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Organic Food Production as a Necessity and Obligation of People in the 21st Century to Preserve Health, Biodiversity, and the Atmosphere the Position of Serbia on a Global Scale

Ana Milojevic Jelisijevic[1*]

[1] Agricultural University Plovdiv, Faculty of Economics, Plovdiv, Bulgaria

[*] Ana Milojevic Jelisijevic E-mail: ana89milojevic@yahoo.com

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Abstract

Ever since the beginning of the existence of homo sapiens on the planet, from the initial basic diet of hunting, there was a gradual transition to using the gifts of nature from the plant world by collecting natural fruits, so that knowledge would lead man to planned cultivation. The initial primitive methods of land cultivation, including irrigation, did not have negative effects on the natural environment, as did the later cultivation of plants and the promotion of growth and yield with organic fertilizers. Only from the middle of the 20th century, when the race to increase yield became closer to the race for profit, was a negative imbalance observed, which directly affects human health and its environment. The continuous trend of increasing the crop, selection and modification of seeds and the use of nitrogen fertilizers, led to the loss of crop quality, especially from the health aspect, then the impact on the habitus and biodiversity of the wider environment, as well as the reduction of soil characteristics (humus layer). Economic crises also include food production, so the dilemma arises as to whether we should produce large quantities at any cost or rapidly switch to ecologically more justified organic production.

In this modest study, a brief analysis of the relationship to basic foods in the human diet was carried out, with an emphasis on cereals, which were and remain a basic component, because in each historical period they represented the sources of about 20% of the calories and proteins necessary for human health, as well as the impact of healthy (organic) types of this cereal on the human environment. And then the quantity of organic food production in Serbia was analyzed.

Keywords

cereals, human nutrition, benefits of organic production, organic food, Serbia

1. Introduction

As in many other spheres of the accelerated development of modern society, agricultural production (mechanical processing, nitrogen and phosphorus fertilizers, pesticides) shows strong impacts on human health, soil, biodiversity preservation and the increase of gas emissions in the atmosphere that lead to the appearance of the "greenhouse" effect. The natural gradual increase in the number of inhabitants on the planet, with an unexpected acceleration in the last century and a half (over seven billion), with the prediction that it will reach 9.1 billion in the middle of this century. also creates an increase in grain production (from 2.5 to 3 billion tons per year), and meat for human consumption (from 400 to 480 million tons) with the necessity of rationalizing production and use, i.e., use with less food waste (twenty-two million tons are wasted annually in the EU countries alone), but also with better recycling of unused food. The sudden deterioration of living conditions on our planet set off a red alarm, so the dilemma arose whether to pursue an indiscriminate increase in food production, following the increase in the population, or to adapt methods to healthier ways that are initially more expensive, but manifold beneficial for man, his health, life the environment, biodiversity and reducing the emission of gases that irreversibly poison the planet's atmosphere. These sobering reflections appear after the publication of the idea of the "green revolution" in the middle of the last century, but the change is insufficient and slow (conditioned by economic and other opportunities). The last important appeal was in 2015 in Paris, the "Paris Climate Agreement" on production methods that would mitigate and reduce climate change, but the world is permanently on the brink of an economic crisis, so the implementation of knowledge mostly remains a letter on paper. Both necessity and compulsion maintain existing ways and methods of food production. One of the most dangerous phenomena for humans, due to the permanent increase in temperature and air humidity, is the creation of a climate for the awakening of long-dormant pathogenic microorganisms, increasing resistance and directly affecting the health and life of people on the planet, flora, and fauna as well. Although the planet's land has been declared a non-renewable resource, with recommendations for its preservation, in practice there are still too few self-sustaining food production processes that enhance the healing of a damaged ecosystem, promote the cycles of circulation of substances in the surface layer in width and depth, thereby enhancing biological diversity and soil activity.

H1—return to organic production and food is necessary to preserve the health of people, flora, and fauna, and show responsibility towards future generations. Cereals are one of the basic and main foods in people's diet.

H2—Serbia has the chances and conditions to match the more developed countries of the world in the production of organic food.

2. Modern Types of Cereals Adaptable to the Transition to Organic Production

The cereal story could easily be called back to the future, because it goes back to the old values, and for that during production it is necessary to minimize the use of synthetic agrochemicals, to clean the agricultural land from the harmful effects of artificial fertilizers and to convert it into organic plots, and after some time to plant natural varieties (just like with other plants, fruits, vegetables, and others). In addition to clean and healthy grain, ecological production preserves and improves biodiversity, stimulates natural biological cycles, and therefore the human environment is refined and transformed into a better place for the life of all living creatures, not only humans. A persistent approach to agricultural production in this way rounds off a holistic system whose basic value is based on traditional practices that have survived centuries, and due to biological and agronomic properties, cereals in organic production certainly grow into a significant agro technical potential, due to nutritional values, health effects, but also economic justifications. The benefit on the market (including ours) is absolutely guaranteed, and at the same time diversification of production is carried out on a limited farm, so it becomes more flexible, profitable and sustainable, and in addition to better quality human food, better nutrition for livestock is also provided. Rye, sorghum, millet and buckwheat, although they trace their roots from ancient times, were neglected for a long time, and priority was given to cereals that gave a higher primary yield, even though they did not allow intercropping with cover crops, because the least amount of manual and mechanized work was needed for flat plots enriched with nitrogen fertilizers and sprayed with unhealthy protective agents against plant pests, which reduced the production cost, but also significantly and systematically ruined and reduced the natural fertility of the soil, bringing the healthy humus layer to the threshold of disappearance. And those segments improve a lot, heal the plots and enable diversity, precisely the organic approach to production, where basic cereals in combination with cover crops achieve multiple benefits for soil fertility and yield value, as well as protecting the landscape from erosion, increasing the percentage of organic matter and minerals, soil moisture control and water quality protection, as well as increased control and suppression of weeds and harmful organisms. The main crops can coexist with intercrops as broad, subsequent, and winter crops, and for optimal coordination local agro-ecological conditions of the climate and soil, the effects of subtropical and steppe climates, the amount and frequency of precipitation, the timing of early autumn and late spring frosts must be considered. natural needs of the main crops, irrigation possibilities and type, method of field cultivation, etc. As well as the choice of crop rotation, species and varieties, method of sowing, management of the main and cover crops during the ripening of the harvest.

2.1 Cereals in the Balkans Suitable for Organic Production

Table 1. Created by Author

Culture	Origin	Age	Traits
Rye *(Secale cereale L)*	Eastern Europe	4,000 years	grows tall (1.5 m), has strong and deep roots
Buckwheat (*Triticum spelta* L),	Transcaucasian regions	7,000 years	Chaff wheat, the grain should be shelled
Durum (*Triticum turgidum* ssp.)	Middle East, Mediterranean	7,000 years	Durum wheat, high % protein (17%) and gluten
Oats (*Avena)*	Europe	3,600 years	3 types of Avena sativa: diffuse, orientalis and naked.
Millet *(Panicum) (Panicum miliaceum* L)	Asia, Africa	8,000 years	Warm climate, short vegetation. period, high yield
Buckwheat (*Polygonaceae)*, Moench *Fagopyrum esculemtum*	Mongolia	1,100 years	Shelled nuts have a high nutritional value

Observing the harm to human health from nutrition obtained from intensive production (with the use of pesticides and artificial fertilizers) caused an increasing demand for cereals and vegetable crops that are characterized by valuable nutritional characteristics and even then there were over 40 such varieties, such as (except those listed in Table 1): single grain wheat (Triticum monococcum), double grain wheat (Triticum diococcum), korasan (Triticum turgidum), flax (Linum usitatissimum), oilseed rape (Brassica napus), triticale (Triticosecale), oil squash (Cucurbita pepo), sweet potato (Ipomoea batatas) , corn (Amaranthus sp), quinoa (Chenopodium quinoa), chicory (Heliantus tuberosus), cowpea (Vigna unguiculata) and other species.

Soil type, altitude, windiness, and wind rose, medium and extreme temperatures and their periodicity, natural and added moisture, soil alkalinity and acidity, water permeability, looseness, aeration, and general agrometeorological conditions, influence the optimal choice of cereals according to their nutrient absorption from the soil, so it is necessary to properly measure the amounts of nitrogen and (or) phosphorus fertilizer used. In the case of organic production, all these factors have a similar influence, but a more natural treatment of crops is the bearer of changes in conditions and the wider environment, thus a different choice of crops. From the table below (2), the correct selection of crops according to

the plot is a basic prerequisite for the best cultivation and yield. Any imbalance in the use of fertilizers also impairs the growth and fertility of the plant, gives it a lusher and more unnecessary biomass to the detriment of the grain, leads to crop dormancy, etc. which refers to the obligation to adapt plantings to the type of soil and other environmental conditions.

2.1.1 Amounts of Minerals Taken from a Hectare of Planted Crops (in Grain and Biomass)

Table 2. Obvious Guidelines

Culture	Rye	Krupnik	Durum	Oats	Millet	Buckwheat
Nitrogen N (kg ha)	**8.3**	**9.5**	**9.5**	**8.5**	**5.6**	**4.7**
Phosphorus P2O5 (kg/ha)	**3.5**	**3.3**	**3.3**	**3.9**	**5.0**	**2.2**
Potassium K2O (kg/ha)	**6.1**	**8.0**	**8.0**	**10.9**	**10.8**	**3.9**

The above Table gives obvious guidelines for the selection of crop cultures in certain areas, to optimally use the available agricultural area, but at the same time preserve the potential of the soil for further successful use. Due to reckless insistence on the same type of grain, constant demands for higher yields, along with indiscriminate use of artificial fertilizers, in parts of our country the native humus layer has already decreased by even 50% during the second half of the 20th century.

3. Preservation and Promotion of Biodiversity by Increasing Organic Production

Everything that has been happening for millennia in the relationship between man and nature is still happening today: while nature (forest, taiga, mountains, seas) was an unknown and a challenge for people, its strength prevailed, and today, with the use of modern means and technology, man has partially won (with many negative side effects), so even long untouched rainforests are millennia old, destroyed for profit, but also for the need for food (Amazonia, Africa, Indonesia and Malaysia), and with a disastrous effect on many plant and animal species, whose losses are irreversible. Due to wrong local reasoning enhanced by high corruption and immaturity of society, what is gained (rapeseed oil, etc.) is much more marginal than the total losses and damage to humans in a global sense. Preservation of the existing and any promotion of the development of biodiversity is a one-way investment in the quality of life of people on the planet and there is no alternative, because it directly affects the health value and fertility of agricultural crops, human health and longevity, and finally survival itself, while for the plant and animal life it is crucial, because the number of different species has already been reduced by more than half. Intensive mechanized agriculture with the main and only task to increase

yield is the cause of these catastrophic changes.

The organic production of grains, fruits, vegetables, and other crops on consolidated plots of the micro location, in a noticeably brief period, show the revival of other animal species, from insects (bees, bumblebees, wasps, butterflies, beetles) to different species of birds, which are quickly and unmistakably recognized change of environment. In research by Krauss et al. the increase in biological diversity (compared to plots where production is organized in a conventional way) is highlighted, where the appearance of old almost extinct varieties of plants, pollinators, but also predators that improve natural pest control, including herbivores and pollinators, is noticeable, and insects, then birds, mammals, beneficial microorganisms, earthworms, etc. The planned introduction of eco-corridors, i.e., protective and insulating, and ecologically clean flower belts in agricultural production, could bring multiple benefits, and if the trend continues, the belts will expand and then merge into clean regions. According to the study of the European Commission "Strategy of Biodiversity 2020", there is a surprising fact that since the nineties of the last century in agro-biodiversity, about 75% of the genetic diversity of agricultural crops in the world has been completely lost, and that over 75% of food is produced using only 25% plant and animal species. This increase in genetic uniformity determines the sensitivity of plants to the action of diseases, pests, weeds, and other harmful factors.

Organic production is based on four interrelated principles and has numerous advantages over conventional agriculture.

ORGANIC AGRICULTURE			
PRINCIPLE OF HEALTH	PRINCIPLE OF ECOLOGY	PRINCIPLE OF CARE	PRINCIPLE OF JUSTICE
absence of pesticide residues, additives. and antibiotics	prevention of loss of nutrients	land	multifunctional agriculture
absence of nitrates	biopesticides	microbiological activity	employment of labor force
nutritional value of food	reduction of gas emissions	conservation of genetic resources	certification

human health	biodiversity	animal welfare	profitability

Figure 1. Created by Author

4. Agricultural Areas in Serbia under Organic Production

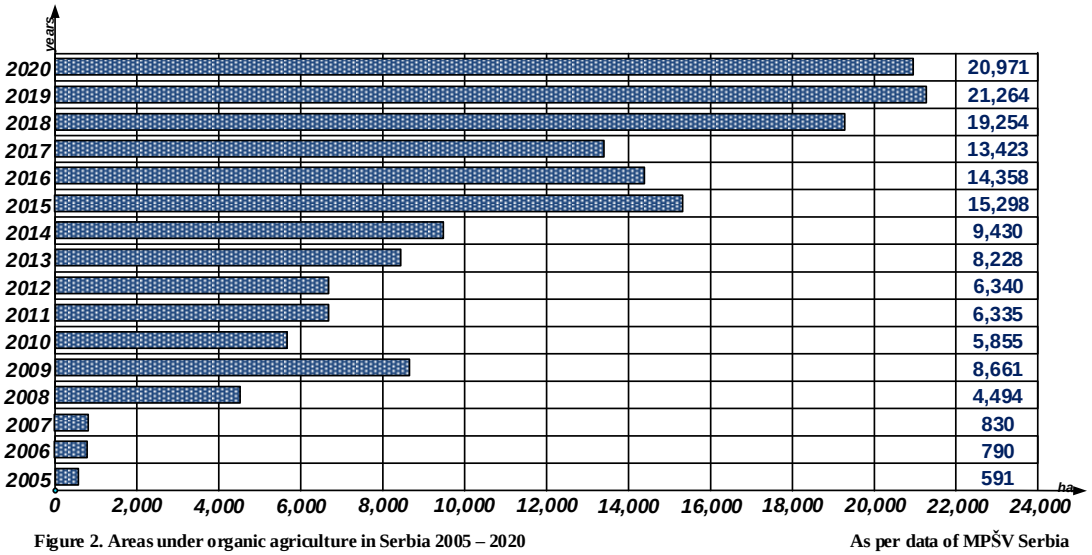


Figure 2. Areas under Agriculture in Serbia 2005-2020

The growth trend of organic agriculture in Serbia is permanent at the beginning of this century, with setbacks in some years, due to misunderstanding of the state and producers, and then the Covid-19 pandemic. The incentives given by the EU to member countries are significant and high, so keeping up with them is not an easy task. Although some countries in the world (Australia, countries of Latin America) are making big strides, a lot of it is related to the economic power of the state, so our place in it is natural. The term "organic" is also misused here by some small companies that import spices, confectionery products, cereals, and the like under its umbrella, which in no way promotes organic agricultural production. Certainly, one of the key factors in this is a strong import lobby that benefits from a low (artificial) exchange rate, which causes direct damage to small agricultural producers.

4.1 Serbia's Place in the World of Organic Agriculture

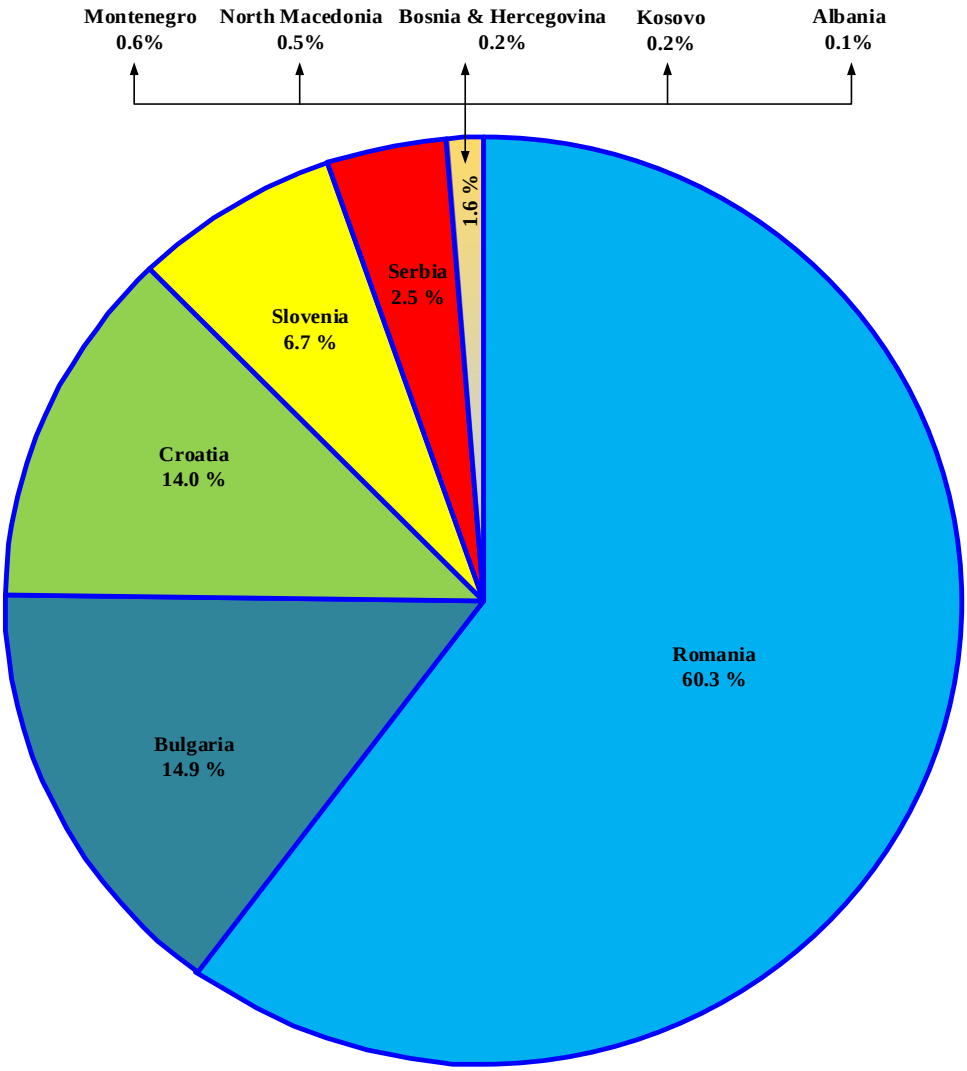
At the world level, of the total agricultural area, in 2020, 1.6% was under organic production, with a constant trend of increase, the highest in Australia and Oceania 9.7%, then Europe 3.4% (only the EU 9.2%. In the same period, organic production was increased by three million hectares (4.1%) and totaled 74.9 million hectares. Including plots in conversion from conventional production, in the same year Australia records the most with 35,687,799 ha, followed by Argentina with 4,453,630 ha, then

Uruguay, India, France and Spain with over 2 million ha, while Serbia with 19,317 ha is somewhere in the middle, and the countries of the region Romania 468,887 ha, Bulgaria 116,253 ha, Croatia 108,610 ha, Slovenia 52,078 ha, Montenegro 4,823 ha, North Macedonia 3,727 ha, Bosnia and Herzegovina 1,692 ha, Kosovo 1,604 ha, Albania 887 ha. It is obvious that the economic power of the state is not decisive in turning to organic food production, but even countries with an exceptionally low gross national income cannot afford this turn in the right direction, because they struggle to provide enough food for the survival of the population. Romania is the leader in the region, and Serbia leads the Western Balkans as the most backward in the region. Otherwise, in the world, from 2000 (15 million ha and growth of 0.3 %) to 2015, with a growth below 1 %, it reached 50.3 million ha, and in the last 5 years (until 2020), the average growth was over 1.5 %, so it reached 74.9 million hectares of agricultural land under organic production.

Although today the countries of Europe can be viewed according to the division of EU members - the rest, the Balkans is still a region, primarily geographically, as one big peninsula of our continent, so it is interesting to look at the position and results in organic agricultural production among different countries in this activity as well.

4.1.1 Subhead

The growth trend of organic agriculture in Serbia is permanent at the beginning of this century, with setbacks in some years, due to misunderstanding of the state and producers, and then the Covid-19 pandemic. The incentives given by the EU to member countries are significant and high, so keeping up with them is not an easy task. Although some countries in the world (Australia, countries of Latin America) are making big strides, a lot of it is related to the economic power of the state, so our place in it is natural. By the way, the term “organic” is also misused here by some small companies that import spices, confectionery products, cereals, and the like under its umbrella, which in no way promotes real organic agricultural production. Certainly, one of the key factors in this is a strong import lobby that benefits from a low (artificial) exchange rate, which causes direct damage to small agricultural producers.



Total area under Organic agriculture in Balcan countries in 2020. year: 777,878 h

Figure 3. Total Area under Organic Agriculture in Balcan Countries in 2020, Year: 777,878h

In terms of the production of temperate fruits, due to the region itself, the climate, the geographical position that crosses the east-west roads and brings novelties from various parts of the world (especially during the Ottoman occupation), as well as tradition, Serbia has for centuries been a serious and respected producer and exporter of quality fruit. Today, when the market is saturated with products of intensive treatment, unfortunately, we are not in a high place in terms of organic fruit production, as shown by the table and graph below. From the data for the year 2000, economically more stable countries are leading in organic production. The areas under organic production of temperate fruits in the world in 2020 are 256,000 ha (2.2% of the total area), where the leaders at the global level are China 69,800 ha, followed by Turkey 26,577 ha, Italy 26,499 ha, France 23,531 ha, the United States 18,130 ha , while Serbia is 2,002 ha, and the Balkan countries (in or outside the EU): Romania 8,606 ha, Bulgaria 6,976 ha, Croatia 2,525 ha, Slovenia 420 ha, North Macedonia 268 ha, Montenegro 137 ha,

Albania 21 ha, Bosnia and Herzegovina 2 ha. Here, it is obvious that Serbia ranks right behind the EU member states, even better than some, thanks to the long-term practice of several fruit growing institutes, as well as the traditional cultivation of quality fruit, related to small rural agricultural producers, especially for the national product of the alcoholic beverage - brandy.

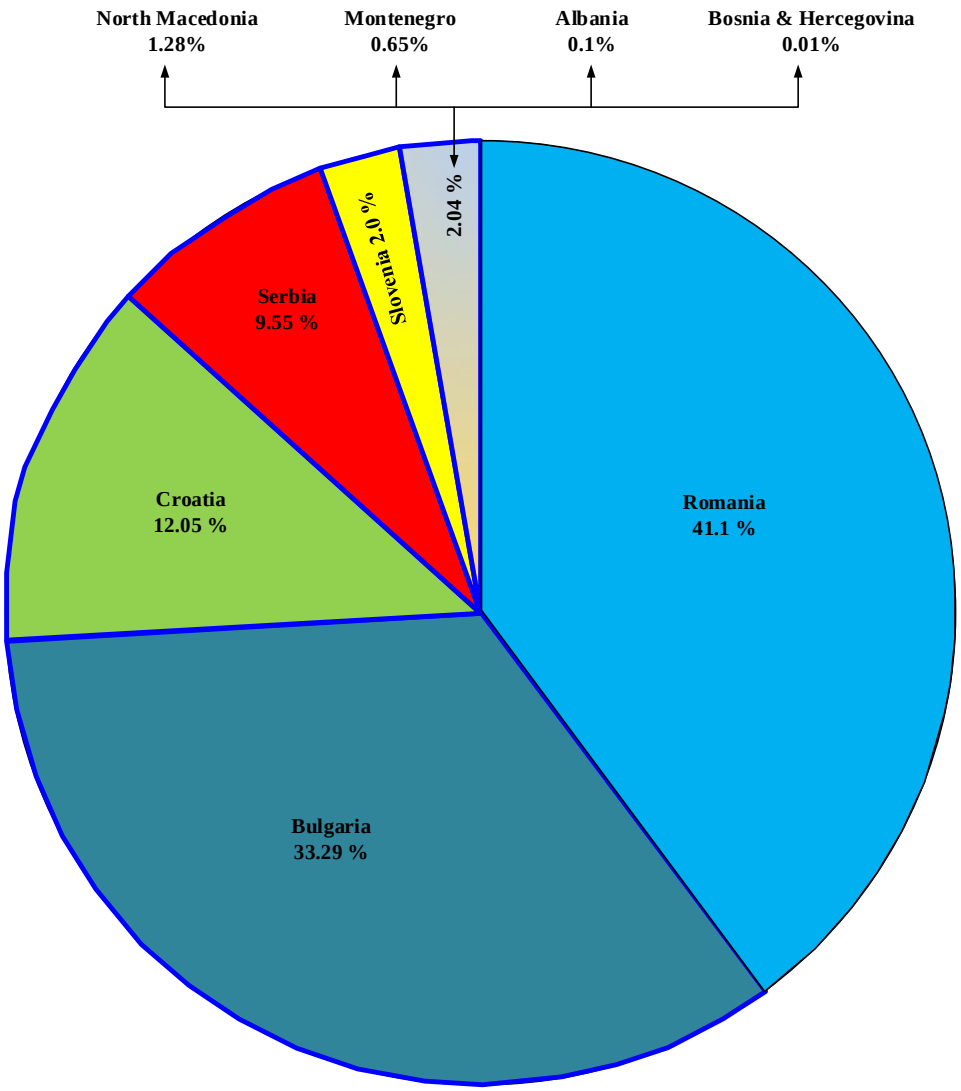


Figure 4. Total Area under OP Temperate Fruits in Balkan Countries in 202, Year: 20,957ha

In recent decades, a major change has occurred in Serbia in relation to the production, storage, and marketing of many agricultural items, including temperate fruits, because the behavior of storekeepers (refrigerators) is insufficiently regulated by the law, so real terror and extortion arose when purchasing from small agricultural producers. They do not even know what to do with the goods without buyers, and they time the purchase and prices in a way that is favorable to them, directly damaging the

producer. Rule-of-law countries do not have this problem.

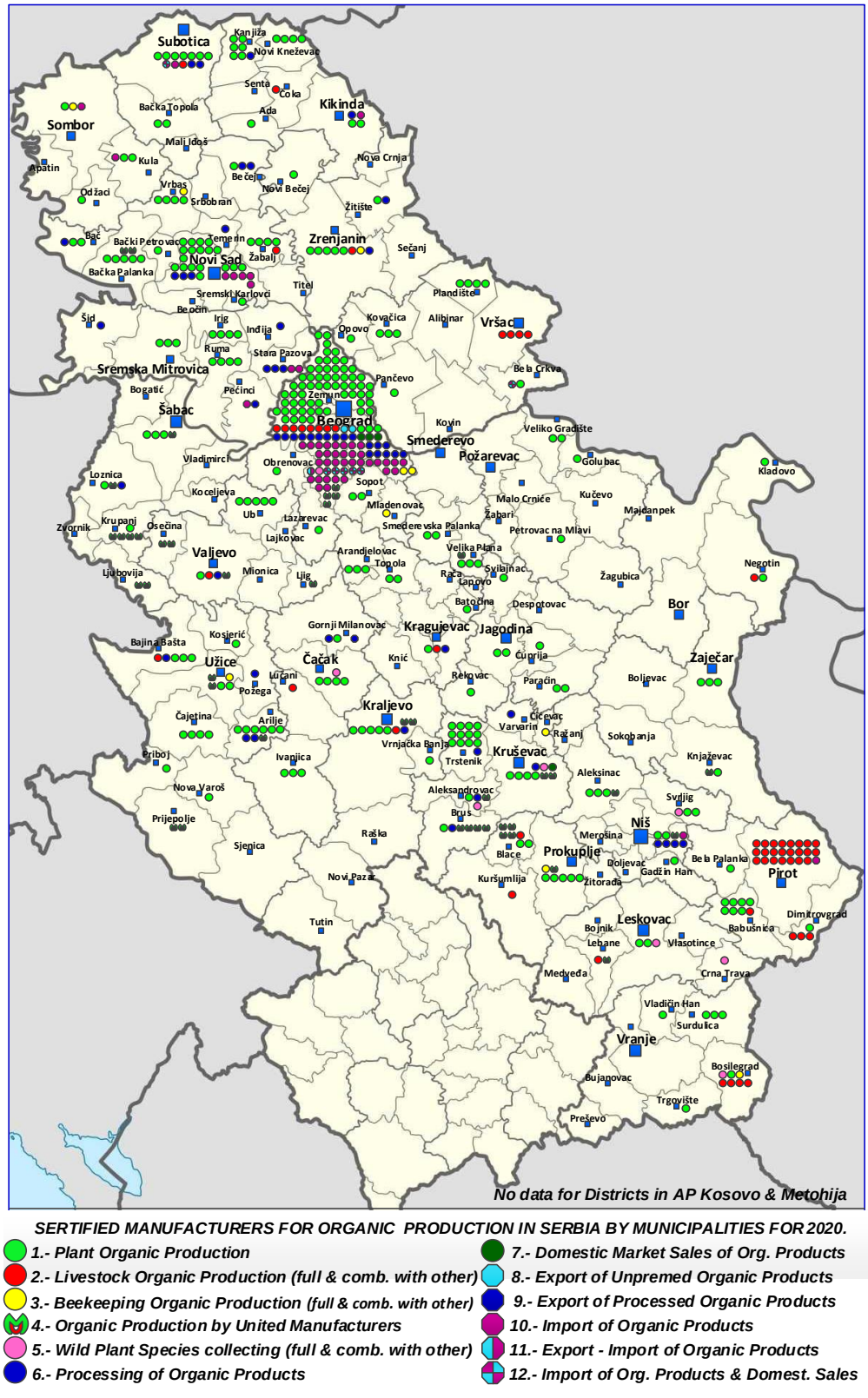


Figure 5. Serbia with Certified Organic Entrepreneurs in 2020

From the map of Serbia with certified organic entrepreneurs in 2020, the advantages of untouched nature in higher and high hill and mountain areas are not used enough, but the concentration is based on the proximity of large trade centers, which is initially wrong. Also, despite the proven harm to the health and life of citizens, gases and particulate emissions produced by large fossil fuel power plants, as well as steel mills and separators in the mining industry, there is no clear inclination towards a healthier environment, greenery, forests, mountains, in which the air, water and soil little or not at all polluted. This is not a manufacturer's choice, but a poor organization of goods purchase, storage, transportation, and market openness. If organic producers from items 1, 2, 3, 4 & 5 are singled out, Plant Organic Production has the largest number of Certified Manufacturers, 431/573, but they are scattered from serious operators with grains, through the cultivation of medicinal, fodder and industrial plants, fruit growing to vegetable growing , with a trend of decreasing total yield, while Livestock Organic Production is at a standstill, 67/573 even shows a negative trend in quantities, as entrepreneurs reduce the number of livestock on farms, since they cannot compete with importers of frozen meat from Latin America. When talking about Fish Organic Growing, there is a total standstill here, 0/573 and the same is happening with Beekeeping Organic Production, 11/573 while with Wild Plant Species collecting, 17/573 the initial interest of people in rural areas for this activity slowly suppressed by growing similar crops in controlled conditions (always with a higher yield and easier picking and selling: blueberries, blackberries, currants), as well as by importing goods of questionable and unverified quality. The fact that truly wild fruit is incomparably healthier, but it is more expensive in our country (again, cold storage and an unorganized market), so this activity is slowly and inexorably dying out.

Such analyzes often acquire a political connotation, and this modest analysis has no such intentions; the only important thing is to state the undeniable facts. Today, Serbia has too many polluters of soil, water, and air, and this, in the name of the country's progress, is usually done by large multinational and national companies, especially since they could not do that on the territory of their own countries. And those dirty technologies are disastrous for organic agriculture, so until it stops, the country cannot be expected to progress in this area, because there will be no unpolluted fields.

Despite the great potential and constant growth of the main organic indicators production, however, is slowly achieving the expected development, especially within the context of the modernization of agriculture. Achieving the competitiveness of organic producers on the national, regional, EU and global markets, through raising production, lateness is one of the challenges faced by the organic production sector. The production of fruit still dominates, followed by the production of arable crops with constant growth in the production of cereals, oilseeds, and animal feed livestock production.

5. Conclusion

H1—The goal of this analysis was to point out the fact that Organic production in agriculture is necessary nowadays, but that it is only a return to something that the inhabitants of the country had. Man (unlike other living organisms on the planet), considering it his right, took everything he could

from the Earth, not considering the damage it produces. Although it took many billions of years for the planet Earth to reach this state for life and survival, humans have been disrupting that beautifully established biocenosis for hundreds of years, rivers and forests have suffered irreversibly at the hands of humans, the temperature has been constantly rising, the atmosphere

has become more and more polluted, the ice at the poles melted and the sea level rose. The last seventy years of human activity have intensified the evil that we inflict on a vulnerable system, with the slogan: ‘‘let us take while we can’’, without thinking about whether and how our planet can handle it. Wars, accelerated burning of fossil fuels, even atomic bombs have caused the system to crack. Turning to nature and its impulses, even though it is already much too late, can slow down the rapid deterioration of living conditions for people on this planet, and a small segment of this is the increase of organic agriculture, which goes far beyond just healthy and tasty fruit.

H2—Compared to previous years, in 2017, Serbia had an increase in organic production of as much as 62%, i.e., 0.44% of the total agricultural area was under organic production. Although this is still a small percentage, the tendency towards increasing organic production, as well as the interest in organic food in Serbia is growing, so that Serbia has a chance to match more developed countries in the production of organic food, but only on the condition that the government gets involved with subsidies and support. As well as in the education of farmers and the population. However, pollution in Serbia is increasing, and in this constellation of rule of law and resource management, any serious progress is illusory.

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