Can organic agriculture be competitive?

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Abstract

The organic system of agricultural production is a system of production that has a positive impact on the environment, has a fair attitude towards farmers, workers and consumers and enables the achievement of ecological, economic, social and cultural sustainability. Thanks to its positive characteristics, the organic market has been experiencing constant growth and

expansion since its inception (ie in the 1990s). In 2018, the value of this market was more than 100 billion US dollars. The analysis of the economic success and sustainability of the organic system implies the determination of its comparative advantages. The authors analyze the specificity of organic production at the level of the national economy (Republic of Serbia) by determining the competitiveness index of RCA and ARCA. The results show that organic production in Serbia has comparative advantages in the analyzed period (2011-2015), which leads the authors to the conclusion that investing in this production system is justified.

Keywords: Organic agriculture. RCA and ARCA index. Competitiveness.

1. Introduction

The development of the modern concept of organic agriculture is linked to the beginning of the twentieth century. Modern organic agriculture developed first in Europe and then in the United States. Long-standing problems of conventional agriculture such as land erosion, declining land production capacity, low quality of agricultural products, health safety issues of products have become increasingly important and scientists and producers became inspired and motivated to solve these problems. (Tomaš Simin and Glavaš-Trbić, 2016).

Unlike conventional food production, whose shortcomings are increasingly noticeable and pronounced, alternative forms of food production (including organic agriculture) represent a production system that should have a positive impact on income and food security. It is a production system in which the environment is preserved, farmers and workers have fair access to production factors and a fair return on investment, and consumers receive food they trust at fair prices (Tomaš Simin et al., 2019). These principles form the basis of organic agriculture, which strives to have fair relations, to be safe for all participants and to be a "healthy" alternative to the industrial model of agricultural production (Sligh and Cierpka, 2007).

Organic farming is often defined as a system or method of food production without the use of synthetic mineral fertilizers and pesticides. *Codex allimentarius* (2007) presents organic agriculture as a system of ecological management of agricultural production that promotes and improves the health of agroecosystems including biodiversity, biological cycles and biological activity of land. It is based on the minimal use of non-farm materials and on agro-technical measures that restore, maintain and improve the ecological balance. IFOAM states that organic production is a system that maintains the health of soil, ecosystems and people. It relies on ecological processes, biodiversity and production adapted to local conditions, with limited use of inputs. Organic agriculture combines tradition, innovation and

science in order to achieve mutual benefits and promote fair relations and a good quality of life for all involved in this production system.

It is precisely these specifics and characteristics of the organic production system that have led and are leading to the constant growth of the market for these products. In 2018, the market for organic products exceeded the value of 100 billion US dollars. Starting from the minimum market values (1990s), the global organic market today is worth 105.5 billion dollars. With organic farming practiced today in more than 180 countries, organic production is considered a bastion of sustainability in the food industry (Sahota A., 2020). Observed individually, in 2018, the countries with the largest market of organic products were the USA (40.6 billion euros), Germany (10.9 billion euros) and France (9.1 billion euros). European Union countries imported 3.3 million tons of organic agri-food products in that year (Willer et al., 2020).

The comparative advantages of one country are determined by its ability to gain a certain profit from trade in specific goods or services in relation to another country. Samuelson and Nordhaus (2005) define the principle of comparative advantage as "..the principle of comparative advantage says that every country will benefit if it specializes in the production and export of those goods that it can produce at relatively lower costs. On the contrary, every country will benefit from the import of those goods that it produces at relatively high costs." The law of comparative advantage was defined in 1817 by David Ricardo, who showed that international specialization benefits the economy. The most famous contemporary economist who has studied comparative and competitive advantages is Harvard University professor Michael Porter.

Comparative advantages are a key concept when explaining and defining the degree of specialization of exports in a particular country (Hadziev, 2014). Porter (1990) believes that "…companies gain comparative advantages through innovation. Innovation can be a different or new product design, a new production technology, a different approach to the market or a new way of training future entrepreneurs." Krugman and Obsfeld (1997) point out that "…a country has comparative advantages in the production of certain goods if the opportunity costs of production in this country is lower than in other countries." Freebairn (1987) defines competitiveness as an indicator of the ability to supply the market with products and services in a particular place, in the required form, at a certain time according to customer needs, at a price equal to or better than competitors, while earning at least opportunity costs of invested resources. Porter (1990) states that true national competitiveness is measured by productivity. Exports are often the result of productivity growth, as they arise as a result of subsidies or

price distortions, so it is often attributed that the RCA index provides a better measure of competitiveness than a country's comparative advantages (Siggel, 2006).

Organic production integrates all aspects of sustainability - environmental, economic, social and cultural (Tomaš Simin, 2019). The economic viability of this system presupposes, among other things, the acquisition of certain revenues that can be generated on the national and international markets. Although the pioneers of organic production and today's proponents of this principle are in favor of local sales and the local market, no less important is assessing international trade of these products. The aim of this paper was to determine the comparative values of organic production in a national economy through appropriate indices. The benefits identified in this way would confirm and justify the support to the organic production system that it receives in the form of various subsidies and other types of support from national and regional governments. Determining comparative advantages contributes to the further development of the organic production system, but the authors point out on this occasion that, even if there are comparative advantages, the improvement and development of the domestic market should not be neglected because the developed local market reflects organic agriculture in its magnificence.

2. Literature Review

The complexity of the issue related to the topic of competitiveness stems from the fact that competitiveness can be researched at several levels of analysis (macro, meso, micro), from different aspects, including different time and geographical dimensions, all depending on the main goal of research. The foundations of competitiveness theory lie in the views of classical economists such as Adam Smith, David Ricard and JS Mill, through Heckscher-Olin's model all the way to the modern understanding of competitiveness through Porter's „Diamond Model" and its modification by various modern economists. Adam Smith emphasized absolute advantages as the main element of a country's competitiveness and advocated specialization in that area of production (economy) in which that country has absolute advantages. Absolute advantages arise primarily as a consequence of the difference in absolute production costs. He believed that all participants in the international market could benefit from international trade (positive-sum game). Nowadays, only a small part of international trade can be explained and fit into the theory of absolute advantages, rather on the example of trade between developed and developing countries.

Ricardo extended Smith's theory from absolute to comparative advantages, believing that any country can benefit from joining the international market even if there is no absolute advantage in any production or product. Considering the comparative advantages of countries, his model included two countries, two products and one factor of production - labor. Mill supplemented the theories of his predecessors by explaining not only whether a country is competitive or not, but also the origin and sources of competitiveness. Representatives of the neoclassical school of economics, Heckscher and Ohlin, explained in their H-O model that the basic differences in comparative advantages stem from differences in available factors of production between countries. According to Richard's theory, labor productivity is crucial, while Heckscher and Ohlin argued that comparative advantages stem from differences between countries in the availability of factors of production and used labor and capital in their analysis. Countries will have comparative advantages and export those products that require intensive engagement of factors of production in abundance in that country, because in that case the production costs will be lower, and import products that require greater engagement of deficient factors of production. After that, many economists such as Samuelson, Leontiev, Linder, Posner, Krugman (Davis, 1995, Leamer, 1995) and others tried to supplement or modify existing theories or to use their models to explain special cases of competitiveness and sources of competitiveness that occur in international trade.

Modern competitiveness theory is based on the competitive advantages of Michael Porter and his „Diamond Model“. Porter explains national competitiveness through four basic groups of competitive factors (1) factors of production; (2) demand conditions; (3) related industries; (4) firm strategy, structure and rivalry. External elements have been added to these four elements - the influence of the state and unforeseen events and chances. Rugman, De Cruz, Cho, Moon, and Verbeke were the most critical of Porter's model and proposed additions through the „double diamond model“ the „generalized double diamond model“ and the „nine-factor model“ (Rugman and Verbeke, 2001, Almodóvar and Rugman, 2015, Oh and Rugman, 2014, De Cruz, 1999, Cho and Moon, 2000, Dong-Sung and Hwy-Chang, 2013, Van Den Bulcke et al., 2009). Nevertheless, Porter's model of competitiveness is still the most widely used in research and practical studies today.

In Serbia, the competitiveness of certain branches of agriculture or agricultural products was investigated by authors such as Birovljev et al. (2013), Božić and Nikolić (2013), Stojanović et al. (2013), Adžić and Stojić (2014), Ignjatijević et al. (2014), Birovljev et al. (2015), Zekić et al. (2016), Matkovski et al. (2017) and others, while studies on organic production are rare, and the competitiveness of organic production is almost non-existent.

3. Materials and Methods

Determining the comparative advantages of a country in a certain sector requires the analysis of certain indicators of these advantages, ie certain indexes. Empirical analysis is based on the application of the concept of RCA (Reveald Comparative Advantage) index in order to identify the comparative advantages of organic agriculture in Serbia. In this case, the RCA index was used, which was calculated according to the following formula (Ballasa, 1965):

$$RCA = (X_{ij}/X_B)/(X_{wi}/X_w),$$

where:

X_{iB} is the export od j products for i country;

X_B is the total export for i conutry;

X_{iw} is a world export of j products;

X_w is the total world export.

RCA values greater than 1 indicate the fact that the observed country has comparative advantages in a given sector, while values less than 1 imply a lack of comparative advantages of a country in a particular sector. Data on exports of organic products of the Republic of Serbia are internal data of the Customs Administration and the values of exports of organic products worldwide are taken from the database OrganicDataNetwork. Data from the UN database were used for the total value of world exports.

First of all, organic production is not legally regulated in all countries of the world, and for that reason there are no official data on the value of exports of organic products for all countries. This shortcoming is a significant limiting factor in the use and interpretation of said RCA index and the results obtained must be taken into account with some caution. In order to be able to analyze and calculate the index, for the values of Xw, ie the values of total world exports, the countries for which there are data and the value of exports of organic products are taken into account.

In addition to the RCA index, there are numerous alternatives in the literature for measuring comparative advantage. One is to determine the Additive Revealed Comparative

Advantage Index. This index was proposed by Hoen and Oosterhaven (2006) which indicate a higher stability of this index compared to RCA, which is calculated by the following formula:

$$ARCA_j^A = \left(X_j^A / X^A\right) - \left(X_j^{REF} / X^{REF}\right)$$

where:

X_j^A export sector j in the country A;

X^A total exports of the country A;

X_j^{REF} exports of sectors j of reference countries;

X^{REF} total exports of reference countries.

The values of this index range from -1 to +1. When the values of this index are greater than 0, country A has comparative advantages in sector j, and when the values of this index are less than 0, they indicate that country A does not have comparative advantages in sector j.

When analyzing the comparative advantages of organic production in the Republic of Serbia, the limiting factors are the same as those when calculating the RCA index - the lack of a database in all countries on imports and exports of organic products. When calculating the ARCA Europe index as a reference country all countries in Europe that have available data on exports of organic products and which are presented in the database OrganicDataNetwork are taken. Data for the total value of exports of these countries were obtained from the UN database (UNCTAD statistics). For the ARCA world index, the reference countries are those that have data on organic production at the world level (OrganicDataNetwork database) and the total value of exports of these countries is also from the UN database.

4. Results and Discussion

International trade is of great importance for any country because it provides the opportunity for it to specialize in production fields in which it has the best performance, so the causes of exchange are differences in production factors (land, labor, natural resources and capital) and production technology between countries.

Research by Schlatter et al. (2020) showed that data on international trade in organic products are now available for 56 countries, which is approximately 30% of the countries that have data on organic agriculture. The country with the largest market for organic products is the United States (40.6 billion euros), followed by Germany (10.9 billion euros), France (9.1 billion euros) and China (8.1 billion euros) (*Table 1*). Observed by regions, North America has the largest market (43.7 billion euros), followed by Europe (40.7 billion euros) and Asia.

Table 1: Global market data: sales and consumption per capita by region in 2018

Region	Retail value (millions of euros)	Per capita consumption (euros)
Africa	17	0,01
Asia	10.071	2,4
Europe	40.729	50,5
South America	810	1,5
North America	43.677	119,9
Oceania	1.378	33,5
World	96.683	12,9

Source: Schlatter et al., 2020, pp. 66.

Data relating specifically to organic production and the organic market are still difficult to obtain, especially for non-EU countries. According to data from OrganicDataNetwork, which is a project financed under 7FP projects, the state of imports and exports of products of organic origin is presented in the following table (*Table 2*).

Table 2: Value of imports and exports of organic products in European countires 2011-2015

	2011		2012		2013		2014		2015	
Country	Import (€ mill.)	Export (€ mill.)	Import (€ mill.)	Export (€ mill.)	Import (€ mill.)	Export (€ mill.)	Import (€ mill.)	Export (€ mill.)	Import (€ mill.)	Export (€ mill.)
Austria		79,90		79,90		79,90		79,90		79,90
Bosnia and Herzegovina		2,34		2,34				1,42		2,07
Croatia	30,90	2,70	34,75	2,90	34,75	2,90	34,75	2,90	34,75	2,90
Czech Republic	35,00	23,00	35,00	24,00	35,00	31,00	35,00	43,00	35,00	43,00
Denmark	195,70	139,30	206,50	156,50	239,90	205,80	260,30	230,81	321,68	265,81
Estonia	14,00		3,45		3,45		3,45		3,45	
Finland	19,00	14,00	19,00	9,00	19,00	90,00	19,00	10,00	19,00	10,00
France			670,00		720,00	393,00	720,00	435,00	720,00	435,00
Hungary	18,00	20,00	18,00	20,00	18,00	20,00	18,00	20,00	18,00	20,00
Italy		1.135,00		1.200,00		1.260,00		1.420,00		1.650,00
Moldova		15,00		15,00		15,00		15,00		15,00
Netherlands		525,00		783,00		826,00		928,00		928,00
Romania	35,00	150,00	35,00	200,00	35,00	200,00	35,00	200,00	35,00	200,00
Russia	30,00	4,00		4,00		4,00		4,00		4,00
Serbia	1,17		3,70	4,00	3,70	10,00	3,70	10,00	3,70	19,57
Slovenia	23,00	0,10	23,00	0,10	23,00	0,10	23,00	0,10	23,00	0,10
Spain	219,00	515,00	201,00	589,70	201,00	671,60	365,00	724,00	431,00	778,00
Turkey		19,78		19,78		19,78		19,78		62,40
Ukraine						36,00		70,00	4,00	50,00

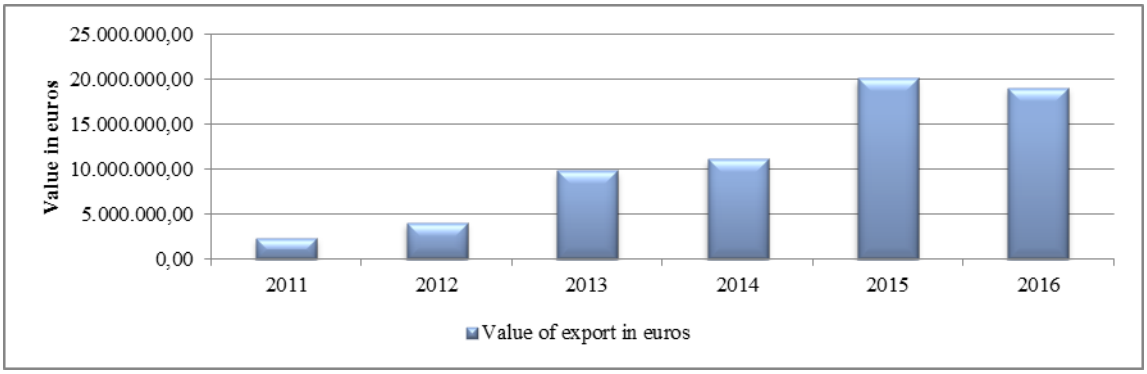
Source: OrganicDataNetwork

When analyzing and interpreting data, it is important to keep in mind that data in different countries were collected by different methods. Also, certain countries do not keep

official statistics on organic production, so the data came from some other, alternative sources, which are listed in detail on the website where the database is located.

Analysis of trends in international trade is of great importance if we want to establish a comparative advantage of a country in the production of certain products or in a particular sector of the economy. In the Republic of Serbia, according to the data of the Customs Administration, the export of organic products recorded an increase in value for the period from 2011 to 2016 (*Table 3* and *Graph 1*), while the value of imports is available only for 2016.

Table 3 and Graph 1: Value of exports and imports of organic products in the Republic of Serbia 2011-2016



Year	Export value (in euros)	Import value (in euros)
2011	2.390.752,18	
2012	4.048.437,90	
2013	9.831.541,21	
2014	11.137.237,86	
2015	20.135.982,96	
2016	19.099.758,10	723.654,85

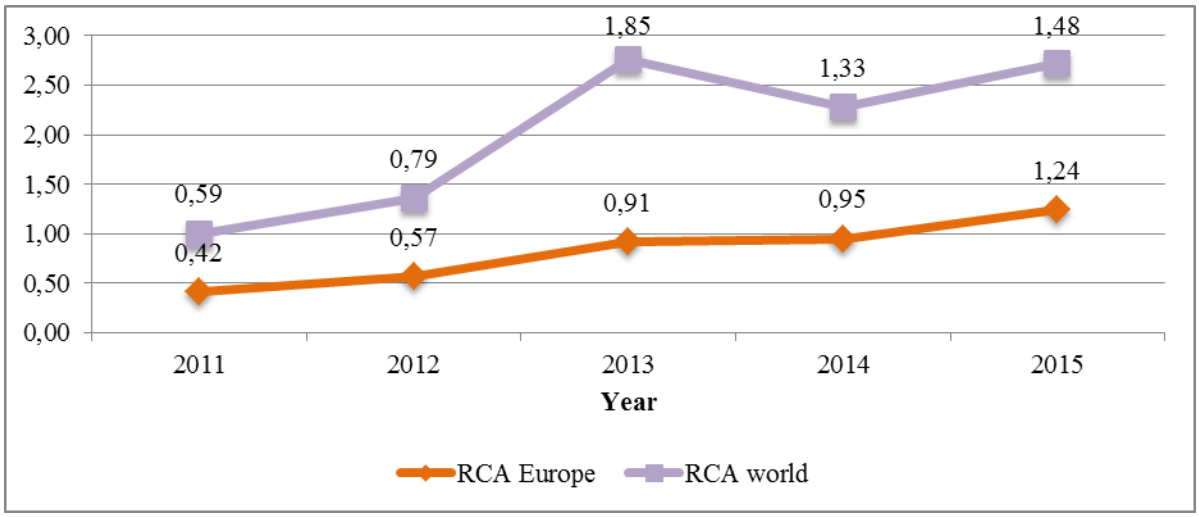
Source: Customs Administration, internal documentation

The calculation and analysis of the RCA index as an indicator of the comparative advantage of the Republic of Serbia in organic production was performed on the basis of available data related to organic production. Data on exports of organic products of the Republic of Serbia are internal data of the Customs Administration and the values of exports of organic products worldwide are taken from the database OrganicDataNetwork. Data from the UN database were used for the total value of world exports.

As mentioned, organic production is not legally regulated in all countries of the world, and for that reason there are no official data on the value of exports of organic products for all countries. This shortcoming is a significant limiting factor in the use and interpretation of said RCA index and the results obtained must be taken into account with some caution. In order to

be able to analyze and calculate the index, for the values of Xw, ie the values of total world exports, the countries for which there are data and the value of exports of organic products are taken into account.

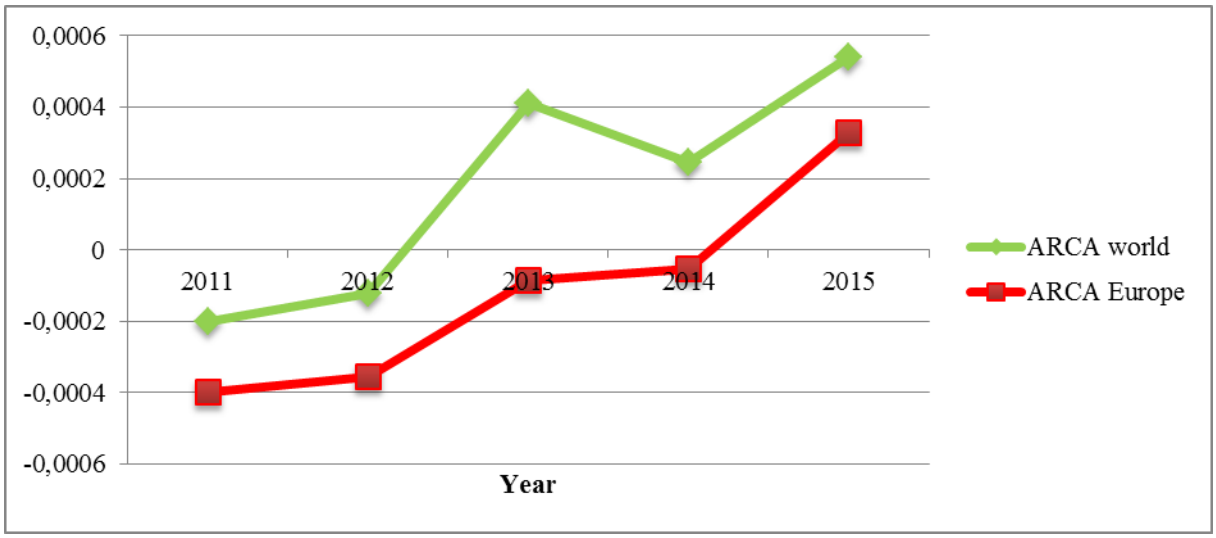
The analysis was done for the period 2011-2015. The RCA index is calculated in comparison of the Republic of Serbia with the world and with European countries. The results (*Graph 2*) show that, observed in this way, the Republic of Serbia in relation to Europe shows its comparative advantage since 2015 when the RCA was 1.24 and in relation to the world since 2013 when the value of this index was 1.85.



Graph 2: Values of the RCA index for the period 2011 – 2015

The interpretation of the results obtained in this way shows the comparative advantages of the Republic of Serbia in organic production - the results should be accepted only with the remark of the stated limiting factors during the analysis.

When analyzing the comparative advantages of organic production in the Republic of Serbia using the ARCA index, it is also necessary to pay attention to the limiting factors that are the same as those when calculating the RCA index. The method of calculation is presented in the section Material and Method and the values of this index are presented in Graph 3.



Graph 3: Values of the ARCA index for the period 2011 – 2015

According to this indicator, the Republic of Serbia has comparative advantages in organic production compared to European countries since 2015, when the index value was positive and ARCA world index values show that comparative advantages have been manifested since 2013, which is identical to the results obtained by RCA index analysis.

5. Conclusions

Organic agriculture is a system of production that differs in its characteristics and production technology from the paradigm of the system that is today called conventional agriculture. The most important factor that distinguishes organic agriculture from other alternative sustainable systems is the existence of legal standards and certification processes that allow a clear distinction between organic and other production systems. In addition, viewed in a broader context, organic agriculture is a kind of social movement with its attitudes and values that often go beyond the legal framework that defines the certification process.

The specifics of this production system lead to a constant growth of the market of these products, which speaks in favor of the fact that organic production also has economic sustainability. In 2018, the market of organic products exceeded the value of 100 billion US dollars, and the explosive growth of this market during the past two decades speaks of its relevance.

Related to the issue of international trade is the concept of competitiveness of a particular production. The analysis of the competitiveness of the organic sector of the Republic of Serbia (using the RCA and ARCA index) showed that Serbia has competitive advantages in this production and that it is a sector to which certain attention should be paid. The analysis was done for the period 2011-2015. The RCA index is calculated in comparison of the Republic of Serbia with the world and with European countries. The results show that, viewed in this way, the Republic of Serbia in relation to Europe shows its comparative advantage since 2015, when the RCA was 1.24, and in relation to the world since 2013, when the value of this index was 1.85. The same results were obtained by applying the ARCA index. In this way, the investment in this production system by the state through various forms of financial support has been confirmed and justified to some extent.

However, although organic production has comparative advantages, further investments should be directed towards the improvement of the national (domestic) and local market, because in that way organic production is even more strongly connected with its basic principles on which it was conceived.

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