural production in Serbia is at the average level of developing countries, which is paradoxical given the existing professional human and natural resources. This is due, obsolescence and lack of technical resources, unfavorable age structure and the number of agricultural population, as well as the inexperience and incompetence of returnees from urban areas in agriculture (Micanovic and Zecevic, 2012). Also, a significant factor affecting the maintenance of stagnation in agricultural production is the presence of competition, the presence of managers in comes to building production without adequate education and experience, insufficient investment in science and support scientific and mid-career programs, if they exist at the level of analysis without further implementation of the formulated conclusions and the program of measures for development of agriculture (Fridman and Zamir, 2012). Also, a significant inhibition factor is the lack of investment and existing expensive investment in agriculture

### **Conclusion**

For efficient agricultural development is necessary financial resources, revision current import and export regulations and stronger subvention and realisation on the market. Also, is necessary mobilize human resources and use natural resources to make strong agricultural sector which will be the main source of revenue for the Country. The intensification of agricultural production is based on the development and application of new technologies of cultivation of plants and animals, technology, nutrition, harvest, storage and marketing. Improving productivity in agriculture in a sustainable manner is today a realistic target. The future progress of agricultural will based on using of new technologies in farmers production and developing an open market environment to make the resulting production as profitable to producers as employment opportunities in other sectors. In environment where agricultural

development is not possible, rural poverty will only be solved by migration to urban areas. The intensive investment in agriculture, application of scientific methodology, achieve production with low input and high output and provision open market for agricultural product will contribute to economy strengthening and reduction of poverty.

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## **ANALYSIS OF THE ECONOMIC EFFECTS OF DRIED PLUM PRODUCTION ON FAMILY FARMS**

Mirjana LUKAČ BULATOVIĆ<sup>1</sup>, Dušan MILIĆ<sup>1\*</sup>, Branka KALANOVIĆ BULATOVIĆ<sup>2</sup>

<sup>1</sup>Faculty of Agriculture, University of Novi Sad, Serbia

<sup>2</sup>Faculty of Agriculture, University of Belgrade, Serbia

\*Corresponding author: milic@polj.uns.ac.rs

### **Abstract**

The traditional model of fruit drying in Serbia is founded upon small family dryers, which are used for drying plums and occasionally apples. Such model features a sustainable energy supply due to utilizing biomass as an energy source. However, a serious technological disadvantage of the model is reflected in the employment of direct drying, which inevitably results in fruit oxidation. Changes in consumers' habits, accompanied by increased sanitary and health requirements, have made this technology obsolete on the market. The contemporary production of dried fruit necessitates "friendly technologies" with a stable and inexpensive energy support. Therefore, a number of researches at the Faculty of Agriculture in Novi Sad examined the adoption of friendly fruit drying technology with a sustainable energy supply. Consequently, the solution was found in the combined fruit drying technology powered by renewable energy sources. Using the combined technology, the production of dried fruit in small drying facilities on family farms can be very profitable. On the basis of the financial analysis of dried plum production, the total and variable costs were calculated for a dryer with a capacity of 450 kg of fresh plums per day. The contribution margin was computed as the difference between the total sales revenue and variable costs, whereas the profit was calculated as the difference between the value of production and total costs. The cost price of dried plum halves was 187.3 RSD/kg (1.52 €/kg). A retail price of 504 RSD/kg was set for dried plum halves by adding an average trade margin of 20% and a value-added tax of 20% to a wholesale price of dried plum halves totalling 350 RSD/kg. The calculations showed that a gross margin of 843,960 RSD (6,861 EUR) and a profit of 729,480 (5,931 EUR) was generated during 40 days of production, using the given purchase and selling prices.

**Key words:** *dried plums, cost price, contribution margin, profit, Serbia.*

### **Introduction**

The industrial significance of plums is determined by their usability, prevalence in the total fruit and agricultural production, share in international trade, production workforce requirements, processing and marketing, as well as their contribution to sustainable agriculture and environmental protection (Lukač Bulatović, 2014). Plums are consumed fresh or used in domestic and industrial processing. According to Vlahović (2003), plums are mostly used for plum brandy production (approximately 65%), processing (21%), fresh (8%) and dried (4%) consumption, whereas the smallest share of plums is utilised in jam production (2%). The Serbian plum production ought to be enhanced by applying contemporary growing and protection technologies.

The development of fruit production in Serbia greatly depends on the prospects of marketing fresh and frozen fruit, as well as processed fruit products. Fruit processing is primarily