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ORGANIC HEALTHY SAFE FOOD AND HEALTH

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Abstract

Organic production has a significant impact on human health, animal, food security and environmental sustainability. Pesticide exposures from conventional production may lead to important diseases, such as Parkinson's disease, diabetes, brains damage, especially in children and certain types of cancer. Epidemiological studies highlight adverse effects of certain pesticides on children's cognitive development. Use of pesticides in organic agriculture is restricted. Organic food are abundant with vitamins, antioxidants (vitamin C, polyphenols and flavonoids), minerals and dry matter content. Regular consumption of organic products (fruits and vegetables, dairy products and meat) significant reduces the risk of overweight, of pre-eclampsia in pregnancy and allergic disease. Organic meats and dairy products have a higher content of omega-3 fatty acids compared to conventional products and do not contain antibiotics. Due to the reduced amount of pesticide residues and an increased secondary plant metabolites, intake which are found in organic food, there is a reduction in health problems and a positive effect on health.

Key words: *Organic production, Antioxidants; Importance for health;*

Introduction

Organic agriculture is a holistic production management system, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices instead of the use

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of off-farm inputs, considering that regional conditions require locally adapted systems. This is accomplished by using, when available, biological, agronomic, and mechanical methods, rather than synthetic materials, to accomplish any specific function within the system [1-5]. The General Assembly of IFOAM – International Federation of Organic Agriculture Movements – established a succinct definition of organic agriculture: organic agriculture is a production system that sustains the health of soils, ecosystems, and people. It depends on ecological processes, biodiversity, and cycles adapted to local conditions, instead of inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to support the shared environment and stimulate fair relationships and good quality of life for everyone who is involved [6]. Organic agriculture is a certified system, well controlled by authorities, so it would a strategy for gathering and analyses of data could be of great value to reinforce the implementation of organic agriculture as a health indicator, in any country or region, where organic agriculture certification already exists. Organic agriculture could be considered as a public health indicator, belonging to the group of health determinants, with the purpose of planning, developing, and implementing health policies adjusted to population needs [7]. The aim of this study is to analyze organic fruit production in Montenegro, record the number of organic farms, area under organic plantings and crops and types of organic products, indicate the direction of movement and provide guidelines for improving future production.

Material and methods

The paper, based on data from the Research Institute of Organic Agriculture FiBL, [8] www.fibl.org, the national certification body "Monteorganica" doo, Podgorica [9, 10] for 2000-2020, statistically shows: area under organic crops in world and in Montenegro and the impact of organic production on health. Areas under organic production in the world for the researched period (2000-2020) are shown. Data were processed using descriptive statistics. The investigated parameters are shown in tabular and graphical form.

Results and discussion

Organic agricultural production in the world is engaged in by 2.98 million producers in 181 countries, on 69.8 million ha, which is 1.4% of the total agricultural land, and its value is 97 billion dollars. In recent years, many countries in the world have recorded growth in organic production [1]. The growth of organic production from 0.3% (2000) to 1.6% (2020) is evident. The total area of organic production in the world in 2020 was 74.93 million hectares. The largest areas are recorded in the territory of Oceania, 35.91 million hectares, Table 1, Figure 1.

The largest part of the total areas by continents had Oceania (47.9%), followed by Europe (19.9%), South America (13.3%), Asia (8.2%), North America (5.0%) and Africa (2.8%), Table 2, Figure 2.

The highest production was recorded in ten top countries: Australia (35.9 million ha), Argentina (4.5 million ha), Uruguay (2.7 million ha), India (2.7 million ha),



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France (2.6 million ha), Spain (2.4 million ha), China (2.4 million ha), USA (2.3 million ha), Italy (2.1 million ha) and Germany (1.7 million ha), table 3.

Table 1. Growth of the organic agricultural land and organic share 2000-2020

Year	Organic area, million hectares	Organic area in percent, %	Year	Organic area, million hectares	Organic area in percent, %
2000	15.0	0.3	2011	36.7	0.8
2001	17.3	0.4	2012	36.8	0.8
2002	19.9	0.4	2013	43.1	0.9
2003	25.8	0.5	2014	48.7	1.0
2004	30.2	0.6	2015	50.3	1.1
2005	29.2	0.5	2016	58.0	1.2
2006	30.2	0.6	2017	69.2	1.3
2007	31.5	0.7	2018	70.9	1.5
2008	34.5	0.8	2019	72.0	1.5
2009	36.3	0.8	2020	74.9	1.6
2010	35.7	0.8	Source : [11]		

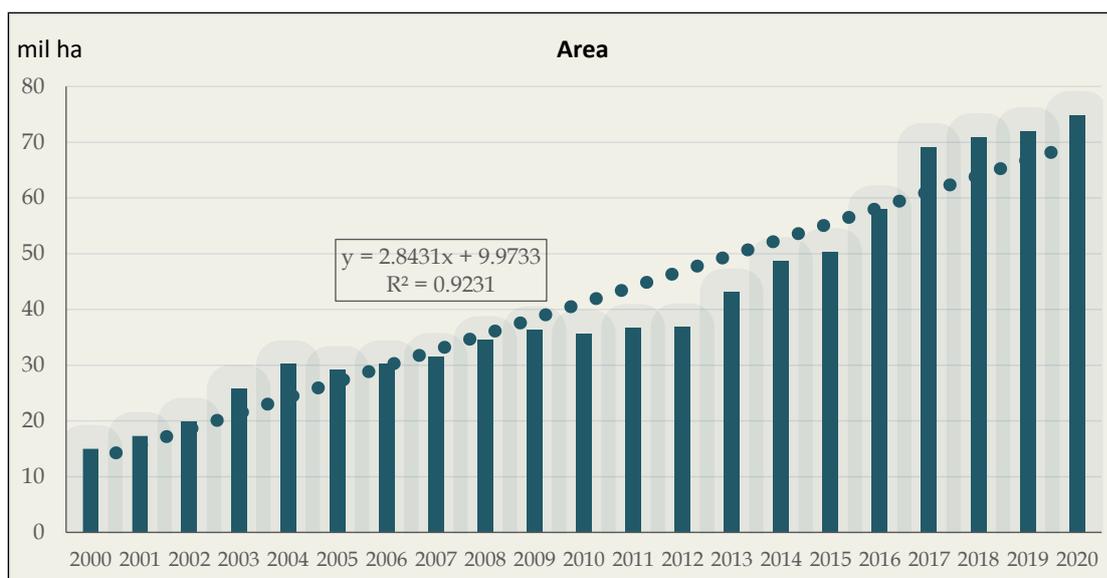


Figure 1. Organic agricultural area in world, 2000-2020

Table 2. Distribution of organic agricultural land by region 2020

Organic agricultural land by region	%
Oceania	47.9
Europe	19.9
Latin America	13.3
Asia	8.2
North America	5.0
Africa	2.8
Source: [11].	

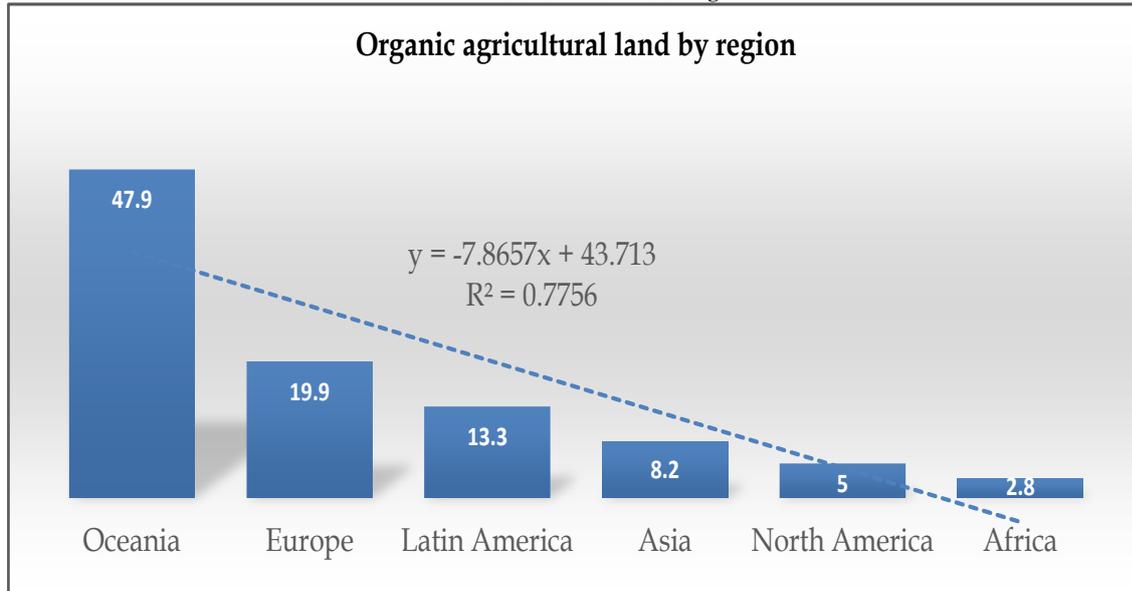


Figure 2. Organic agricultural area in world, by region, 2020

Table 3. The ten countries with the largest organic farmland areas 2020

No	Largest organic farmland areas in countries	Areas, mil. ha
1	Australia	35.9
2	Argentina	4.5
3	Uruguay	2.7
4	India	2.7
5	France	2.6
6	Spain	2.4
7	China	2.4
8	USA	2.3
9	Italy	2.1
10	Germany	1.7

Source: [11].

Organic agriculture in Montenegro

Montenegro is an ecological country. Organic agriculture in Montenegro developed at the beginning of the last decade of the twentieth century. The work is carried out through the association: Association "Production of healthy food" in Nikšić and the organization "Center for Agrarian Development", in 2004 in Bijelo Polje. Since 2004, the first producers have started to be certified and the Law on Organic Production has been applied, which is harmonized with the Regulation of the Council of Europe no. 834/2007, [11].

Montenegro is an ecological country. Organic agriculture in Montenegro developed at the beginning of the last decade of the twentieth century. The work is carried out through the association: Association "Production of healthy food" in Nikšić and the organization "Center for Agrarian Development", in 2004 in Bijelo Polje. Since 2004, the first producers have started to be certified and the Law on Organic Production has been applied, which is harmonized with the Regulation of the Council of Europe no. 834/2007. Source: [1, 4]. In Montenegro, according to data from FiBL, Monteorganica and the Ministry of Agriculture 2020 the agricultural area used in organic farming was 257,949.8 hectares, which corresponds to an increase of 15.7% compared to 2010, table 4.

Table 4. Total agricultural utilised land in Montenegro, in 2010 and 2020.

Year	2010	2020	Increase, %
Total agricultural utilised land	222 890,6	257,949.8	15.7

Source: Monstat, 2021



Figure 2. Benefit of organic farming. Source: [12].

National production for human consumption remains low. The olives, dry fruits, grapes, vegetables, and citrus fruits stand out. In the surveys carried out within the scope of the creation of the National Strategy for Organic Agriculture, more than 50% of the Montenegrin said that they intend to consume organic products, especially fruits, vegetables, cereals, legumes, dairy products, and some meat. The fruits from organic production were recently integrated into the scholar fruit and milk regimen: apple, pear, clementine, tangerine, orange, banana, cherry, grapes, plum, peach, carrot, and tomato. An increase in the payment of products from quality certified schemes is granted, namely organic production, according to budget availability.



Organic agriculture for human health

The widespread use of chemicals in agriculture worldwide exposes people through contaminated food, water, and soil, to endocrine disruptors capable of altering their development and reproduction. Pesticides are potent endocrine disruptors, which bioaccumulate in the food chain, and their harmful effects on the reproductive system of several animal species have already been identified [13]. Cassal et al. [14] in a review study on the indiscriminate use of pesticides and their consequences for public health, suggest that the risks are not only limited to rural workers, they also affect groundwater, soil, air, and animals and contaminate food with toxic residues. These chemicals can be spread in the environment and accumulated in the human body, causing acute and chronic adverse effects, jeopardizing public health. Mie et al. [7] conducted a review study on the implications of organic foods and organic agriculture on human health, comparing the production of organic versus conventional foods in relation to important parameters for human health. The study reveals that residues in conventional vegetables and fruits are the foremost source of human exposure to pesticides. It also shows that several epidemiological studies have described adverse effects of some pesticides, at current levels of exposure, on children's cognitive development. The feeding requirements for organic livestock farming, such as the consumption of grass and alfalfa, result in generally higher levels of omega-3 fatty acids, which are more heart-healthy than other fats. Indeed, these higher contents of omega-3 fatty acids are found in organic dairy, meats, and eggs [15]. Benefit for organic food is great: enhances immune system, reduces presence of pesticides, boosts cardiovascular protection, prevents cancer and premature aging, etc., Figures 3a and 3b.

Barański et al. [17], in a systematic literature review and meta-analysis, based on 343 studies on the differences in composition between organic and conventional crops, concluded that vegetables from organic farming have higher concentrations (18–69%) of antioxidants, such as phenolic acids, flavones, flavanones, flavonols, anthocyanins, and stilbenes, and lower concentrations of pesticide and heavy metal residues than those from conventional agriculture.

By understanding the power of nutrition and making conscious choices about the foods we consume, we can proactively strengthen our immune system and promote our overall well-being. Embracing a diet rich in immune-boosting foods can be a delicious and enjoyable way to support our body's defense mechanisms, leading to a healthier and more resilient life [18].

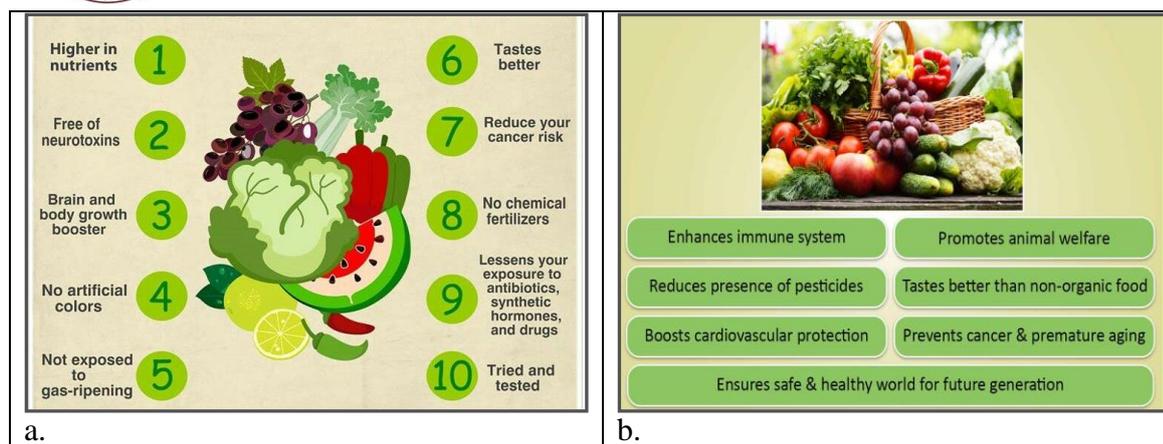


Figure 3. Ten reasons why organic food healthier, a., and benefit for health, b.
Source: [16].

Food Science & Nutrition

Grapefruit, oranges, clementines, tangerines, lemons, and limes are the popular citrus fruits. Vitamin C is an important micronutrient found in citrus fruits, which empowers the immune system by boosting both adaptive as well as innate immune cellular functioning. It helps the epithelial barrier function against infections [19]. Vitamin C may also boost the development of infection-fighting white blood cells called lymphocytes and phagocytes, especially the differentiation and proliferation of B and T cells, two of the most important immune system players. It can also help in prevention and cure of respiratory and systemic infections. Vitamin C is also known to function as an antioxidant, assisting in the battle against free radicals, which damage and impair the ability of immune system to operate effectively [20]. The antioxidant present in lemons can aid in protecting the eyes from age-related damage such as macular degeneration, and prevention of several diseases such as cancer and cardiovascular ailments [21], Figure 4.

Pomegranate (*Punica granatum* L.) juice has been found to suppress the development of dangerous germs such as *E. coli* O157:H7, *Listeria*, *Shigella*, *Clostridium*, *Yersinia*, *Salmonella*, and *Staphylococcus aureus* [22-23]. It has also been demonstrated to have antiviral properties, making it useful in fighting against viruses like flu. Pomegranate juice also promotes the growth of healthy gut flora, such as *Bifidobacterium* and *Lactobacillus*, which can significantly boost the immune system [24].

The few human studies that have directly investigated the effects of organic food on human health have so far yielded some observations, including indications of a lower risk of childhood allergies, adult overweight/obesity [25-26] and non-Hodgkin lymphoma (but not for total cancer) [27] consumers of organic food. Owing to the scarcity or lack of prospective studies and the lack of mechanistic evidence, it is presently not possible to determine whether organic food plays a causal role in these observations. Food analyses tend to support the notion that organic foods may have some health benefits. Consumers of organic food have a comparatively low dietary exposure to pesticides [28-29]. Organic agriculture allows

for lower pesticide residues in food and may be instrumental in conventional agriculture's transition towards integrated pest management by providing a large-scale laboratory for non-chemical plant protection. Organic agriculture when compared with the conventional agriculture is proven to contribute to the maintenance of an optimal health [30-31] and to decrease the risk of developing chronic diseases, because of the general association of higher quantity of bioactive compounds and lower content of unhealthy substances, such as pollutants (e.g., cadmium), pesticides, and synthetic fertilizers.

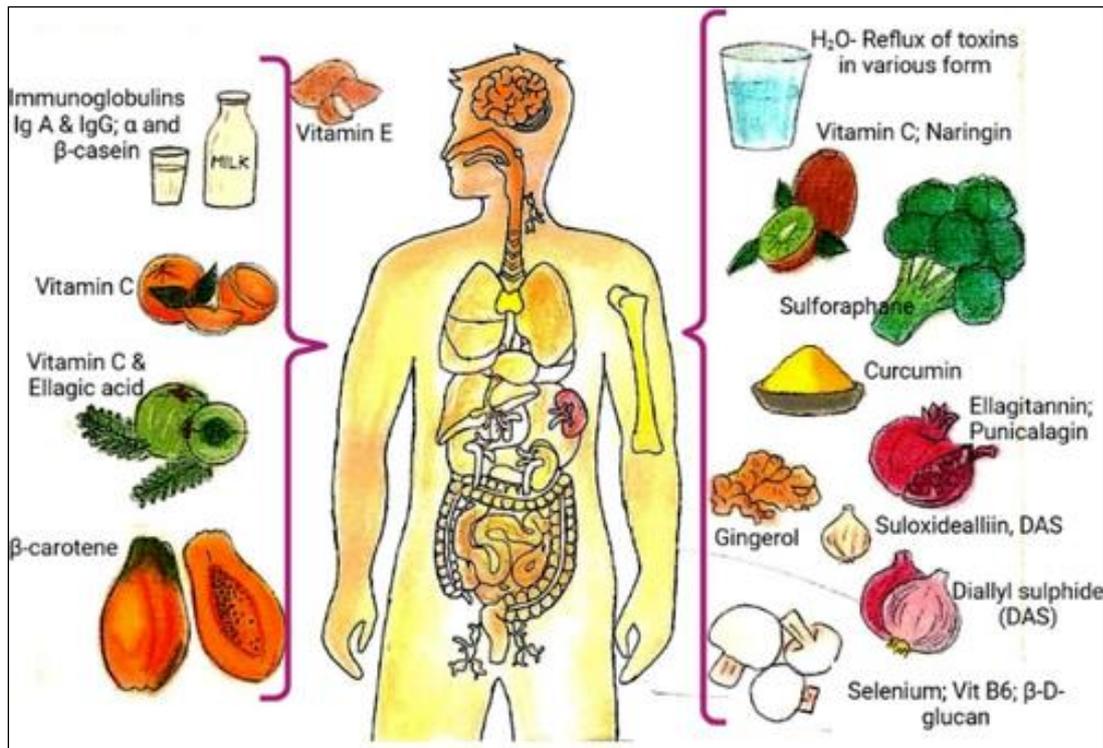


Figure 4. Bioactive compounds in various food items for boosting human immunity.

Source: [18]

Curcumin reduces metastasis, invasion, cell proliferation, and angiogenesis in a variety of malignancies by inhibiting various protein signaling pathways [32]. Iron deficiency anemia is treated with lemon and green leafy vegetables, which raise hemoglobin levels. It aids in the improvement of iron bioavailability in the blood [33]. Yogurt and banana, on the other hand, play an important role in the reciprocal advantages of probiotics and prebiotics. Prebiotics work as a fertilizer for good bacteria, whilst probiotics deliver good bacteria into the stomach [34]. This study suggests the general population in incorporating vital foods into their daily diets in order to strengthen and improve their immune system and overall health.



Conclusions

Organic agriculture emerges as a response to the industrialization paradigm with principles are: Health, Ecology, Fairness and Care. These principles and its interactions make a positive impact on economic, environmental, social, cultural, and health contexts. Suggestive evidence indicates that organic food consumption may reduce the risk of allergic disease and of overweight and obesity. In organic agriculture, the use of pesticides is restricted, and residues in conventional fruits and vegetables constitute the main source of human exposures. Organic food production has more potential benefits for human health, and wider application of these production methods, would therefore most likely benefit human health.

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