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THE STATUS OF THE FORAGE ORGANIC PRODUCTION IN THE REPUBLIC OF SERBIA

SUMMARY

Organic agricultural production, as a type of sustainable agriculture, has been permanently growing at the global level. In the Republic of Serbia, this trend is characteristic for all crops, including forage crops. Organic cereal production has a primary role and is performed on the area of 4,251.94 ha. Total areas cultivated with forage crops organically produced amount to 1440.39 ha, but they were, on average, 975.8 ha in the analysed 2012-2015 period. The smallest areas were located near the municipality of Belgrade, while the largest ones were in the region of the Province of Vojvodina (1331.7 ha in 2015) in all four analysed years. The regions of Šumadija and western Serbia were characterised by the reduction of areas cultivated with organic forage crops in the analysed period, so the production of this type of crops was performed only on 4.96ha in 2015, making a decrease of 12.37% in comparison to 2014.

The greatest increase of areas cultivated with organic forage crops was recorded in 2014, when the value of the chain index was 202.5%, indicating the increase of areas of 102.5% in comparison to 2013.

Keywords: forage crops, area, regions, districts

INTRODUCTION

The concept of organic agriculture has been designed to protect biodiversity, the environment and existing resources, and to be technically applicable, socially acceptable and economically sustainable, making an alternative to the conventional production (Veličković et al., 2016). The essential aims of this production system are as follows:

1) the increase of soil fertility,
2) minimising energy inputs,
3) the reduction of environmental risks and

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4) maintenance of achieved production levels (Popović et al., 2016; Golijan and Popović, 2016).

The goal of organic production is to preserve natural resources of soil, provide the organic food production, increase producers' standards of living, alongside with the production of food of high quality, introduction of constructive relationships of production and natural ecosystem; the reduction and/or the prevention and control of soil erosion and the increase of its fertility; the reduction of all forms of pollution that occur in the production process; the maintenance of genetic diversity within the production system with the protection of crops and natural habitats, as well as affecting social and ecological impacts of farmers (Šiljković, 2001). Among other things, the basic principles of organic production are focused on the production of high-quality food, which as a preventive measure contributes to health protection and welfare of animals and humans (IFOAM, 2016; Golijan, 2016). Furthermore, the emphasis is on providing animals with opportunities to perform natural behaviour, getting feed adapted to their physiology and live in a natural environment (Lund, 2006). The stated principles of organic food are regulated by the European organic regulations (Council Regulation, (EC) No 2092/91), e.g., "…*feeding of livestock with organic-farming crop products produced on the holding itself or on neighbouring organic holdings*" and "*... animals should have, whenever possible, access to open air or grazing areas*" (citation by Jacobsen et al., 2015).

The forage crops production has a very important role in organic farms, where it is necessary for livestock breeding based on methods of the organic system, and it is especially significant in respect to ecological and economic sustainability of farms (Will, 2012). Marchall (2002) has stated that *"Organic systems of forage production for feeding ruminants are based on a grass plus legume based sward with regular reseeding, placing a high demand on seed of appropriate varieties."*

MATERIAL AND METHODS

Organic crop production has been increasing both in the world and in our country. The production of forage crops significantly participates in this segment of plant production. The trend of changes in areas with organic forage crops in Serbia and in certain regions and districts is analysed and graphically presented in this paper for the 2012-2015 period on the basis of relevant literature data and data provided by the Ministry of Agriculture and Environmental Protection of the Republic of Serbia. This presentation was done by the use of the Microsoft Excel 2010. The desk research method was applied. The average values of areas cultivated with organic forage crops and base and chain index were calculated for the analysed period by the use of Microsoft Excel 2010. Base indices were calculated by the division of a value of a parameter in a certain year by the base: $B_i = \frac{Y_i}{Y_B} \cdot 100(\%)$. The average value of areas cultivated with organic cereals in the 2012-2015 period was used as the base. The base indices show a relative change

in areas cultivated with organic crops in relation to the average value. Chain indices are estimated by dividing a value of a parameter in a certain year by a value of the parameter in the previous year: $L_i = \frac{Y_i}{Y_{i-1}} \cdot 100(\%)$. They indicate a relative changes expressed in percentages in relation to the previous year.

RESULTS AND DISCUSSION

Areas under organic farming has been permanently increasing both in the world and Serbia. Total areas under this type of farming amount to 7628.55 ha and to 7669.47 ha in the period of conversion, while these areas in 2015 spread over 15298.02 ha (Ministry of Agriculture and Environmental Protection, 2017; www.makroekonomija.org), which represents the increase of 62% in comparison to 2014. Arable land encompasses 13398 ha (Golijan et al, 2017, Popović et al., 2017a), which is an increase of 81.1% in comparison to 2014, when arable land amounted to 7897 ha, while meadows and pastures spread over1899 ha. Cereals covered the greatest area of 31.1% (Popović et al., 2017), and were followed by vegetables (21.6%) (Veličković and Golijan, 2016). The participation of areas under organic farming in the total cultivated agricultural land amounted to 0.44% in 2015, which was an increase of 0.16% in relation to 2014. In the analysed 2012-2015 period, areas under forage crops spread, on average, over the area of 975.8 ha (Table 1). Organic production of cereals covered the greatest areas (4251.94 ha), while organic production of forage crops covered the area of 1440.39 ha in 2015, which was the increase of 19.6% in comparison to 2014. The greatest increase of areas was recorded in 2014, when the value of the chain index was 202.5%, which was the increase of 102.5% in areas under organic farming of forage crops in comparison to 2013.

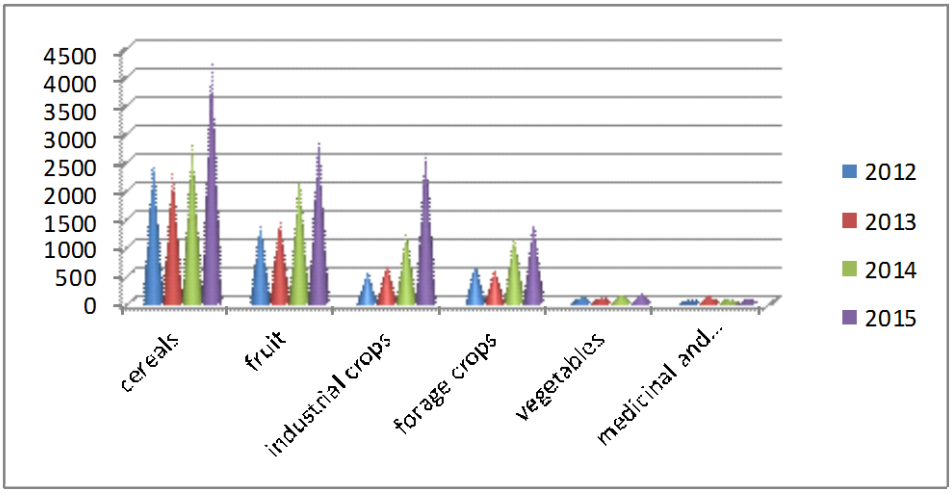

Figure 1. The structure of the organic plant production in Serbia (2012-2015)

Table 1. Fixed base index and chain index for the plant species (2012-2015)

Plant species	Base indices				Chain indices			Average
	2012	2013	2014	2015	2013	2014	2015	
Cereals	85.0	76.6	95.2	143.2	90.1	124.4	150.4	2968.7
Fruits	54.4	77.9	115.8	151.9	143.0	148.8	131.1	1906.4
Industrial crops	42.3	52.6	96.0	209.1	124.4	182.5	217.8	1279.0
Forage crops	68.0	61.0	123.5	147.6	89.7	202.5	119.6	975.8
Vegetable crops	83.6	78.5	112.9	125.0	93.9	143.8	110.7	136.0
Medicinal and aromatic plants	36.8	182.1	83.6	97.5	494.2	45.9	116.5	72.9

Figure 2 shows the distribution of organic production of forage crops in the region of the Republic of Serbia. The smallest areas were placed in the Belgrade municipality in the form of areas in the period of conversion - 3.1 ha in 2015. On the other hand, the greatest areas of forage crops production was located in the Province of Vojvodina (1331.7 ha in 2015) in all four analysed years.

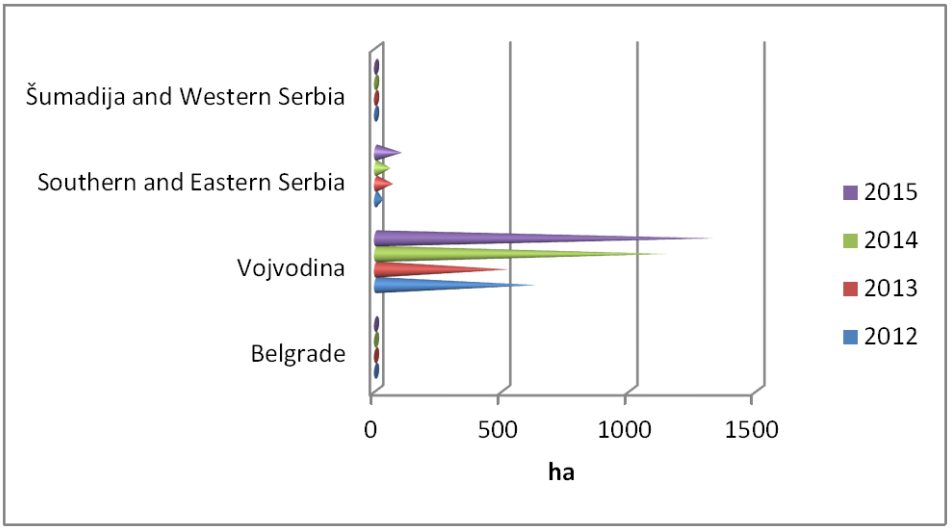

Figure 2: The distribution of areas (ha) under organic forage production over regions in the period 2012-2015

The base index of forage crops in 2015 for the region of Vojvodina was 211.7%, which meant that the average increase in the production of these crops amounted to 111.7% in relation to the production in the observed period. The greatest increase in the areas of 119.26% was recorded in 2014 in comparison to 2013 (Table 2).

Table 2. Fixed base index and chain index over regions in the R.Serbia, 2012-2015

Region	Base indices				Chain indices			Average
	2012	2013	2014	2015	2013	2014	2015	
Belgrade	100.00	9.94	0.00	308.12	9.94	0.00	/	1.05
Vojvodina	100.00	82.95	181.87	211.70	82.95	219.26	116.40	906.66
Southern and E.S.*	100.00	255.53	215.65	394.16	255.53	84.39	182.78	61.61
Šumadija and W.S.**	100.00	104.09	75.25	65.94	104.09	72.29	87.63	6.49

*S.E.S. - Southern and Eastern Serbia; **W.S. - Western Serbia

The greatest areas under organic forage production in Vojvodina was recorded in the South Bačka District in 2015 (860.13 ha), with the highest base index of 141.59% recorded in 2014 in relation to the average organic forage production in the observed period (Table 3). Unlike previous three years, in which the organic production of forage crops in the Srem District covered the smallest area, these areas were reduced to 0 ha in 2015, i.e. certified organic production of these crops was not recorded (Figure 3).

Table 3. Fixed base index and chain index for Vojvodina (2012-2015)

District	Base indices				Chain indices			Average
	2012	2013	2014	2015	2013	2014	2015	
North Bačka	100.00	57.56	7.25	205.75	57.56	12.60	2836.50	121.08
West Bačka	100.00	51.30	54.15	92.03	51.30	105.55	169.94	23.76
South Bačka	100.00	97.12	241.59	196.88	97.12	248.77	81.49	694.20
North Banat	100.00	63.50	176.50	70.00	63.50	277.95	39.66	2.05
Central Banat	100.00	46.83	46.84	18.60	46.83	100.01	39.72	1.14
South Banat	100.00	11.94	211.96	693.91	11.94	1775.93	327.37	62.89
Srem	100.00	99.88	740.01	0.00	99.88	740.91	0.00	1.55

The region of Southern and Eastern Serbia ranked the second according to areas under the organic production of forage crops. Organic farming in 2015 was performed on 100.62 ha (Ministry of Agriculture and Environmental Protection, 2017), which was an increase of 82.78% in relation to 2014 (Table 2). In the

2013-2015 period, the greatest organic forage production was carried out in the Pirot District (Figure 4). The highest value of the base index was recorded in 2015 (937.15%), which meant that areas under the organic forage production increased by 837.15% in relation to the average organic production in the observed period (Table 4). These areas were reduced by 1.58 ha in the Nišava District, hence there was no registered organic production of forage crops in 2015. Moreover, this production was not registered in the Podunavlje District in the last three years.

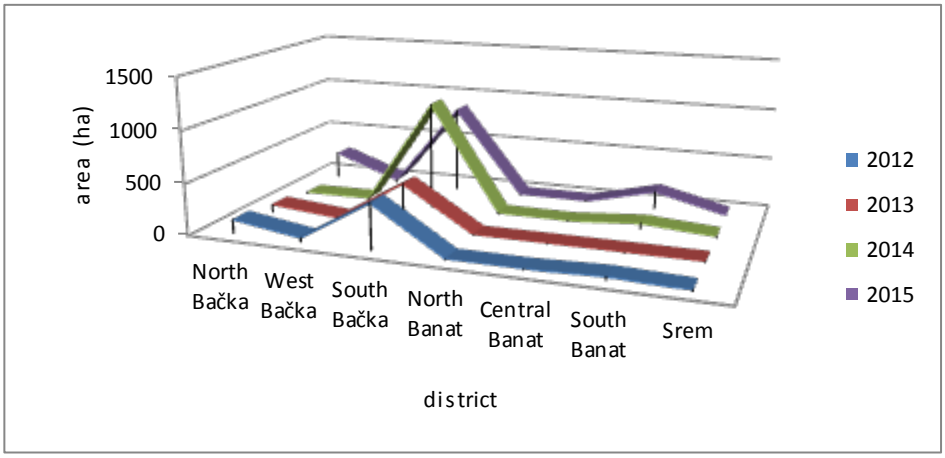

Figure 3. Area (ha) under organic forage production in the region of Vojvodina (over districts) in the 2012-2015 period

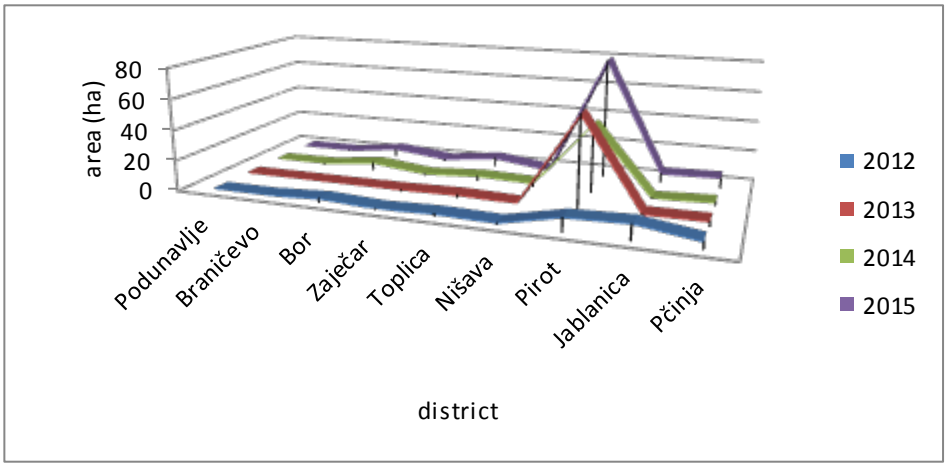

Figure 4. Area (ha) under organic forage production in the region of Southern and Eastern Serbia (districts) in the 2012-2015 period

Table 4. Fixed base index and chain index for the region of the Southern and Eastern Serbia, for the 2012-2015 period

District	Base indices (%)				Chain indices (%)			Average (ha)
	2012	2013	2014	2015	2013	2014	2015	
Podunavlje	/	/	/	/	/	/	/	0
Braničevo	/	/	/	/	/	/	10.00	0.06
Bor	100.0	0.00	221.63	240.45	0.00	/	108.49	2.69
Zaječar	100.0	275.0	275.0	450.0	275.00	100.00	163.64	0.33
Toplica	100.0	94.77	223.44	422.54	94.77	235.78	189.11	2.42
Nišava	100.0	0.00	548.61	0.00	0.00	/	0.00	0.47
Pirot	100.0	702.83	527.30	937.15	702.83	75.03	177.73	47.82
Jablanica	100.0	22.97	0.63	55.79	22.97	2.74	8866.67	4.28
Pčinja	100.0	56.80	38.69	152.29	56.80	68.10	393.67	3.55

This type of production decreased in the region of Šumadija and western Serbia in the 2012-2015 period. The organic farming in 2015, was performed on the area of only 4.96 ha (Ministry of Agriculture and Environmental Protection, 2017), which was the reduction of 12.37% and 27.71% in relation to 2014 and 2013, respectively (Table 2). The organic production is not registered in Moravica District, Raška District, Šumadija District and Rasina District. The greatest average organic production of forage crops in the 2012-2015 period was in the Kolubara District, hence the greatest decrease in areas (of 93.72%) in this period was registered in 2015 (Table 5).

Table 5. Fixed base index and chain index for the region of the Šumadija and western Serbia, for the 2012-2015 period

District	Base indices (%)				Chain indices (%)			Average (ha)
	2012	2013	2014	2015	2013	2014	2015	
Mačva	100.0	100.0	2650.0	2100.0	100.0	2650.0	79.25	1.24
Kolubara	100.0	90.51	24.24	6.28	90.51	26.78	25.93	3.69
Zlatibor	/	/	/	/		0.0	/	0.22
Moravica	100.0	100.45	156.25	0.00	100.45	155.56	0.00	0.48
Raška	/	/	/	/	/	0.0	/	0.13
Šumadija	/	/	/	/	/	/	/	0
Pomoravlje	100.0	150.0	280.0	950.0	150.0	186.67	339.29	0.74
Rasina	/	/	/	/	/	/	/	0

The following species are present in the certified organic production of forage crops: vetch, clover, Italian ryegrass, perennial ryegrass, alfalfa, fodder beet, field pea and Sudan grass (Ministry of Agriculture and Environmental

Protection, 2017). Alfalfa, Italian ryegrass, field pea, Sudan grass and clover are species with the highest organic production in the Republic of Serbia (Figure 5). Alfalfa is one of the best options for making the three-year transition to certified organic production (Menalled et al., 2009) and alfalfa was equal to or better than many other transition cropping systems in terms of weed control, soil fertility, organic wheat yield following alfalfa, and overall economics (Fuerst et al., 2009).

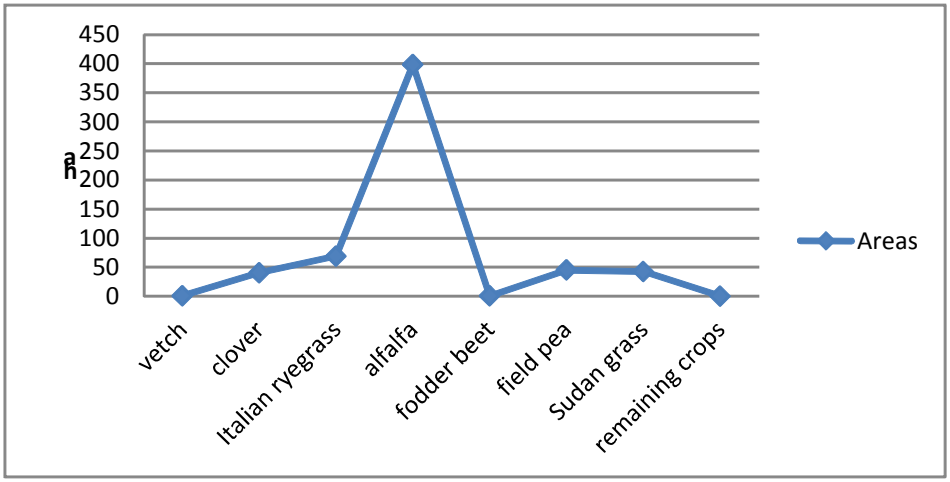

Figure 5. Participation of species of forage crops in the organic production
Source: Ministry of Agriculture and Environmental Protection, 2017

Organic agricultural production recorded a continuous growth in output and demand, globally speaking, in order to meet consumer needs for quality and safe food. Due to guaranteed quality, demand for organic Food records a continuous trend of growth, and this in parallel with the increase of consumer knowledge about the necessity for food to be of high quality, chemically and microbiologically safe (Popović, 2015; Glamočlija et al., 2015; Popović et al., 2012; 2017a). Food security is a complex sustainable development issue. Ensuring that sufficient nutritious foods are available to all people and that they can access these foods at all times are critical elements of economic and social development (Capone et al., 2016).

In Europe in 2015, arable land encompassed the area of 5.7 million ha, out of which even 2.1 million ha was used for green fodder (Willer and Lernoud, 2017). Cereals and forage crops are mostly grown in the countries of the EU, and these two crops are grown on more than 80% of total areas under organic farming in 14 countries (including areas in the conversion period) (www.fibl.org). In EU-27, arable land accounts for 41% of the agricultural area converted to organic farming with more than four million ha, whereby the greatest areas are under organic cereals and forage crops (1.5 million ha) (Lichtfouse, 2014).

According to the legal regulations effective from January 1, 2004, only seeds organically produced may be used in organic production. As far as forage

seed production is concerned it is an important technical challenge both to seed growers and the seed industry. These challenges must be overcome if organically produced forage seed of the appropriate varieties is to be available at a reasonable price and quantity for the organic sector (Marshall, 2002). On most organic farms that meet prescribed methods of organic production, nutrition with organic forage crops is of a fundamental significance to the application of good organic farming practices. There are many challenges facing organic farmers, not least the need to produce high quality forage while keeping costs to a minimum (Will, 2012). Prescribed methods used for the conservation, production and utilisation of forage resources have a significant effect on efficiency, productivity and sustainability of organic farms, and therefore this fact should be regarded as one of the highest priorities for economic cost benefit of organic production of these types of crops.

CONCLUSIONS

Organic agricultural production has been increasing worldwide. Cereals and forage crops are grown on more than 80% of total areas under organic farming in 14 countries of the European Union. In the Republic of Serbia, organic farming is performed on the area of 15,298.02 ha. The greatest areas are cultivated with cereals, then fruits and industrial plants, while forage crops rank fourth encompassing the areas of 1,440.39 ha in 2015. In the analysed 2012-2015 period, the greatest increase of areas was recorded in 2014, amounting to 102.5% in comparison to 2013. The greatest organic production of forage crops is carried out in the region of Vojvodina. Nutrition of livestock with organic forage crops on organic farms is necessary for the certification of organic production, but also in terms of ecological and economic sustainability of farms and the application of good organic farming practices. Due to very favourable natural conditions in the Republic of Serbia, as well as sufficient areas with unpolluted soils, there is a great potential in the production and the increase of the areas under organic forage crops. This production is also supported by the unlimited demand of the world's market, which is another major challenge for agricultural producers.

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