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HEALTHY AND SAFE ORGANIC FOOD IN THE FUNCTION OF ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION WITH A FOCUS ON GLOBAL TRENDS AND INNOVATIONS

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Abstract

Healthy and safe organic food plays a crucial role in environmental protection and biodiversity conservation. Organic agriculture is an approach to cultivating healthy and safe food and other agricultural products that rely on natural methods and processes, avoiding the use of synthetic fertilizers, pesticides, genetically modified organisms (GMOs), and other synthetic substances. The primary goal of organic agriculture is to preserve the health of soil, plants, animals, humans, and the environment by promoting sustainable practices that support biological diversity. Organic farming methods, such as crop rotation and composting, provide a sustainable approach to agriculture by improving soil structure, increasing fertility, and reducing ecological risks. Organic agriculture is continuously evolving, introducing new technologies and approaches that enhance sustainability and productivity. Research indicates that organic farming supports greater plant and animal species diversity compared to conventional agriculture, reduces greenhouse gas emissions—critical for combating climate change—and offers significant health benefits to consumers, including food richer in nutrients. By promoting and supporting organic agriculture, we can achieve a sustainable balance between food production and the conservation of natural resources, ensuring long-term sustainability, environmental health, and biodiversity conservation on our planet.

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Introduction

Organic agriculture plays a key role in preserving the environment and biodiversity, offering healthier and safer food products. This holistic approach to production management not only enhances the health of agroecosystems but also contributes to long-term sustainability through the conservation of biodiversity, biological cycles, and soil biological activity. Organic production systems are based on specific standards aimed at achieving optimal agroecosystems that are socially, ecologically, and economically sustainable [1-3].

According to the definition by the International Federation of Organic Agriculture Movements (IFOAM), organic agriculture is "a production system that sustains the health of soils, ecosystems, and people, relying on ecological processes, biodiversity, and cycles adapted to local conditions, rather than the use of inputs with adverse effects." This definition emphasizes the integration of tradition, innovation, and science to benefit the shared environment and promote fair relationships and quality of life for all involved.

In the context of global trends and innovations, organic agriculture is evolving in response to the pervasive challenges of environmental protection and biodiversity conservation. Modern approaches and innovative technologies allow for improved efficiency and sustainability in food production, while minimizing negative environmental impacts. These trends include the application of new methods for soil health preservation, pollution reduction, and the enhancement of biological productivity, all while respecting the principle of sustainability.

In organic agriculture, key components include the preservation of long-term soil fertility, maintenance of biological diversity, and the recycling of materials and resources. The use of natural minerals, organic fertilizers, and compost contributes to the development of healthy, organic matter-rich soil, which is essential for plant growth. These practices help prevent soil erosion, improve water retention, and reduce the need for irrigation [4-9].

Reasons for organic agriculture

Organic agriculture represents a key strategy for sustainable food production, which is essential given the rapid growth of the global population and the increasing demand for food. This method contributes to the preservation of the environment and biodiversity, integrating modern innovations that further enhance its benefits.

Organic food is rich in vitamins, minerals, and other micronutrients due to the use of sustainable farming practices. Studies show that products from organic farms often contain higher levels of nutrients compared to conventional products. Organic fruits



and vegetables frequently offer better nutritional value, including higher concentrations of vitamin C, which contributes to improved consumer health.

Organic agriculture opposes the use of genetically modified organisms (GMOs), which is crucial for preserving natural food sources and reducing risks associated with genetic modifications. Since GMOs are not always labeled, consuming organic food becomes a reliable way to avoid the potential negative effects of GMOs on health [10-13].

Organic products often have superior taste due to higher-quality soil and plant care. Organic farmers focus on maintaining soil health and biodiversity, resulting in richer and more natural flavors in food.

Purchasing organic food directly supports local farmers and contributes to the development of sustainable agricultural practices. This support can help reduce dependence on subsidies for conventional farming and lower the health risks associated with commercially produced food.

Organic agriculture helps preserve different species of plants and crops, which is crucial for preventing biodiversity loss. The conservation of crop diversity reduces the risk of losing certain species entirely due to diseases or pests.

Organic farming eliminates the need for chemical pesticides, antibiotics, and hormones in livestock production, thereby reducing the risk of food contamination with harmful substances. This contributes to better human health and reduces environmental consequences [14, 15].

Innovations in organic agriculture

To advance organic agriculture and overcome its challenges, numerous innovations have been developed in recent years. The introduction of smart technologies, such as sensors for monitoring soil conditions and climate parameters, enables more precise management of organic farms. Digital platforms and applications help farmers monitor crop health, optimize resource use, and improve production techniques. The development of biofertilizers and microbiological products that enhance soil health and increase fertility, such as biopesticides and biostimulants, allows organic farmers to efficiently manage nutrients and pest control without the use of synthetic chemicals [15-18].

Innovations in waste management, such as composting systems and recycling of organic materials, improve soil quality and reduce the need for external inputs. This includes the use of food waste and manure to enrich the soil. The development of sustainable and efficient irrigation systems, such as drip irrigation or water recycling systems, helps conserve resources and reduce environmental impact [19-21].

The integration of renewable energy sources, such as solar energy and biogas, into organic farming reduces dependence on fossil fuels and contributes to more sustainable farm management [22-23].



Limitations and consequences of organic agriculture

Despite its many advantages, organic agriculture faces several challenges. Organic fertilizers are not always readily available and can be more expensive than chemical fertilizers, which may pose a barrier for farmers transitioning to organic farming. In the first few years of transitioning to organic agriculture, production may decline. Farmers need to be compensated with higher prices for organic products to offset these losses [24-28].

Guidelines for organic production, processing, transport, and certification can be complex and difficult to understand, creating obstacles to the wider adoption of organic farming practices.

The marketing of organic food is often not well-organized, which can lead to issues with selling products that are not certified as organic. The high costs of certification and the complicated documentation process may deter many farmers from seeking certification. Innovations in organic agriculture offer solutions to overcome these challenges and can significantly contribute to the expansion of sustainable and efficient food production methods, ensuring a healthier and safer food future [29].

Impact of climate change on organic production

Climate change poses a significant challenge to global agriculture, including organic production. Rising temperatures, changes in precipitation patterns, and extreme weather events can affect the productivity and sustainability of organic farms. However, organic agriculture offers numerous advantages in adapting to these changes. Organic systems contribute to reducing greenhouse gas emissions through techniques such as preserving organic matter in the soil and reducing the use of fossil fuels. Additionally, organic farming increases carbon sequestration in the soil through the application of organic fertilizers, crop rotation, and soil cover conservation, which helps lower the overall concentration of carbon dioxide in the atmosphere [30, 31]. These methods also help preserve natural habitats and biodiversity, which is crucial for protecting plant and animal species threatened by climate change. Organic systems improve soil resilience to extreme weather conditions, such as droughts and floods, through moisture conservation techniques, helping to maintain productivity and reduce the damage caused by climate change [32, 33].

Traditional preservation of a healthy life through organic agriculture

Traditional methods in organic agriculture play a crucial role in maintaining a healthy lifestyle and sustainably managing natural resources. These methods, which often incorporate local practices and knowledge, provide effective solutions for preserving soil, water, and biodiversity. Traditional practices such as crop rotation, the use of organic fertilizers, and crop sequencing help maintain soil fertility and prevent



erosion, contributing to the long-term productivity of the soil and reducing the need for chemical inputs [34, 35].

Additionally, water management techniques, such as rainwater conservation and responsible water resource management, help preserve water quality and availability for agricultural needs. Using natural predators and competitors for pest control, rather than chemical pesticides, helps maintain ecosystem balance and minimizes negative environmental impacts. The preservation of local plant varieties and native animal breeds, along with the continuation of traditional agricultural practices, contributes to biodiversity conservation and enhances resilience to climate change [36, 37].

Integrating these traditional methods with modern innovations allows organic agriculture to better adapt to the challenges of climate change, offering sustainable solutions for food production and environmental preservation [38, 39].

Conclusion

In conclusion, it is important to emphasize that the production of safe, healthy, and nutritious food is crucial for the preservation of human health and the environment. Given the global population growth and the increasing demand for food, organic agriculture plays a vital role in providing food that is not only rich in nutrients and free from harmful chemicals but also environmentally friendly. The issue of food scarcity is becoming increasingly prevalent, but organic farming offers solutions through its ecological practices, which reduce negative environmental impacts and help preserve biodiversity.

Compared to conventional agriculture, organic production reduces the use of synthetic pesticides and fertilizers, which contributes to the preservation of soil, water, and air quality. Climate change presents a significant challenge for global agriculture, but organic farming offers solutions through its eco-friendly practices that help mitigate these changes. Reducing greenhouse gas emissions, increasing carbon sequestration in soil, and preserving natural habitats all contribute to the fight against climate change.

Innovations in organic agriculture, such as the application of modern technologies, the improvement of production techniques, and better resource management, are key to enhancing sustainability and efficiency. Through these innovations, organic agriculture can better adapt to the challenges of climate change and the growing demand for food, providing food that is not only healthy and safe but also environmentally sustainable.

Ultimately, the integration of these approaches and technologies enables the achievement of long-term sustainability, the conservation of natural resources, and support for global efforts in combating climate change and food scarcity.

References

[1] Akhmetshina, L., Mussina, A., Izmaylova, S. (2019). Factors influencing farmers' willingness and behaviors in organic agriculture development: an empirical analysis



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based on survey data of farmers in Anhui province. *Sustainability*, 14, 14945. <https://doi.org/10.3390/su142214945>

[2] Atere, C.T., Olayinka, A. (2012): Effect of organo-mineral fertilizer on soil chemical properties, growth and yield of soybean. *Afr. J. Agric. Res.*, 7 (37), 5208–5216. <https://doi.org/10.5897/AJAR11.1378>.

[3] Baker, B.P., Cooley, D., Futrell, S., Garling, L., Gershuny, G., Green, Thomas, A., Moyer, J., Rajotte, E.G., Seaman, A.J., Young, S.L. (2015): Organic Agriculture and Integrated Pest Management: Synergistic Partnership Needed to Improve the Sustainability of Agriculture and Food Systems, vol. 49. <https://doi.org/10.13140/RG.2.1.3616.8085>.

[4] Bennett, A.B., Chi-ham, C., Barrows, G., Sexton, S. (2013): Agricultural Biotechnology: Economics, Environment, Ethics, and the Future, pp. 249–281. <https://doi.org/10.1146/annurev-environ-050912-124612>.

[5] Bošković, J., Popović, V., Mladenović, Jelena, Stevanović, A., Ristić, V., Maksin, M., Jovanov, D. (2023): The future of smart agricultural production through applied information technologies. International Scientific Conference Science, education, technology and innovation SETI V 2023. Belgrade October 14, 2023, ISBN 978-86-81512-11-1. p. 3-35.

[6] Burić, M., Popović, V., Bošković, J., Šarčević-Teodosijević, Lj., Petrović, B., Stevanović, A., Bojović, R. (2023). Organic healthy safe food and health. In International Scientific Conference Science, Education, Technology and Innovation. SETI V 2023. October 14, 2023, Belgrade, ISBN 978-86-81512-09-8, pp. 357-368.

[7] Cheema, M.J.M., Khan, M.A. (2019). Information Technology for Sustainable Agriculture. In Farooq, M., Pisante, M. (Eds.), *Innovations in Sustainable Agriculture*. Springer, Cham. https://doi.org/10.1007/978-3-030-23169-9_19

[8] Gartner Inc. (2023): Definition of Digitalization – Gartner Information Technology Glossary. Available online: <https://www.gartner.com/en/information-technology/glossary/digitalization> (accessed on 23 January 2023).

[9] Faller, A.L.K., Fialho, E. (2010): Polyphenol content and antioxidant capacity in organic and conventional plant foods. *J. Food Compos. Anal.*, 23 (6), 561–568. <https://doi.org/10.1016/j.jfca.2010.01.003>.

[10] Furtak, K., Gałzka, A. (2019). Effect of organic farming on soil microbiological parameters. *Polish Journal of Soil Science*, 52, 2, 259-268. <http://dx.doi.org/10.17951/pjss.2019.52.2.259>

[11] FiBL (2023). Area data on organic agriculture worldwide. The Statistics.FiBL.org website maintained by the Research Institute of Organic Agriculture (FiBL), Frick, Switzerland. Available at statistics.fibl.org/world.html. Accessed on 15.07.2023.

[12] How the M2 works - organic farm, combining IT technologies and safety systems: an overview [Electronic resource] Available online: <https://milknews.ru/longridy/organicheskaya-ferma-m2.html>

[13] Ikanović, J., Popović, V. (2020). Organic plant production. Bijeljina, B&H, pp. 1-250.

[14] ISPA Precision Agriculture Definition (2021). Available on: <https://www.ispag.org/about/definition>. Accessed: 03.10.2023.



SETI VI 2024

Book of Proceedings

[15] Kirkaya, A. (2020): Smart farming – Precision agriculture technologies and practices. *Journal of Scientific Perspectives*, 4, 123–136, ISSN 2587-3008.

[16] Kukreti, A., Kurmarchali, N., Rawat, L. (2021). Organic farming and biochar. In Uniyal, A., Sharma, I. (Eds.), *Trends in Agriculture: Traditional and Modern Approaches*, pp. 141–153.

[17] M.J.M. Cheema, M.A. Khan. (2019). Information Technology for Sustainable Agriculture. In Farooq, M., Pisante, M. (Eds.), *Innovations in Sustainable Agriculture*. Springer, Cham. https://doi.org/10.1007/978-3-030-23169-9_19

[18] Moysiadis, V., Sarigiannidis, P., Vitsas, V., Khelifi, A. (2021): Smart Farming in Europe, *Computer Science Review*, Vol 39, pp. 100345, ISSN 1574-0137.

[19] Morrone, S.; Dimauro, C.; Gambella, F.; Cappai, M.G. (2022): Industry 4.0 and Precision Livestock Farming (PLF): An up to Date Overview across Animal Productions. *Sensors*, 22, 4319. [CrossRef]

[20] Mulla, D.J. (2013): Twenty-five years of remote sensing in precision agriculture: Key advances and remaining knowledge gaps, *Biosystems Engineering*, 114, 4, 358–371, ISSN 1537-5110.

[21] Murmu, K., Das, P., Sarkar, A., Bandopadhyay, P. (2022). Organic agriculture: as a climate change adaptation and mitigation strategy. *Zeichen J.*, 8(3), 171–187.

[22] Nyéki, A., Neményi, M. (2022). Crop Yield Prediction in Precision Agriculture. *Agronomy*, 12(10), 2460.

[23] Official website of Eurostat [Electronic resource]. Access mode: <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Eco-schemes>

[24] Official website of IFOAM - Organics International [Electronic resource]. Access mode: <https://www.ifoam.bio/why-organic/organic-landmarks/definition-organic>

[25] Official website USDA Agricultural Marketing Service (2018). The Organic INTEGRITY Database. USDA Agricultural Marketing Service. <https://data.nal.usda.gov/dataset/organic-integrity-database>. Accessed 2023-07-23.

[26] Owen, M.D.K., Beckie, H.J., Leeson, J.Y., Norsworthy, J.K., Steckel, L.E. (2015). Integrated pest management and weed management in the United States and Canada. *Pest Management Science*, 71(3), 357–376.

[27] Pandiselvi, T., Jeyajothiand, R., Kandeshwari, M. (2017): Organic nutrient management a way to improve soil fertility and Sustainable Agriculture – A review. *Int. J. Adv. Life Sci.*, 10 (2), 175–181.

[28] Popović, V., Sikora, V., Glamočlija, Đ., Červenski, J., Vasić, M., Gvozdanović Varga, J., Maksimović, L. (2012). Effect of soil conditioner on yield and quality of organic soybean. In III International Symposium Agrosym, November 15-17, 2012, Jahorina, pp. 435-441. DOI: 10.7251/AGSY1203435P

[29] Popović, V., Sikora, V., Adamović, D., Glamočlija, Đ., Rajićić, V., Ikanović, J. (2013): Influence of foliar fertilization on buckwheat yield and quality in organic cultivation system. *Bulletin for Alternative Plant Species*, 45(86): 55–58.

[30] Popović, V., Burić, M., Gantner, V., Janković, S., Dokić, D., Filipović, V., Ikanović, J., Bojović, R. (2023). State and the importance of organic plant production to human



SETI VI 2024

Book of Proceedings

health. In Sustainable agriculture and rural development-III. December 15-16, 2022, Belgrade, pp. 489-501.

[31] Popović, V., Jovović, Z., Mirecki, N., Lakić, Ž. (2019). The trend of organic production. In Organic production and biodiversity. Biodiversity Open Days, Pančevo, ISBN 978-86-88997-16-4, pp. 3-32.

[32] Savage, S. (2022): The Connected Cow: Optimizing Dairy Cow Health and Productivity with Technology. Forbes. 9 June 2022. Available online: <https://www.forbes.com/sites/stevensavage/2022/06/09/the-connected-cow-optimizing-dairy-cow-healthand-productivity-with-technology/?sh=2d36a0b2656e> (accessed on 2 October 2022).

[33] Stevanović, A., Šarčević-Todosijević, Lj., Bošković, J., Popović, V., Živanović, Lj. (2019). Organic production, genetically modified organisms and biodiversity conservation - leading challenges in environmental protection. In Scientific conference: Sustainable primary agricultural production in Serbia-state, opportunities, limitations and opportunities, Bačka Topola, pp. 95-102.

[34] Stevanović, A., Bošković, J., Šarčević-Todosijević, Lj. (2020). The importance of organic production in the protection of human health, biodiversity and environment. In IRASA Second International Scientific Conference Science, Education, Technology and Innovation, SETI II 2020, Book of Proceedings, Belgrade, pp. 475-482.

[35] Stevanović, A., Stevanović, S., Jauković, M., Bošković, J., Popović, V., Ristić, V., Šarčević-Teodosijević, Lj. (2023): Modern organic agriculture in accordance with global GAP standard and HACCP system. International Scientific Conference Science, Education, Technology and Innovation SETI V 2023

[36] Stevanović A., Saulić M., Blažić M., Stupar V, Stojićević D., Živković Z. (2023): Biopreparations in the function of organic agriculture in fruit growing and viticulture. 30th International Conference Ecological Truth & Environmental research, 20-23 June, Bor, Serbia, EcoTer 2023. 379-385. ISBN 978-86-6305-137-9, COBISS.SR-ID 118723849.

[37] Stevanović A., Nestorović G., Popović, V. (2023): Information systems in organic agriculture. *International scientific and professional conference Politehnika 2023*, Belgrade, 15th December, In press.

[38] Zejak, D., Popović, V., Spalević, V., Popović, D., Radojević, V., Sezai Ercisli, Glišić, I. (2022). State and Economical Benefit of Organic Production: Fields Crops and Fruits in the World and Montenegro. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, 50(3), 12815. DOI: 10.15835/nbha50312815

[39] Zhou, X., Ding, D. (2022). Factors influencing farmers' willingness and behaviors in organic agriculture development: an empirical analysis based on survey data of farmers in Anhui province. *Sustainability*, 14, 14945. <https://doi.org/10.3390/su142214945>