THE DEVELOPMENT OF ORGANIC AGRICULTURE IN SERBIA AND WORLDWIDE

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SUMMARY

Organic agriculture is a food production system that sustains the health of people, soils and ecosystems with no adverse consequences, combining tradition, innovation and science. The development of such type of agricultural production, from its beginnings to the present day, has encompassed a number of specific stages both in Serbia and worldwide. Accordingly, the purpose of this survey study is to present the developmental course of organic agricultural production in Serbia and worldwide. The paper also summarises the state of organic plant production across different regions of Serbia, arguing that the Serbian organic production has been increasing since the 1990s. Following the political changes in Serbia in 2000, foreign donations, investments and organisations have significantly enhanced the country's organic production sector as a whole. The largest number of organic producers (1/3) and the largest areas devoted to organic farming are concentrated in Vojvodina.

Key words: organic agriculture, production, regions, areas, plant species

INTRODUCTION

Organic production is a system of sustainable agricultural production methods that enhance and/or maintain soil fertility and biodiversity, while protecting the environment and health of plants, animals and people (Popović et al., 2016; Golijan et al., 2017a). Agro-ecosystems have been long compromised by diversity reduction, the loss of genotypes and the genetic background uniformity of a large number of main crops. Conventional agriculture is associated with the overall simplification of the agro-ecosystem structure, thus resulting in the reduced biodiversity of crops and domestic animals within the agro-ecosystem (Veličković et al., 2016). Man is a key factor in maintaining biodiversity both locally and globally (Hawthornthwaite, 2001). Owing to the adverse effects of conventional agriculture and soil, air and water pollution, a more avid interest of producers and consumers of organic food has been increasingly evident. The use of synthetic pesticides is not allowed in the organic production so as to minimise the harmful effects of plant protection. Organic production methods are stipulated by the law and organic products must be labelled as such in the market (Golijan & Dimitrijević, 2018). Compared to conventionally produced food, organic food products have been argued to contain a lower nitrate content and higher contents of vitamin C, dry matter, mineral elements (particularly Fe, Mg and P), sugars, essential acids, polyphenols, etc. (Woese et al., 1997; Worthington, 2001; Winter & Davis, 2006; Dangour et al., 2009; Golijan & Veličković, 2015; Golijan, 2020). Although the origins of organic agricultural production date back as far as a hundred years ago, organic farming gained prominence in the 1980s. The development of organic agriculture has gone through three stages (Shi-ming & Sauerborn, 2006):

1. the stage of emergence of organic agriculture (1924-1970),
2. the stage of development of organic agriculture (1970-1990), and
3. the stage of growth of organic agriculture (1970-present day).

The stage of emergence of organic agriculture (1924-1970)

In the early twentieth century, organic agriculture was originally recognised as biological dynamic agriculture. A series of lectures entitled "The Spiritual Foundations for the Renewal of Agriculture" and delivered by Dr. Rudolf Steiner (1861-1925) in Koberwitz (Poland) in 1924 served as the basis for the development of biodynamic agriculture and subsequently organic agriculture. Rudolf Steiner (Austria), Hans Müller (Switzerland), Lady Eve Balfour and Albert Howard (United Kingdom), Jerome Irving Rodale (USA) and Masanobu Fukuoka (Japan) were the greatest contributors to the development of organic agriculture at the time of its emergence. Rudolf Steiner's ideas were further developed by Hans Müller and Hans Peter Rush, and Hans Müller eventually created the foundations of biodynamic agriculture in 1930. Therefore, the concept of biodynamic agriculture was further disseminated in the German-speaking countries. Following Steiner's ideas that man is a part of the universe and, as such, should live in harmony with the surrounding environment, Ehrenfried Pfeiffer (1899-1961, Munich, Germany), a German scientist and a student of Rudolf Steiner, had to strike a balance between the spiritual and material aspects of life, applying this philosophy to agriculture. The author spread these ideas in Germany, Switzerland, England, Denmark, France and the Netherlands. In 1938, Ehrenfried Pfeiffer's text "Bio-Dynamic Farming and Gardening" was published in five languages: English, German, Dutch, French and Italian. Thereafter, and just months before the outbreak of World War II, Pfeiffer ran the Britain's first biodynamics conference, the Betteshanger Summer School and Conference, at the Lord Northbourne's estate in Kent. The Betteshanger Conference is considered the link between biodynamic agriculture and organic farming. In 1940, Lord Northbourne published his manifesto of organic farming "Look to the Land" in which he coined the term 'organic farming' (Paull, 2011). The greatest credit for the development of biodynamic agriculture in the United States belongs to Pfeiffer, who lectured about the biodynamic agriculture in New York in 1933 during his first visit to the States (Dann, 2000). Furthermore, spreading the concept of biodynamic agriculture in the USA, he established the Biodynamic Farming and Gardening Association in 1938. In 1935, Mokichi Okada established a distinctive agricultural system in Japan originally known as "nature farming" or "no fertiliser farming". At the time, there were two schools of "nature farming" advocated by Mokichi Okada and Masanobu Fukuoka (Setboonsarng & Gilman, 1998). They both aspired to establish and maintain the natural function of the soil and plants in agricultural production systems in order to increase the humus content while avoiding the use of fertilisers, chemicals and tillage.

After many years of research in Indore (India), a microbiologist Sir Albert Howard published "An Agricultural Testament" in Great Britain in 1940, outlining the basics and directions of organic farming. Sir Albert Howard argued that the maintenance of humus, water and mycorrhizae in the soil was of particular importance to agricultural production. In addition to "An Agricultural Testament", he also developed the "Indore" method of composting, the details of which were published in the book "The Waste Products of Agriculture" in 1931 (Solomon, 2008). Howard is considered the father of the modern composting. His knowledge and techniques of organic farming have been spread through the UK-based Soil Association (UK) and the Rodale Institute (USA) (Lockeretz, 2007).

Jerome Irving Rodale (1898-1971, New York, USA), an American author, publisher and founder of the Rodale Press, was the first proponent of sustainable agriculture and organic production in the USA. Inspired by the ideas of Albert Howard, he promoted organically produced food and healthy lifestyle, ultimately establishing the Rodale Organic Gardening Experimental Farm in 1940. In May 1942, he published the first periodical magazine on organic production and gardening (*Organic Farming and Gardening*) (Paull, 2013). According to Rodale, agricultural production is inseparable from human health. In this regard, he stated that compost was necessary for fertile and healthy soil, and that the application of synthetic fertilisers and pesticides should be avoided.

The Australian Organic Farming and Gardening Society was established in Sydney (Australia) in 1944 (Paull, 2007). In the United Kingdom, Lady Eve Balfour, following the ideas of Sir Albert Howard, founded The Soil Association in 1946. She was the author of many books about organic farming, including *The Living Soil*. As an advocate of organic farming in England, Lady Eve Balfour was the first person to carry out a comparative study on organic farming and conventional farming, known as "the Haughley Experiment".

In the ten-year period 1950-1960, organic farming was vigorously spreading worldwide, particularly in France. Environmental and human health considerations favoured the development of organic farming in Japan in the period considered. After the 1960s, organic farming has been globally expanding. The oil crisis in 1973 caused a number of adverse effects on global economy and politics (Ahrari, 2015). Conversely, this crisis has raised a number of issues related to the environmental conservation and protection, as well as the establishment of sustainable agricultural systems. The crisis was followed by a series of protest movements and social changes, which promoted alternative lifestyles and alternative forms of food production. During that period, the concepts of organic, biodynamic, ecological and natural farming gained importance.

Influenced by Lemaire Boucher in France, the New Alchemy Institute, a research centre in Massachusetts (founded by John Todd, Nancy Jack Todd and William McLarney) investigated the organic agriculture and aquaculture in the USA between 1969 and 1991. The results obtained argued the importance of organic farming and food production with no pesticides and with less fertilisers and water (Vehapi, 2014).

Rachel Louise Carson (1907-1964), an American scientist and biologist from Pennsylvania, published a book *Silent Spring* in 1962, as a result of the studies on harmful effects of pesticides on the environment. This book brought environmental concerns to the American public, despite much opposition from pesticide-producing companies. Consequently, a policy shift led to the ban of the extremely strong poison dichlorodiphenyltrichloroethane, commonly known as DDT. Rachel Carson became one of the initiators of the global environmental movement (Paull, 2007).

The stage of development of organic agriculture (1970-1990)

The increasing awareness and use of healthy, organic food in the period 1924-1970 led to the establishment of the first scientific institutions within the field of organic agriculture in the 1970s. The International Federation of Organic Agriculture Movements – IFOAM, with over 120 member countries, was founded (with the help of Lady Eve Balfour) in Versailles (France) in 1972. The first standards for organic agriculture were defined by the IFOAM in 1980 (www.ifoam.bio).

William A. Albrecht (1888-1974), Chairman of the Department of Soils at the University of Missouri, studied the relationship between soil fertility and human health, and introduced the ecological principle, thus making a great contribution to organic agriculture (Coleman, 1989).

In 1973, the Research Institute of Organic Agriculture (in German Forschungsinstitut für Biologischen Landbau, in short FiBL) was established in Switzerland. The aim of the Institute founders was to spread information and practical advice in order to engage as many farmers as possible into organic food production. The seat of the FiBL is in Frik, but there are a number of branch offices in Germany (Frankfurt), Austria and France (www.fibl.org).

Following the foundation of the IFOAM and the FiBL, organic production has spread around the world. Moreover, these institutions played a major role in the process of standardisation and marketing of organic products. During this period, the methods of organic production were also legislatively regulated.

In the USA, the first organic farming regulation was established in Oregon (1974) and California (1979) (Greene, 2001). The Report and Recommendations on Organic Farming, released by the USDA and based on the status of 23 states with 69 organic farms, was a turning point in the development and legislation of organic farming in the USA. The Report outlined the guidelines and action plan for the US organic sector development.

The legislative framework within the field of organic farming was also established in France, where the first standards were issued by the producer association Nature and Progress in 1972. Almost ten years later, the National Committee for the Organisation and Development of Organic Agriculture was established in 1981. The Technical Institute for Organic Farming (French Institut Technique de l'Agriculture Biologique) was established in Paris in 1982 (ITAB, 2018). Furthermore, legislative regulations within the field of organic production were established in 1985 (Graf & Willer, 2001), as well as the national logo AB (Agriculture Biologique), i.e. a designation for organically produced goods in France.

The stage of growth of organic agriculture (since 1990)

Since the 1980s, a vigorous growth in organic farming has been reported worldwide. The institutional frameworks, strategic areas, legislation and regulations pertinent to organic farming have been established and implemented. Increasing attention has been paid to the supervision and analysis of organic products at the international level. Furthermore, trade organisations have also been established, whereas governmental and non-governmental organisations have been involved in raising awareness of and promoting organic production (Kristiansen et al., 2006; Shi-mingl & Sauerborn, 2006; Behera et al., 2012; Tomaš-Simin & Glavaš-Trbić, 2016). All of the considerations stated above resulted in the global development of organic food markets.

The Organic Agriculture Act was passed in the USA in 1990 (Greene, 2001), whereas the European Commission adopted the first EU organic regulation (COUNCIL REGULATION (EEC) N° 2092/91) in 1991 (June 24, 1991) (eur-lex.europa.eu). This regulation also encompassed the method of labelling of organically produced products and food, as well as the use of the term “organic” in different EU languages: *ecológico* (Spanish), *oekologisk* (Danish), *oekologisch* (German), *ἀειρώδης* (Greek), *organic* (English), *biologique* (French), *biologic* (Italian), *biologisch* (Dutch), and *biologic* (Portuguese).

The Council Regulation (EEC) No 2092/91 was passed as a law in 1993, which was adopted in almost all EU member states in 1994. Furthermore, the first regulations on subsidies for organic farming in the European Union were adopted on June 30, 1992 (Council Regulation (EEC) No. 2078/92).

The first trade fair for organic products BIOFACH was held in Nuremberg (Germany) in 1990, and has remained the largest in the world (www.biofach.de).

Regulations and legal frameworks pertinent to organic farming have been gradually established worldwide, especially in the world leading organic markets such as North America, Australia and Japan (Yussefi & Willer, 2003).

Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods present an important step in the improvement, harmonisation and standardisation of the organic production system made in 1990 by the International Federation of Organic Agriculture Movements and the Food and Agriculture Organisation of the United Nations (FAO/WHO, 1999). These Guidelines were the basis for the creation of Japan Agricultural Standards (JAS), which were implemented by the Japanese Ministry of Agriculture on April 1, 2001 (Yussefi & Willer, 2003). The Guidelines were intended to facilitate the harmonisation of organic production at the international level, as well as to assist the governments of countries that need a legislative system within the field of organic agriculture. Provisions relative to livestock and livestock products were adopted in 2001, whereas revisions to the Guidelines were carried out in 2003, 2004 and 2007, and amended in 2008, 2009 and 2010 (Morgera et al., 2012).

Following the Guidelines for organic agriculture published in the Codex Alimentarius in 2001, the European Union adopted the Council Regulation (EEC) No 2078/02 in 2001, which regulates the budget for organic producers, the promotion of organic products, the education of farmers, and scientific research within the field of organic production.

During 2002, numerous summits were held concentrating on sustainable and safe food production, with a focus on organic production methods: The FAO World Food Summit, Rome, June 2002, IFOAM Organic World Congress, Canada, August 2002, The World Summit for Sustainable Development, Johannesburg, September 2002 (UNCTAD et al., 2002). Following many research projects within the field of organic production, the European Action Plan for Organic Food and Farming was adopted in 2004, whereby the legislative framework within the field of organic production was completed.

In 2005, the improvement of legal framework for organic production was initiated, resulting in the Council Regulation (EC) No. 834/2007 in 2007, which defined the principles, objectives and rules of organic production and labelling. The Commission adopted the Council Regulation (EC) No 889/2008 in 2008, which encompassed the rules for the implementation of the new regulation specifying the production, labelling and control of organic products, whereas the Council regulation (EC) No 1235/2008 implemented the new import regime. The Regulation (EC) No. 834/2007 introduced the EU rules for organic aquaculture. The implementation of these rules was detailed in the Regulation (EC) No. 710/2009, whereas the pertinent amendments were done by implementing the new rules stipulated in the Regulation (EC) No. 889/2008. The Regulation No. 834/2007 and No. 889/2008 came into force in January 2009 (IFOAM, 2012). These Regulations introduced the obligation to label organic products in accordance with the prescribed organic production standards, i.e. in the form of a logo, in all EU member states as of July 1, 2010.

The European Union logo for organic products shows 13 stars in the shape of a leaf against green background. The logo symbolises the relationship between Europe and nature.

As a result of the well-established legal framework in the organic farming system, 26 European countries created an action plan for organic farming in 2011 (Willer & Kilcher, 2012).

On May 30, 2018, the European Council adopted the Regulation (EU) 2018/848 on organic production and product labelling, which will be applied from January 1, 2021. This Regulation will simplify the rules for the production of organic products by introducing stronger product control measures, expanding the product list, abolishing deviations for the bed cultivation in greenhouses in order to reduce the risk of accidental contamination with pesticides, and applying the same rules to non-EU organic producers. The certification system will be facilitated for small producers by the introduction of a group certification system (Ministry of Agriculture, Forestry and Water Economy of the Republic of Serbia, Directorate for National Reference Laboratories, 2019).

The development of organic agriculture in the Republic of Serbia

The organic production in the Republic of Serbia was first initiated in the southern Serbian region of Blace in 1989. With the assistance of the company Den Juro, the first consignment of organic fruits was exported from Serbia in 1990. The first Serbian non-governmental organisation for organic agricultural production Terra's was established in

Subotica in 1990. The Terra's Association was founded as part of the Open University in Subotica and has launched many campaigns with the aim of promoting organic food. The association became a member of the IFOAM in 1992, and it hosted the IFOAM Conference on organic agriculture in Central East European countries in 1997 (Kalentić et al., 2014). The forthcoming period of sanctions and inflation, followed by the bombardment of Serbia in 1999, adversely affected the interest in organic products and the spread of this type of healthy, agricultural food production (Vehapi, 2014a). However, this sector managed to survive, recording growth to the present day. Following the political changes in 2000, the development of the organic production sector has been aided by numerous donors, investments and foreign organisations (such as Avalon from the Netherlands, SIDA from Sweden, Diaconia and GIZ from Germany, Austrian Development Agency - ADA from Austria, SIPPO (Swiss Import Promotion Programme) from Switzerland, etc.) that have significantly improved the production system through a series of projects. In 2003, the German organisation for the international cooperation GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) supported Terra's in establishing cooperation with the German certification organisation BCS (BCS ÖKO-GARANTIE is the German certification body established in 1992), thereby laying the foundation of the first certification body in Serbia. In 2004, the Serbian organic food producers and companies participated for the first time in the international fair for organic food, textile and cosmetic products BIOFACH in Nuremberg, Germany (Marz et al., 2013). It was the first step towards the international showcase of domestic organic products. BIOFACH has been a leading trade fair for organic products for the past 28 years (www.biofach.de). The Serbia Investment and Export Promotion Agency (SIEPA), in association with the Serbian Ministry of Agriculture, has organised four participations of Serbian producers in the BIOFACH fair (Đoković et al., 2013).

The development of organic agricultural production in Serbia has had an upward trend, especially in the Vojvodina region (where the first Biofest was held in Subotica in 2005 with the assistance of Terra's and the Green Network of Vojvodina). Therefore, the development of local organic product markets in Serbia gradually expanded, reflecting the state of the country's organic production (which increased tenfold in the period 2006-2013 (Vehapi, 2014a).

In 2006, the Ministry of Agriculture, Forestry and Water Economy of the Republic of Serbia joined the Mediterranean Organic Agriculture Network. As a result, Serbia provided financial assistance to the organic production sector through projects supported by the European Union and Mediterranean countries. The projects continued in the following years, and foreign agencies such as Avalon, SIDA, SIPPO, GIZ and others directed their activities to certain regions of the country to improve organic production, processing and certification of this type of products. The Austrian Development Agency worked on the development of regional and rural areas in Vojvodina and Sandžak (Kalentić et al., 2014). By the end of 2009, 20 organic fruit processing companies were certified for organic production (Đoković et al., 2013).

The national association for organic agriculture Serbia Organica (NASO) was established in Belgrade in May 2009 at the initiative of the Ministry of Agriculture. The aim of the association is to unite all participants in the sector of organic agriculture in order to promote organic production in national and international markets. The association is a member of the Foundation for the Advancement of Sustainable Rural Development in Central and Eastern Europe (AVALON), the International Society of Organic Agriculture Research (ISO FAR), and IFOAM. This independent, non-governmental and non-profit civil society organisation is a strategic partner of national and international institutions for the harmonisation and coordination of organic agriculture in Serbia (www.serbiaorganica.info).

In 2010, the Ministry of Agriculture, Forestry and Water Economy of the Republic of Serbia allocated 10 million RSD in support of organic producers. The subsidies were doubled in 2011, whereas the Law on Incentives in Agriculture and Rural Development (Official Gazette of the Republic of Serbia, issues 10/2013, 142/2014, 103/2015, 101/2016) was passed in 2013.

The draft of the first National Plan for the Development of Organic Agriculture in Serbia was made in 2009 with the assistance of GIZ. This Plan was a Serbian version of the Action Plan for Organic Food and Agriculture of the European Commission. The aim of this plan was to increase the land area certified for organic production or converting to organic production to 50,000 ha by 2014. (Vehapi, 2014).

Centres for organic production were set up in Selenča, Leskovac, Valjevo and Negotin in 2011, whereas Svilajnac became the national centre for organic livestock production (Đoković et al., 2013). The fifth regional centre for organic agriculture in the country was established in Užice in 2013.

The organic farming sector in Serbia has been growing steadily, as well as the number of certified organic producers (reaching 500 in 2018). The areas devoted to organic agriculture doubled in the period 2012-2017, i.e. from 6,340.1 ha to 13,423.13 ha (Ministry of Agriculture, Forestry and Water Economy, 2019).

Lion Foods, Foodland and Herba are some of the major Serbian organic producers that sell their products in foreign markets. They produce and process fruits, vegetables, medicinal plants and forest fruits. Moreover, the cooperative farm Arbinje from Pirot is also a significant exporter of organic plums, onions, potatoes, zucchinis and spring beans.

The first organic fertiliser in the country has been produced by the company Ecosoil from Niš (Milenković & Tasić, 2013).

Regional distribution of organic production in the Republic of Serbia

The transition period during the 1990s has negatively affected the entire agricultural production in Serbia, both organic and conventional. The poorly managed agrarian policy and degradation of natural resources have hindered the progress of organic production. The sole bright side of this period was a reduction in pesticide application (by 90%) (Roljević et al., 2009). Production potential parameters indicate that Serbian natural resources are underutilized compared to the neighbouring countries. Approximately 80% of the soils in Serbia are not polluted, which strongly favours the development of organic farming (Oljača et al., 2008). The aspiration of national agricultural experts is to increase the arable land devoted to organic production by approximately a million hectares over the next 10 years (Milenković & Tasić, 2013).

Pedo-geographic conditions divide the territory of the Republic of Serbia into four regions according to the soil type, pollution and degradation. Previous analyses of the quality of soil, water and air in different regions of Serbia have shown that organic agricultural production and processing have great potential (Resulović et al., 1991 in Oljača et al., 2008).

The first region is the Pannonian Plain in the northwest of Serbia, while the second one stretches across the central part of the country along the Great Morava basin (and mostly covers Kosovo). This region is characterised by a temperate continental climate, water erosion, frequent floods, open pits, and pollution near industrial plants. The prevalent soils include brown forest soil, smonitza, pseudogley, distric cambisol, and fluvial deposits along rivers (Resulović et al., 1991 in Oljača et al., 2008).

The western, south-eastern and eastern parts of the country such as Ključ, along the border with Bulgaria, and a part of Kosovo belong to the third region, which is characterised by a continental mountain climate, extremely strong erosion, torrential floods, and pollution and soil degradation in the areas of ore and coal mining and near quarries. Rankers, luvisols, black and brown soils, pseudogley, etc. prevail as soil types (Resulović et al., 1991 in Oljača et al., 2008).

The fourth region is a typical mountainous region which covers the greatest part of the territory extending from west to south and southeast. This region is characterised by water erosion, washing away of the soil, frequent torrential floods, and pollution in the vicinity of numerous quarries and industrial plants. Rankers, luvisols, brown soils, distric cambisols, black soils and brown calcareous soils prevail in the region. Areas with ploughed-down meadows are suitable for organic production in the first year without conversion. The hilly region makes up to about 20% of Serbia's agricultural lands with mostly arable fields (40%), pastures (30%) and meadows (20%), whereas orchards claim just 6% (40% of fruit growing in the entire territory of Serbia is located in this region). Furthermore, approximately 30% of Serbian agricultural producers are also concentrated in this region. The mountainous region is characterised by low soil fertility and karst relief (western Serbia and much of Kosovo). In this region, there are 14% of the total areas devoted to agricultural production, whereas meadows (60%) and pastures (38%) cover the greatest part. The region boasts favourable conditions for the organic production of alternative cereals such as spelt wheat, rivet/white wheat, khorasan wheat, maize, oat, barley, millet, buckwheat, rye, sorghum, potato and other root vegetables. Out of the total number of agricultural producers, 15% are located in this region (Oljača et al., 2008). Hilly-mountainous and forest areas are characterised by organic forest fruits such as cornelian cherries, wild roses, elder, blue black berries, wild strawberries, blackberries, wild cherries, chestnuts, walnuts, hazelnuts (which are mostly exported to foreign markets) (Roljević et al., 2009; Lukač-Bulatović, 2011), followed by the production of medicinal and aromatic plants.

In addition to the properties of agricultural areas, the structure of crop production in Serbia is also conditioned by the country's economic and natural diversity. The lowland region is characterised by the greatest areas of arable land with the highest production volume of cereals (72%), followed by industrial crops (19%), and, to a lesser extent, vegetables (5%) and forage crops (4%). In the plain and hilly regions, arable fields cover 75-92% of the total area, with cereals and fruits as predominant crops. The rolling hilly region has significantly less arable fields (35-55%) than the previous ones, thus the production of field and vegetable crops is smaller. Pastures and forests mostly cover this region. The potential of this region for agricultural production is small due to small-sized plots and poor soil quality (Tasić, 2015).

According to Lazić (2010), organic farms could be classified by size and cultivated species into the three following groups:

- 1) small eco-farms with closely related crop and livestock production,
- 2) farms with a single type of production (e.g. crop, fruit or other), and

3) large eco-farms with a combination of crop-vegetable production and livestock production.

Small farms prevail in Serbia due to the fragmented ownership structure, which consequently renders the Serbian organic food production fragmented and small as well (Curić & Ceranić, 2011). According to Kalentić et al. (2014), there are two groups of organic producers in Serbia: independent producers that have a direct contract with the certification body and cooperating producers, i.e. subcontractors that do not have a direct contract with the certification body, but are subjected to the group certification. The subcontractors distribute their products to a selected company that cover certification costs and provide necessary inputs and training. However, the holder of the organic certificate is the chosen company, not producers themselves.

In 2018, the areas devoted to organic production in Serbia amounted to 19,254.6 ha: 12,654.7 ha were certified for organic production and 6,599.9 ha were in the process of conversion to organic production. Of the total area devoted to organic production, arable lands covered 13,723.8 ha, whereas meadows and pastures covered 5,530.8 ha (the Ministry of Agriculture, Forestry and Water Economy, 2019). Compared to the year of 2016 (14,357.96 ha), the share of areas devoted to organic production decreased by almost 5 ha (4,896.64 ha), whereas the number of hectares devoted to organic production increased 15 times in the period 2006-2012 (Vehapi, 2014). According to Oljača et al. (2008), there are 20,000 ha of forest areas in Serbia suitable for gathering certified organic products.

Perennial and annual species prevail in the structure of Serbian organic plant production. As the average size of agricultural land per farm approximates to 5.4 ha, organic production on small farms is of immense importance (Curić and Ceranić, 2011). The greatest number of organic producers is registered in Vojvodina (1/3), followed by Western and Southern Serbia. Therefore, Vojvodina and Western Serbia are considered the most important organic production zones. A smaller number of producers (about 15%) produce fish and meat, whereas the largest number (approximately 85%) is engaged in the organic plant production (Vehapi, 2014).

Over the recent years, most of the organic production areas in Serbia have been devoted to cereals. The organic cereal production in Serbia indicated growing trends throughout the period 2012-2015 (Golijan & Živanović, 2017). Approximately 90% of the total Serbian organic crop production was done in Vojvodina in the period 2012-2015, whereas the share of organic cereals amounted to as much as 91% in 2014 (Golijan & Živanović, 2017). The predominant organic crops were maize, wheat and soybeans in the period considered.

The area devoted to organic wheat in Serbia amounted to 4,607.34 ha in 2016, whereas the area devoted to fruit was 4,055.96 ha in 2017. A total of 3,661.72 ha are devoted to organic cereals in Serbia, with the largest areas in the region of Vojvodina (2,462.44 ha) and Southern and Eastern Serbia (1,085.004 ha). The organic cereal production in Šumadija and Western Serbia is somewhat smaller (108.84ha), whereas the smallest areas devoted to organic production are in the Belgrade region (only 5.44 ha) (Ministry of Agriculture, Forestry and Water Economy, 2019). The following crops have the certified organic status: barley, maize, silage maize, oats, millets, wheat, spelt wheat, rye, triticale and buckwheat.

The region of Southern Serbia, dominated by perennial plantations, meadows and pastures, is famous for the production of raspberries, blackberries, sour cherries, apples, plums, and strawberries (Veličković & Golijan, 2016). The raspberry production in Arilje accounts for 30% of the total raspberry production worldwide (Milenković & Tasić, 2013). Organic fruit marketing in many countries amounts to 4-5% of their total fruit turnover. Serbia is the leading producer of raspberries in the world with a volume of 1000 t, although the production within the organic system was initiated in 1999 (Mišić et al., 2004). The largest production of organic fruits in Serbia takes place in Šumadija and Western Serbia (2,208.38 ha), followed by Southern and Eastern Serbia (1,596.34 ha), Vojvodina (239.52 ha) and Belgrade (11.72 ha) (Ministry of Agriculture, Forestry and Water Economy, 2019).

The areas devoted to the organic industrial crops in the Republic of Serbia ranked third with a total of 2,290.46 ha in 2017. These areas increased by 75% in the period 2013-2015 (Golijan et al., 2017b). Vojvodina is the largest producer of organic industrial crops in Serbia with the area of 1,591.67 ha. The areas devoted to organic industrial crops in Southern and Eastern Serbia are twofold smaller (697.08 ha), whereas the smallest area is located in Belgrade (1.71 ha) (Ministry of Agriculture, Forestry and Water Economy, 2019). The following crops are included into the system of certified organic production: hemp, flax, poppy, soybean, sunflower, mustard, oilseed rape and pumpkin.

The organic production of forage plants in Serbia (namely fescue, vetch, clover, bird's foot trefoil, lupine, alfalfa, field pea, grass mixture) covered an area of 1,210.95 ha in 2017. Vojvodina is the leading national producer of organic forage plants with a total of 969.27 ha, followed by Southern and Eastern Serbia (142.74 ha), Šumadija and Western Serbia (89.9 ha) and Belgrade (9.05 ha) (Ministry of Agriculture, Forestry and Water Economy, 2019). A reduction in the areas devoted to organic production of forage plants was recorded in Šumadija and Western Serbia in the period 2012-2015 (Golijan et al., 2017c).

The area devoted to organic vegetables is the smallest in Serbia (230.01 ha). Vojvodina is also the leading national producer with a share of 154.17 ha, followed by Šumadija and Western Serbia (48.63 ha), Southern and Eastern Serbia (15.59 ha), and Belgrade (11.62 ha) (Ministry of Agriculture, Forestry and Water Economy, 2019). Organic string bean, pea, potato, tomato, French bean and onion are most produced in Šumadija and Western Serbia. The production of organic potato, French bean, pumpkin and topinambur prevail in Southern and Eastern Serbia, whereas potato, popping maize, French bean, pepper, pumpkin, carrot and cabbage are organically produced in Vojvodina (Golijan et al., 2017d).

Only a total of 114.59 ha are devoted to the production of organic medical and aromatic plants in Serbia. The regional distribution of organic production of these plants is very uneven. The largest production takes place in Šumadija and Western Serbia (72.05 ha), within the Pomoravlje District (72.015 ha), which was the largest producer of organic medicinal and aromatic plants in Serbia in 2017. In Vojvodina, a total of 35.98 ha are devoted to organic medical and aromatic plants, whereas only 6.48 ha in Southern and Eastern Serbia, within the Pirot District (6.35 ha) (Ministry of Agriculture, Forestry and Water Economy, 2019). The Pirot District is characterised by a drastic decrease in the area devoted to the organic production of medicinal and aromatic plants. In 2015, this district was the leading national producer of organic medicinal and aromatic plants in Serbia with a total of 40.3 ha devoted to organic medicinal and aromatic plant production (Golijan, 2016). The largest areas are devoted to organic everlasting plants (70.59 ha), lavender (17.78 ha) and lemon balm (8.03 ha) (Ministry of Agriculture, Forestry and Water Economy, 2018). The total turnover of medicinal and aromatic plants in Serbia is carried out by plantation production (50%) and the gathering of spontaneous flora (Golijan, 2016).

CONCLUSION

Organic farming was originally recognised as bio-dynamic agriculture in the German-speaking countries. Rudolf Steiner (Austria), Hans Müller (Switzerland), Lady Eve Balfour (United Kingdom), Albert Howard (United Kingdom), Rodale (USA) and Masanobu Fukuoka (Japan) made the greatest contribution to the development of the organic farming system at its inception. From the beginning in 1924 to the present day, the development of this agricultural production method passed through three stages: 1) the stage of emergence (1924-1970), 2) the stage of development (1970-1990), and 3) the stage of growth (since 1990). In 1991, the European Commission adopted the first legislative regulations on organic production, which defined the production methodology, labelling and different EU language terminology pertinent to organic products. State governments, non-governmental organisations, and trade associations contributed to the promotion of organic products worldwide, which has resulted in the expansion of global markets of organic products.

Organic production was first initiated in South Serbia near Blace in 1989. Thereafter, the number of certified organic producers has been increasing daily. The greatest number of producers has been involved in the organic plant production (85%), whereas approximately 15% of the producers produce fish and meat. A total of 13,423.13 ha were devoted to organic plant production in Serbia in 2017. The largest areas were devoted to organic fruit production, whereas the smallest areas were devoted to the production of organic medicinal and aromatic plants (114.59 ha). Southern Serbia well-known for the production of organic raspberries, blackberries, sour cherries, apples, plums and strawberries, whereas the raspberry production in Arilje account for as much as 30% of the global raspberry production. Vojvodina and Western Serbia are the most important organic production zones in the country.

REFERENCES

- Ahrari E.M. (2015): *OPEC: The Failing Giant*. University Press of Kentucky.
- Behera K.K., Alam A., Vats S., Sharma H.Pd, Sharma V. (2012): Organic Farming History and Techniques. Chapter 1 in E. Lichtfouse (ed.), *Agroecology and Strategies for Climate Change, Sustainable Agriculture Reviews* 8: 287-328.
- Coleman D.C. (1989): Agro-ecosystems and sustainable agriculture. *Ecology*, 70: 15-90.
- Council Regulation (EEC) N° 2092/91: eur-lex.europa.eu
- Council Regulation (EEC) No. 2078/92: eur-lex.europa.eu
- Council Regulation (EEC) No 2078/02: eur-lex.europa.eu
- Council Regulation (EC) No. 834/2007: Council Regulation (EC) No. 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No. 2092/91. *Official Journal of European Union*.
- Commission Regulation (EC) No 889/2008: Commission Regulation (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control. *Official Journal of the European Union*.

- Commission Regulation (EC) No 1235/2008: Commission Regulation (EC) No 1235/2008 of 8 December 2008 laying down detailed rules for implementation of Council Regulation (EC) No 834/2007 as regards the arrangements for imports of organic products from third countries. *Official Journal of European Union*.
- Commission Regulation (EC) No. 710/2009 amending Regulation (EC) No. 889/2008 laying down detailed rules for the implementation of Council Regulation (EC) No. 834/2007, as regards laying down detailed rules on organic aquaculture animal and seaweed production.
- Curić J. & Ceranić S. (2011): Lanac vrednosti organske hrane u Srbiji. *Zbornik naučnih radova Instituta PKB Agroekonomik*, 17 (3-4): 185-191.
- Dann K. (2000): *Across the Great Border Fault: The Naturalist Myth in America*. Rutgers University Press.
- Dangour A.D., Dodhia S.K., Hayter A., Allen E., Lock K., Uauy R. (2009): Nutritional quality of organic foods: a systematic review. *The American journal of clinical nutrition*, 90(3): 680-685.
- Đoković G., Vuković A., Rončević D. (2013): Zastupljenost organskih prehrambenih proizvoda u svetskim trgovinskim tokovima. *Ecologica*, 20(72): 719-724.
- FAO/WHO Codex Alimentarius Commission (1999): JOINT FAO/WHO FOOD STANDARDS PROGRAMME, Distribution of the Report of the 26th Session of the Codex Committee on Food Labelling (ALINORM 99/22).
- Golijan J. & Veličković M. (2015): Nutritivni sastav organski i konvencionalno proizvedenih namirnica. *Hrana i ishrana*, 56(2): 43-46.
- Golijan J. (2016): Organska proizvodnja lekovitog i aromatičnog bilja u Republici Srbiji. *Lekovite sirovine*, 36(36): 75-83.
- Golijan J. & Živanović Lj. (2017): Površine pod organskom proizvodnjom žita u Srbiji. *Agroekonomika*, 46(73): 1-10.
- Golijan J., Veličković M., Dimitrijević B., Marković D. (2017a): Plant production by the concept of organic agriculture in the world and Serbia - history and current status. *Acta Agriculturae Serbica*, 22(43): 67-88.
- Golijan J., Živanović Lj., Kolarić Lj. (2017b): Organic production of industrial crops in Serbia. *Field and Vegetable Crops Research*, 54(2): 68-72.
- Golijan J., Popović A., Dimitrijević B., Kolarić Lj., Živanović Lj. (2017c): The status of the forage organic production in the republic of Serbia. *Agriculture & Forestry*, 63(3): 177-187.
- Golijan J., Živanović Lj., Popović A. (2017d): Status and areas under organic production of vegetables in the Republic of Serbia. *Agro-knowledge Journal*, 18(3): 209-217.
- Golijan J. & Dimitrijević B. (2018): Global organic food market. *Acta Agriculturae Serbica*, 23(46): 125-140.
- Golijan J. (2020): *Uticaj načina proizvodnje na životnu sposobnost i hemijski sastav semena kukuruza, spelte i soje*. Doktorska disertacija, Univerzitet u Beogradu, Poljoprivredni fakultet.
- Graf S. & Willer H. (2001): *Organic Agriculture in Europe-Current Status and Future Prospects of Organic Farming in Twentyfive European Countries*. Stiftung Ökologie & Landbau (SOEL).
- Greene C.R. (2001): U. S. Organic farming emerges in the 90s: Adoption of certified systems. *Agriculture Information Bulletin*, U.S. Department of Agriculture, Economic Research Service.
- Hawksworth D.L. (2001): The magnitude of fungal diversity: the 1,5 million species estimate revisited. *Mycological Research*, 105(12): 1422-1432.
- IFOAM (International Federation of Organic Agriculture Movements) (2012): European Organic Regulations (EC) No 834/2007, 889/2008 and 1235/2008 An Evaluation of the First Three Years Looking for Further Development. IFOAM EU GROUP, Brussels, Belgium.
- ITAB (2018): Available at: <http://www.itab.asso.fr> (accessed: 24.10.2018.)
- Kalentić M., Stefanović E., Simić I., Maerz U. (2014): *Organska poljoprivreda u Srbiji 2014*. Nacionalno udruženje za razvoj organske proizvodnje „Serbia organica“, Beograd.
- Kristiansen P., Taji A., Reganold J. (2006): *Organic Agriculture: A Global Perspective*. Published by CSIRO PUBLISHING, Australia.
- Lazić B. (2010): Organska poljoprivreda – zalog za budućnost. *Organic news*: 1.
- Lockeretz W. (2007): *Organic Farming: An International History*. Oxfordshire, UK & Cambridge, Massachusetts.
- Lukač Bulatović M. (2011): Osnovna obeležja organske poljoprivrede. *Agroekonomika*, 49-50: 88-96.
- Marz U., Kalentić M., Stefanović E., Simić I. (2013): *Organska poljoprivreda u Srbiji 2013*. Nacionalno udruženje za razvoj organske proizvodnje „Serbia organica“.
- Ministry of Agriculture, Forestry and Water Economy of the Republic of Serbia, Directorate for National Reference Laboratories (2019): Available at: <http://www.dnrl.minpolj.gov.rs/> (accessed: 15.11.2019.)
- Milenković S. & Tasić J. (2013): Organska hrana kao perspektivni proizvod Srbije. *Ekonomске teme*, 51(2): 411-424.
- Mišić P., Tešović Ž., Stanisavljević M., Milutinović M., Nikolić M., Milenković S. (2004): Malina u Srbiji i Crnoj Gori - prošlost, sadašnjost i budućnost. *Jugoslovensko voćarstvo*, 38(145-146): 5-22.
- Morgera E., Caro C. B., Durán G. M. (2012): *Organic agriculture and the law*. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, Rome, 2012.
- Oljača S., Glamočlija Đ., Kovačević D., Oljača M., Dolijanović Ž. (2008): Potencijali brdsko - planinskog regiona Srbije za organsku poljoprivrednu proizvodnju. *Poljoprivredna tehnika*, 33(4): 61-68.
- Paull J. (2007): Rachel Carson, a Voice for Organics - the First Hundred Years. *Journal of Bio - Dynamics Tasmania*, 86: 37-41.
- Paull J. (2011): The Betteshanger Summer School: Missing link between biodynamic agriculture and organic farming. *Journal of Organic Systems*, 6(2):13-26.

- Paul J. (2013): A history of the organic agriculture movement in Australia. Chapter 3, in Mascitelli, B. & Lobo, A. (Eds.) *Organics in the Global Food Chain*. Connor Court Publishing, Ballarat.
- Popović A., Golijan J., Babić V., Kravić N., Sečanski M., Delić, N. (2016): Organic farming as a factor for biodiversity conservation. *International scientific conference on Ecological crisis: Technogenesis and climate change*. Belgrade, 21-23. april.
- Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007
- Roljević S., Subić J., Potrebić V. (2009): Proizvodnja organske hrane na području Kolubarskog okruga atraktivne za plasman u Istarskoj Županiji. *Tranzicija*, 11(23-24): 83-89.
- Setboonsarng S. & Gilman J. (1998): Alternative Agriculture in Thailand and Japan. *Asia-Pacific Journal of Rural Development*, 8(1): 71-86.
- Shi-mingl M. & Sauerborn J. (2006): Review of History and Recent Development of Organic Farming. *Agricultural Sciences in China*, 6(3): 169-172.
- „Official Gazette of the Republic of Serbia“, issues 10/2013
- „Official Gazette of the Republic of Serbia“, issues 142/2014
- „Official Gazette of the Republic of Serbia“, issues 103/2015
- „Official Gazette of the Republic of Serbia“, issues 101/2016
- Solomon S. (2008): *Organic Gardener's Composting*. Chapter nine, Making Superior Compost. Soil And Health Library.
- Tasić S. (2015): *Implementacija agroekonomske politike EU na poljoprivredni i ruralni razvoj Srbije*. Doktorska disertacija. Univerzitet Privredna akademija u Novom Sadu, Fakultet za ekonomiju i inženjerski menadžment.
- Tomaš-Simin M. & Glavaš-Trbić D. (2016): Historical development of organic production. *Economics of Agriculture*, 3(63): 1083-1099.
- UNCTAD (United Nations Conference on Trade and Development), IFOAM (International Federation of Organic Agriculture Movements) and FAO (Food and Agriculture Organisation of the United Nations) (2002): Conference Conclusions, *IFOAM Conference on Organic Guarantee Systems International Harmonization and Equivalence on Organic Agriculture, 17-19 February 2002, Nuremberg, Germany*.
- Vehapi S. Z. (2014): *Marketing strategija proizvođača organske hrane*. Doktorska disertacija. Univerzitet u Nišu, Ekonomski fakultet.
- Veličković M. & Golijan J. (2016): Organic Fruit Production in Serbia. *Agro-knowledge Journal*, 17(3): 289-297.
- Veličković M., Golijan J., Popović A. (2016): Biodiversity and organic agriculture. *Acta Agriculturae Serbica*, 21(42): 123-134.
- Willer H. & Kilcher L. (Eds.) (2012): *The World of Organic Agriculture - Statistics and Emerging Trends 2012*. Research Institute of Organic Agriculture (FiBL), Frick, and International Federation of Organic Agriculture Movements (IFOAM), Bonn.
- Winter C.K. & Davis S.F. (2006): Organic foods. *Journal of Food Science*, 71(9): 117-124.
- Woese K., Lange D., Boess C., Bögl K. W. (1997): A Comparison of Organically and Conventionally Grown Foods - Results of a Review of the Relevant Literature. *Journal of the Science of Food and Agriculture*, 74(3): 281-293.
- Worthington V. (2001): Nutritional quality of organic versus conventional fruits, vegetables, and grains. *The Journal of Alternative & Complementary Medicine*, 7(2): 161-173.
- www.ifoam.bio (accessed: 3.2.2019.)
- www.fibl.org (accessed: 3.2.2019.)
- www.biofach.de (accessed: 1.5.2018.)
- www.serbiaorganica.info (accessed: 4.12.2018.)
- Yussefi M. & Willer H. (Eds.) (2003): *The World of Organic Agriculture: Statistics and Future Prospects 2003*. International Federation of Organic Agriculture Movements (IFOAM), DE-Tholey-Theley.

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