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ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN THE WESTERN BALKAN COUNTRIES[1]

Bojana Bekić Šarić[2], Vesna Paraušić[3], Snežana Tanasković[4], Anka Tara Stanković[5]

Abstract

Unsustainable agricultural practices cause significant ecological harm, contributing to climate change and biodiversity loss. This paper aims to monitor progress the environmental performance of agriculture in five Western Balkan countries, identifying similarities and differences among them. The analysis is based on values from the Environmental Performance Index, published by the Yale Center for Environmental Law and Policy, using data for 2020, 2022, and 2024. Across the three years analyzed, Serbia consistently ranked highest in environmental performance of agriculture, while Montenegro (2020; 2024) and Bosnia and Herzegovina (2022) ranked lowest. Overall, across the analyzed countries, achieving greater sustainability in agriculture requires agro-ecological and climate measures to be prioritized within agricultural policies, underpinned by fundamental alignment with the European Union Common Agricultural Policy 2023-2027.

Key words: *Western Balkan, ecological indicators, Environmental Performance Index, Agriculture.*

Introduction

Under unsustainable use of nature resources, agriculture can cause ample environmental degradation and contribute to global climate change (Rad et al, 2022; Usman et al., 2022; World Bank, 2007). For example, agricultural expansion is responsible for around 90% of deforestation globally (United Nations Statistics

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Division, 2022). Moreover, while other sectors contribute directly to carbon-dioxide (CO_2) emissions, the highest percentage of methane (CH_4) and nitrous oxide (N_2O) emissions originates from the agricultural sector (Jovanović et al, 2015; Lamb et al., 2021). High use of pesticides in agricultural production and the presence of their residues in soil and water are associated with ample negative impacts on the environment, harming the health of humans, plants and animals (Kaushal et al., 2021; Lykogianni et al., 2021; Rad et al., 2022; Tudi et al., 2021).

The Western Balkan countries (WBCs) are increasingly being exposed to environmental pressures and consequences of climate change, amplified by unsustainable agricultural practices. Current agricultural practices threaten water quality and availability, degrade the quality and structure of agricultural soils, and deplete natural resources, while agricultural and rural development policies give insufficient attention to environmental concerns (Erjavec et al., 2021; European Commission, 2017; European Commission, 2019; Knez et al., 2022). As stated by the European Commission: „*the agricultural policies in place here have not yet recognised the necessity of finding links and synergies between agriculture and environmental protection*" (European Commission, 2017, p. 35-36). At the same time, agriculture is an important economic sector in all WBCs, contributing significantly to gross value added, local employment, and the livelihoods of small-scale farmers in rural areas (FAO, 2020; Kotevska et al., 2015; Milosevic Djordjevic et al., 2021; Nikolić et al., 2017).

Given these factors, it is evident that governments of the WBCs must prioritize tackling environmental issues and climate change mitigation. Agricultural and rural development policies in these countries should place significantly greater emphasis on measures aimed at environmental protection and the preservation of natural resources. This implies a substantial, and not merely declarative, alignment with the European Union Common Agricultural Policy (EU CAP) 2023-2027 (Erjavec et al., 2021; European Commission, 2017; European Commission, 2019; European Union, 2021). However, the shortage of funds for financing appropriate projects and investments results in low implementation of all environmental and climate actions (Erjavec et al., 2021; European Commission, 2019; European Commission, 2017; Knez et al., 2022).

In this paper, authors will analyse the environmental performance of agricultural production in five WBCs: Serbia, Montenegro, Bosnia and Herzegovina, North Macedonia, and Albania. The aim of the paper is to identify similarities and differences between the WBCs, as well as to document the progress of these countries on the path towards environmentally responsible agriculture.

Materials and methods

For the purpose of this research, Environmental Performance Index (EPI) values for years 2020, 2022 and 2024 were obtained from the Yale Center for Environmental Law and Policyonline database. The latest 2024 EPI Report ranks the progress of 180 countries within the framework of three environmental objectives: climate change performance, environmental health, and ecosystem vitality, using 58 performance indicators in 11 issue categories (Block et al., 2024). Agriculture is one of the 11 issue categories, and its contribution to the EPI value is measured through four indicators (Block et al., 2024, p. 112):

- relative crop yield (40% of issue category);
- sustainable nitrogen management index (40% of issue category);
- phosphorus surplus (5% of issue category) and
- pesticide pollution risk (15% of issue category).

The results were processed and presented using descriptive statistical analysis.

Results: Environmental Performance Indexand Agriculture inWBCs

According to the 2024 EPI Report (Table 1), in terms of overall environmental performance that includes 11 issue categories, Albania is the highest ranked country (score 52.2, rank 52), while Bosnia and Herzegovina is ranked the lowest (score 46.0, rank 87). With the exception of Albania and Montenegro, all countries show weaker results in the area of environmental performance in 2024, compared to 2020 (Table 1).

In terms of environmental sustainability in the agricultural sector in 2024, Serbia achieved the highest results, ranking 26th out of a total of 180 countries worldwide, and showing notably better performance than the other WBCs (Table 1). At the same time, the lowest-ranked countries were Montenegro (2020; 2024) and Bosnia and Herzegovina (2022).

Compared to 2020, Serbia's position worsened in 2024, partly due to two new indicators being introduced into the calculation methodology, Pesticide Pollution Risk and Phosphorus Surplus, where Serbia demonstrates inadequate management (Paraušić et al., 2025). Between 2020 and 2024, the environmental performance of agriculture improved in Bosnia and Herzegovina and Montenegro, while North Macedonia and Albania recorded a decline (Table 1).

Table 1. The Environmental Performance Index for selected countries in 2020, 2022, 2024.

Category	Year	Serbia		Bosnia& Herzegovina		North Macedonia		Montenegro		Albania	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
EPI Index	2020	55.2	45	45.4	78	55.4	43	46.3	74	49.0	62
	2022	43.9	79	39.4	102	54.3	34	46.9	63	47.1	62
	2024	49.3	64	46.0	87	50.3	59	47.7	73	52.2	52
Agriculture	2020	69.9	8	25.1	138	40.9	76	19.2	159	37.6	94
	2022	45.3	51	21.3	148	41.9	65	34.7	90	28.9	115
	2024	71.4	26	52.3	92	46.7	123	43.0	140	50.4	101

Source: Yale Center for Environmental Law and Policy, online database

The following section provides a comparative analysis between the selected countries on the four indicators used to calculate the environmental performance of the agriculture sector.

I Sustainable nitrogen management **(SNMI).** In terms of nitrogen fertilizer management, Serbia showed slight progress between 2020 and 2024, demonstrating better results compared to other WBCs (Figure 1). The low ranking of most countries in the region highlights the need for improved nitrogen fertilizer management in agricultural production, given that inadequate use of nitrogen fertilizers leads to yield reduction and water eutrophication (Gu et al., 2023; Jwaidehet al., 2022). Optimal fertilization levels should be determined onthe basis of soil analyses.

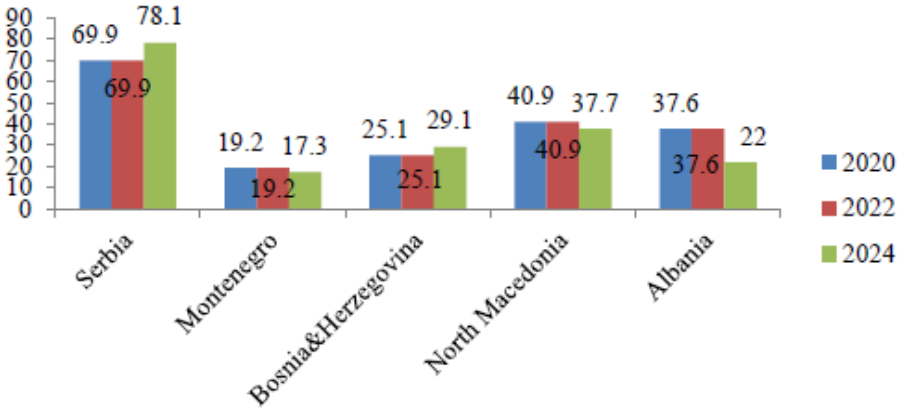

Figure 1. Sustainable nitrogen management, score, 2020, 2022, 2024

Source: Yale Center for Environmental Law and Policy, online database

II Pesticide Pollution Risk. When it comes to sustainable pesticide management in 2024, the best situation was observed in Albania and Montenegro, while Serbia ranked the lowest (Figure 2). Between 2022 and 2024, all countries made significant progress regarding this indicator (Figure 2).

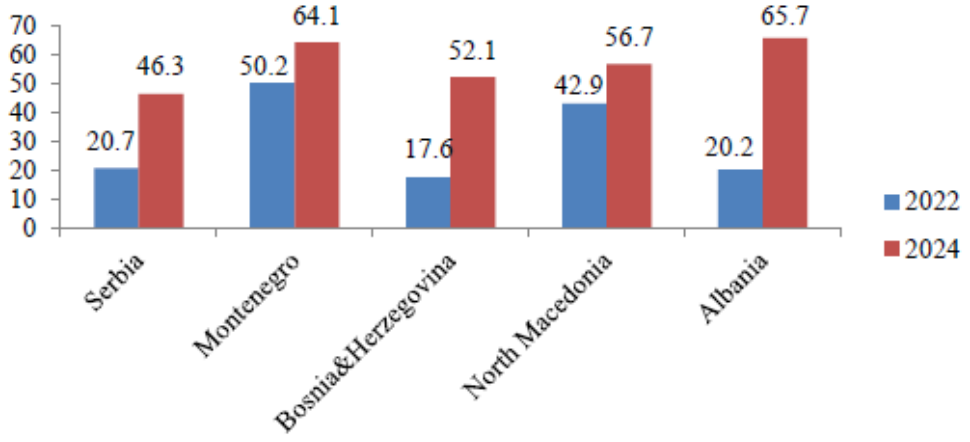

Figure 2. Pesticide pollution risk, score, 2022, 2024

Source: Yale Center for Environmental Law and Policy, online database

III Relative Crop Yield. This indicator has been monitored since 2024, so comparison with previous years is not possible. In 2024, North Macedonia was ranked the lowest (rank 125), while Serbia had the highest rank (rank 49).

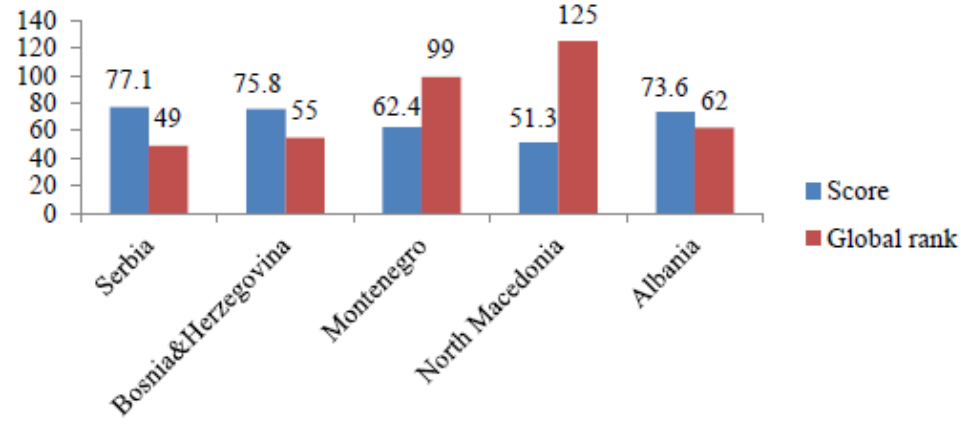

Figure 3. Relative crop yield, score and rank, 2024

Source: Yale Center for Environmental Law and Policy, online database

IV Phosphorus surplus. This indicator has also been monitored since 2024 and comparison with previous years was not possible. According to indicator, all WBCs are poorly ranked, with Montenegro ranked 176th, the lowest among them (Figure 4). Issue of over-fertilized soils requires greater attention in all analyzed countries. Proposed solutions include implementation of eco-schemes, including changing agricultural practices towards more sustainable production methods; more widespread practice of regular agrochemical soil analyses; increased involvement of agricultural advisors in the field, and similar measures.

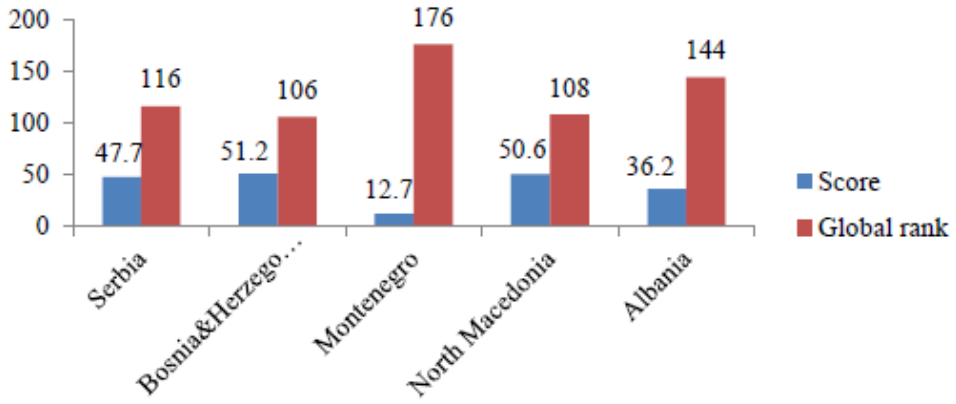

Figure 4. Phosphorus surplus, score and rank, 2024

Source: Yale Center for Environmental Law and Policy, online database

Conclusion

The analysis shows that in all three years (2020, 2022, 2024), Serbia was ranked the highest in terms of overall environmental performance of agriculture, while Montenegro (2020; 2024) and Bosnia and Herzegovina (2022) ranked lowest. Looking at individual indicators of the agricultural sector, the following conclusions can be drawn:

(a) According to sustainable nitrogen management, Serbia shows better results compared to other WBCs;

(b) Regarding pesticide pollution risk, the best situation is in Albania and Montenegro, while Serbia ranked worst. At the same time, all countries in the region made progress on this indicator between 2022 and 2024;

(c) For Relative Crop Yield, North Macedonia ranked lowest, while Serbia holds the highest rank;

(d) All WBCs show poor rankings in phosphorus surplus, especially Montenegro.

Aligning agriculture in WBCs with the EU CAP, which aims to reduce the environmental footprint and contributes to the environmental protection, requires stronger policymaker engagement in designing and implementing various agro-ecological and climate support measures, such as (European Commission, 2017; European Union, 2021; Knez et al, 2022; Lykogianni et al., 2021; Rad et al., 2022):

(a) financial and capacity-building support for farmers applying sustainable production methods that contribute to the protection and preservation of soil (such as crop rotation on arable land; planting of cover crops; grassing of inter-row spaces in perennial plantations; sustainable management of meadows and pastures, etc.);

(b) implementation of Integrated Pest Management (IPM) principles; increased use of environmentally friendly plant protection solutions, such as non-chemical control measures (e.g., biopesticides); trainings aimed at raising awareness among producers about the dangers of excessive or improper handling with agricultural chemicals, and similar actions;

(c) organic production;

(d) afforestation;

(e) a shift toward renewable energy sources and precision agriculture;

(f) improvement of the legal framework; strengthening of inspection services, and related measures.

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