

## ORGANIC SEED PRODUCTION IN THE REPUBLIC OF SERBIA\*

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*Summary: Over the past few years, organic agricultural production has increased globally. This type of production is regulated by numerous laws and concomitant regulations, whereas the basic principles of organic production development are prescribed by the IFOAM standards and the European Union. Seed production is of immense importance to organic agricultural systems as the use of certified seed is crucial in preserving organic production. Prior to 2009, certified organic seed had not been produced in the Republic of Serbia, and producers had used either landrace seeds or chemically untreated conventional seeds. Of the total area devoted to organic farming in the Republic of Serbia (14,357.96 ha), seed production accounts for only 8.4 ha, with uneven distribution over regions. The highest organic seed production (5.2 ha) has been recorded in the region of Vojvodina. However, there is still a lack of certified organic seed in the country, emphasizing the need for organic seed breeding and production in the future.*

*Key words: areas, legal regulations, organic production, prices*

### INTRODUCTION

The excessive use of chemicals in agricultural production may result in numerous disturbances of the biological equilibrium of an agroecosystem, and even of the entire ecosystem (Veličković et al., 2016). Organic agriculture is an agricultural production alternative, i.e. a response to adverse effects of conventional agriculture aiming at preserving not only the endangered nature, but also the health of humans (Kovačević et al., 2011; Popović et al., 2016; Golijan, 2016). The basic principles of organic agriculture have been prescribed by the International Federation of Organic Agriculture Movements (IFOAM) and the European Union (Regulation 209/91). The EU regulations, Codex Alimentarius and the Law on Organic Production and Organic Products of the Republic of Serbia are based on the IFOAM and EU standards (Kolašinac et al., 2017). The demand for organic food is growing annually (Golijan and Popović, 2016). Organic food and beverage sales reached a global level of 81.6 billion Euros in 2015 (Gillian and Dimitrijevic, 2018). Numerous researchers have argued that the nutritional value of organic foods is higher compared to foods produced in conventional systems, which is still characterized by many inconsistencies requiring further research (Winter and Davis, 2006; Golijan and Veličković, 2015; Golijan and Kostić, 2016; Golijan et al., 2018a, 2018b).

Seed quality is extremely important in the organic agricultural system (Kolašinac et al., 2017). The use of certified seeds is one of the key factors for maintaining seed production at a high level. However, the following considerations must be taken into account (Bogdanović and Balešević-Tubić, 2016): seed innovation and breeding (encompassing a continuous increase in the presence of high-yielding and high-quality varieties in the market, a continuous market supply with certain categories of high-quality seeds, and strong international competitiveness of our country), and seed production (entailing an improved quality of the seed material for producers as a prerequisite for achieving higher yields and profits, which may range from 5 to 30%, the prevention of weed proliferation via seeds, and the greater protection of seed users and the environment by means of controlled treatments in processing plants).

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Certified seed is used in few countries around the world such as Hungary, Slovenia and Croatia, where certified wheat seed is devoted to approximately 12%, 35% and 60% of the arable land, respectively. However, up to 50% of the arable land in Serbia is sown with undeclared seeds, which are referred to as "seeds from the attic". Furthermore, the estimates related to soybeans are similar ("seeds from the attic" account for approximately 40-50%) (Bogdanović and Balešević-Tubić, 2016). However, seed issues persist in the organic production of numerous plant species, hence there are almost no organically produced seeds of maize, or some other crops, in the market (Tabaković et al., 2017).

## **LAWS AND REGULATIONS WITHIN THE FIELD OF ORGANIC SEED PRODUCTION**

The principles of organic production address the issues of producing and using seeds and planting materials. Such issues are internationally regulated by the IFOAM Basic Standards 2002. The EC Council Regulation (EEC) No. 2092/91 of June 24, 1991, is one of the first regulations at the level of the then European Economic Community that regulated the issues relative to seeds and planting materials in the organic production. The obligation to use seeds and planting materials from organic sources has been effective from January 1, 2000. As the majority of the EU member states were not ready for the consistent implementation of this provision, the latest regulation, the Commission Regulation (EC) No. 1452/2003 of August 14, 2003, postponed this obligation until January 1, 2004 (Marshall and Humphreys, 2002). However, as even this deadline was not met in practice, the same Regulation anticipated the possibility of using conventional seeds untreated with synthetic products in the following cases: 1) for plant species not presented by any variety in the database of available organic seed, 2) if seed and planting material had been ordered in time but were not delivered in due time; 3) if it is proven that varieties from the organic seed database are not adequate, it is possible to propose conventional seed of another varieties; and 4) for varietal trials on small areas and with the aim of maintaining the variety. On balance, the permission must be sought from the competent authorities before sowing or planting, and the permits issued are individual and valid for one year.

To improve the transparency of the supply and demand for organic seed, the EU Commission has proposed that the databases on this seed be located in each member state so as to be used by farmers and competent governmental institutions with the aim to determine the availability of and insight into a real status of organic seed. Due to its federal structure, Germany had to coordinate 16 databases by establishing the Federal Plant Variety Office (Müller, 2003). Since 2005, the EU member states have been obliged to maintain the database for organic seed and planting material, whereby the databases function as virtual markets for organic seed and planting material. The Regulation (EC) No. 834/2007 imposes the need for each Member State to establish a computerised seed database on seed varieties organically produced in its territory. This Regulation is a very useful guideline for organic seed production in the Republic of Serbia as such a database would provide the insight into the status of seed available in the market, the control of organic seed production, and the end-users of organic seed (Ugrenović et al., 2010).

Organic seed production is regulated by the EU Directives 834/2007 and 889/2008. In the Republic of Serbia, organic seed production is regulated by the Law on Seed (Official Gazette of the Republic of Serbia, No. 45/2006) and accompanying regulations, as well as by the Law on Organic Production and Organic Products (Official Gazette of the Republic of Serbia, No. 62/2006.) and accompanying regulations. Following these laws and regulations, the Law on Organic Production (Official Gazette of the Republic of Serbia, No. 30/2010) and the Ordinance on Control and Certification in Organic Production and Organic Production Methods (Official Gazette of the Republic of Serbia, No. 48/2011), and then the Ordinance on Amendments and Supplements to the Ordinance on the Control and Certification in Organic Production and Organic Production Methods (Official Gazette of the Republic of Serbia, No. 40/12) have come into effect (Golijan et al., 2017e). These laws and ordinances approve the use of conventional reproductive material in the following exceptional cases (provided such material has not been treated with plant protection products prohibited in organic production): 1) when there is no organic reproductive material on the market, 2) when the use of such material is justified in conducting scientific research, and 3) when this is an indigenous variety. In the transition period, conventional seeds may be used provided they are not treated. Furthermore, the Ordinance states that seed, nursery plants/plantlets and planting material must not originate from genetically modified plants, hybrids based on cytoplasmic male sterility, and varieties developed by the application of culture techniques or protoplast fusion. Producers and seed companies must first meet the production requirements regulated by the Law on Organic Production and the abovementioned Ordinance, which is a major hindrance for many plant species. Moreover, fairly small amounts of seeds are marketable as organic, which makes this type of production additionally unappealing.

Organic seed production is distinguished by the following features: 1) seed produced using organic production methods (seed and planting material in the organic farming system during at least one or two growing seasons for annual and perennial plants, respectively), and 2) organic seed. Seed and planting material originating from plots in the conversion period are not considered to have been produced organically, except when seeds or planting material produced by organic production methods are used to establish such seed crops (Berenji, 2008).

Seed and planting material are considered organic if they have been produced by organic production methods, and if the seed or planting material used to establish such production was maintained and multiplied by organic production methods in the period of at least three years. Organic seed must pass through the complete seed production process and be tested according to the laws and regulations pertaining to conventionally produced seed. Once seed is released, it is processed in accordance with the regulations on organic production. Further research is needed to develop new methods of physical, chemical and biological seed treatments which would meet the requirements of organic production.

Organic seed is subjected to dual professional control, accompanied by the issuance of two certificates. Furthermore, seed processing is also subjected to control because the premises of seed processing plants are listed as environmental pollutants in cadastral registers (Ugrenović et al., 2009). Berenji and Sikora (2009) state that seed materials used in organic production have a number of specificities. Official lists of organic seed varieties are created, and seeds produced abiding by the principles of organic production are registered therein. Such seed is used to establish organic crops, serving as a base of reproductive material.

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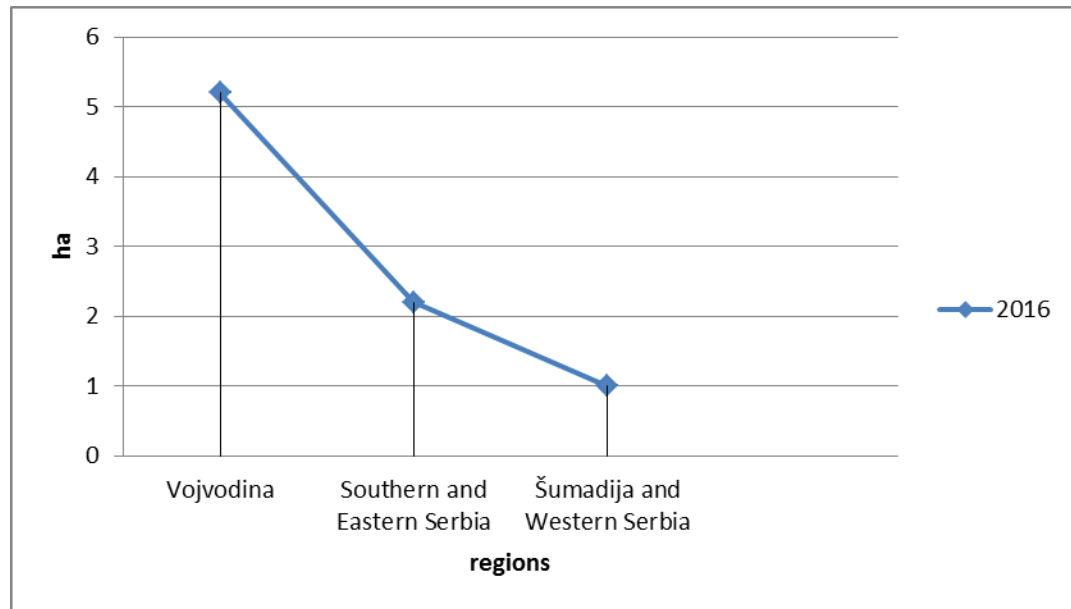
Plant species produced in the conventional agricultural system are not required to be suitable for organic cultivation, thus the development of organic varieties and hybrids is largely underpinned by breeding. Numerous scientific studies have been carried out on these issues in the Republic of Serbia by prominent institutions such as the Maize Research Institute, Zemun Polje, the Institute of Field and Vegetable Crops, Novi Sad, the Institute of Vegetable Crops, Smederevska Palanka, and the Institute Tamiš, Pančevo.

The lack of organic seed is noted by the Ministry in charge of agricultural operations. In the absence of organic varieties, indigenous varieties that are potentially resistant to pests and diseases are recommended. Due to the lack of seeds in our market, producers use seeds from their own production, as well as landrace seeds that are adapted to agroecological conditions. Prior to 2009, certified organic seed had not been produced in the Republic of Serbia, and organic producers had used either landrace seeds or chemically untreated conventional seeds. This problem was recognised by the State and the Act on the Use of Incentives for the Support of Seed Production by Organic Methods was passed at the beginning of 2009. In 2009, organic seed of the following three soybean cultivars were produced in the Institute Tamiš in Pančevo: 'Domaća crna', 'Dukat' and 'Galeb'. The cultivar 'Nirvana' of spelt wheat (*Triticum spelta* L.) was developed in the Institute of Field and Vegetable Crops, Novi Sad. Therefore, the Institute Tamiš was granted state incentives totalling 40.000 RSD per hectare for producing soybean organic seed in 2009 (Ugrenović et al., 2009).

In the Republic of Serbia, the lack of organic seed production is particularly pronounced in vegetable production. This type of production is carried out by the Centre for Organic Production in Selenča. Organic seed of the following species were produced by the company Superior from Velika Plana in 2016: oxheart tomato, elephant's ear pepper, eggplant, courgette and musky gourd (Kolašinac et al., 2017).

The total organic plant production in the Republic Serbia in 2016 covered an area of 14,357.96 ha, which is a decrease of 940.1 ha in comparison with the year of 2015 (Golijan and Živanović, 2017). Cereals claim the largest share in this production system, accounting for 4,607.34 ha in 2016 (which was an increase of 355.4 ha in comparison with 2015). The production of certified organic seed has an important place in organic agriculture. According to the data of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia (2018), this type of seed production covers an area of only 8.4 ha, which indicates low levels of production with regard to the needs of both producers and consumers.

In the regions of Šumadija and Western Serbia, organic seed production is carried out only in the Moravica District, covering an area of 1h (Figure 1). In the regions of Southern and Eastern Serbia, organic seed production covers an area of 2.2 ha in the Podunavlje district. Vojvodina is a leader in the Serbian organic production with a production area of 5.2 ha. Out of seven districts in Vojvodina, organic production is carried out only in the region of South Bačka (5.2 ha) (Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, 2018).



**Figure 1.** Organic seed production by regions in the Republic of Serbia in 2016

Source: Author's calculation according to the data of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia (2018)

Compared to organic seed production, conventional seed production covers significantly larger areas in Serbia. According to the Chamber of Commerce and Industry of Serbia (2018), harvested areas in 2016 amounted to 43.380 ha, whereas approximately 191.480 t of seeds were processed (Table 1). The total harvested area, compared to the previous year (2015), increased by 7%, whereas the amount of processed seeds increased by 6.5%. Small grains were devoted to the greatest area (19.061 ha), with 124.787 t of processed seeds. Grain maize was harvested from an area of 10.052 ha, and more than 31.886 tonnes of seeds were processed. Relative to industrial plants, soybean seed occupies a leading role (harvested from an area of 9.227 ha and with approximately 28.954 t of processed seed). Alfalfa, a leading species in the production of forage crops, was harvested from an area of 1.598 ha, whereas the amount of processed seed totalled 704 tonnes. According to production areas, wheat seed ranks first (16.000 ha), followed by maize (10.052 ha), soybean (9.227 ha) and sunflower seed (2.180 ha). In 2016, the production of wheat, maize, soybean and sunflower seeds amounted to 107.029 t, 31.886 t, 28.954 t and about 3.117 t, respectively (Chamber of Commerce and Industry of Serbia, 2018).

**Table 1.** Seed production by crops in Serbia in 2016

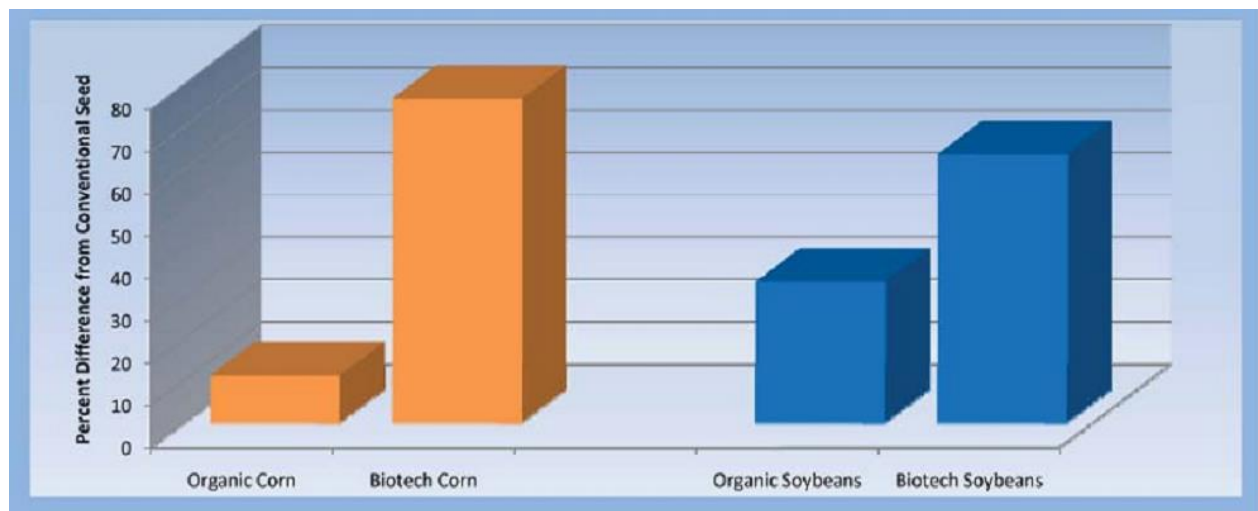
| Crops                  | Harvested area (ha) | Estimate of processed seed (kg) |
|------------------------|---------------------|---------------------------------|
| Small grains seed      | 19.061              | 124.786.861                     |
| Maize seed             | 10.052              | 31.886.009                      |
| Industrial plants seed | 11.418              | 32.096.059                      |
| Vegetable seed         | 283                 | 217.936                         |
| Forage crops seed      | 2.234               | 1.914.880                       |
| Other seed             | 332                 | 578.707                         |
| TOTAL                  | 43.380              | 191.480.452                     |

Source: Chamber of Commerce and Industry of Serbia, 2018

### THE PRICE OF ORGANIC MAIZE AND SOYBEAN SEEDS IN THE WORLD MARKET

In the European Union, organic seed production is up to three percent more expensive than conventional seed production due to the following reasons: 1) seed losses in production or produced seed is of insufficient quality, 2) a greater risk of seed contamination with numerous pathogens, especially weed seed-borne ones, as chemical protection is prohibited in this production system, 3) uneven seed maturation due to landrace heterogeneity (the main cause of poor germination). It is very important to emphasise that the selection of seed in organic seed production is based on seeds with highest germination rates (Ugrenović et al., 2010).

As biotech seed, organic maize and soybean seeds are sold at significantly higher prices than conventionally produced seed. According to the data collected by major world companies that sell organic maize and soybean seed in 2003, many organic maize cultivars were sold in the world market, whereas the price of organic maize seed ranged from 85 to 120 US dollars per unit, i.e. about 107.48 US dollars on average. During the same year, conventionally produced seed was sold at an average price of 90.90 US dollars per unit, hence the profit in organic seed production was higher by 18.2%. In the period 2003-2010, the profit generated by organic seed producers, compared to conventional seed producers, was higher by 11 to 25% on average. The profit in organic soybean seed production was lower by 33.4% in 2010. In the 2004-2010 period, the profit was higher by 31 to 58% (43% on average), whereas a 20% higher profit was recorded in organic maize seed production in the period 2003-2010. According to the results obtained by farmers engaged in both organic and conventional seed production, the USDA's Economic Research Service for 2007 reported that producers of conventional soybean seed produced, on average, 46 barrels per acre, or 30 barrels of organic soybean seed per acre. The average price of conventional soybean seed amounted to 5.53 dollars, whereas the profit was 254.38 dollars per acre (Benbrook, 2009).



**Figure 2.** The Biotech and Organic Seed Price Premium Relative to the Cost of Conventional Seed in 2010F

Source: Benbrook, 2009

### CONCLUSION

Notwithstanding numerous laws and regulations on organic farming, organic seed production is not at a high level in the Republic of Serbia. Of the total area devoted to organic crops (14,357.96 ha), organic seed production accounts for only 8.4 ha. There is still a lack of certified organic seed of many species in the country, and thus producers use either landrace seeds or chemically untreated conventional seeds. Therefore, organised organic seed production needs to be established at a high level and in large quantities as the institutes in the country have produced several certified cultivars. Moreover, in the absence of organic seed, producers should be provided with untreated conventional seed of the highest quality to launch projects within the field of organic breeding in order to enhance the availability of organic seed to producers.

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**ORGANSKO SEME I STANJE NJEGOVE PROIZVODNJE U REPUBLICI SRBIJI**

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**Izvod:** Već duži niz godina organska poljoprivredna proizvodnja na globalnom nivou zauzima sve veće površine. Ovaj vid proizvodnje je u potpunosti zakonski regulisan brojnim zakonima i pratećim pravilnicima, a osnovni principi za razvoj ovog vida proizvodnje propisani su od strane IFOAM-a i Evropske Unije. Važno mesto u sistemu organske poljoprivrede zauzima proizvodnja semena, jer je upotreba sertifikovanog semena ključna u očuvanju njegove proizvodnje. U Republici Srbiji do 2009 nije postojala proizvodnja sertifikovanog organskog semena, usled čega su proizvođači koristili seme iz lokalnih populacija i konvencionalno hemijski netretirano seme. Od ukupnih površina pod organskom biljnom proizvodnjom (14357.96 ha) u Republici Srbiji, semenska proizvodnja se odvija na svega 8.4 ha, uz nejednak regionski raspored. U regionu Vojvodine, odvija se najveća proizvodnja organskog semena na površini od 5.2 ha. Međutim, u zemlji je i dalje prisutan nedostatak sertifikovanog organskog semena, te je neophodno u narednom vremenskom periodu pokrenuti organsko oplemenjivanje i organsko semenarstvo, ne samo organsko semenarstvo, već i organsko oplemenjivanje.

**Ključne reči:** površine, zakonska regulativa, organska proizvodnja, cene

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