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IMPACT OF AGRICULTURE ON THE ENVIRONMENT IN BULGARIA AND ROMANIA

Iliyana KRASTEVA, Georgi ANGELOV

Tsenov Academy of Economics, Svishtov, Bulgaria, Department of Agricultural Economics, 2 Em. Chakarov Str., 063 166 414, 5250, Svishtov, Bulgaria, E-mails: i.krasteva@uni-svishtov.bg, g.i.angelov@uni-svishtov.bg

Corresponding author: i.krasteva@uni-svishtov.bg

Abstract

Agriculture has a significant impact on the environment. The implementation of inefficient agricultural practices can have severe consequences, both for natural ecosystems, the environment, soil and water quality, and for all humanity on the planet. Eurostat data for 2007-2023 were used to make a comparison between Bulgaria and Romania regarding the impact of agriculture on environment using specific indicators. The analysis found that in Bulgaria the areas occupied by organic crops continue to increase, and it is expected that by 2027 they will reach 6.98% of the UAA. In Romania, the areas are constantly increasing and reach 5.08% in 2022. The levels of pesticides and mineral fertilizers used in Bulgaria and Romania are relatively slowly decreasing, which will undoubtedly contribute to limiting pollution processes for the benefit of the environment. The recognized need for joint efforts of administrative structures to make adequate decisions regarding achieving a higher degree of sustainability in agriculture. The shift to sustainable models accelerates the transition to agricultural practices aimed at maintaining ecological balance in the system. The protection of the environment and natural resources is of priority importance for achieving a sustainable long-term vision for agricultural development.

Key words**:** *sustainable development, sustainable agricultural practices, analysis, environment*

INTRODUCTION

In recent years, the sustainable development of the agricultural sector has focused on environmental and climate challenges related to a greater contribution to environmental care. Global climate change, limiting harmful emissions into the atmosphere, and preserving and protecting natural ecosystems require a transition to more ecological and sustainable agricultural practices.

The use of excessive amounts of pesticides and fertilizers in agriculture still leads to negative consequences for the environment, climate and biodiversity.

Promoting the implementation of environmentally friendly agricultural practices is key in creating sustainable systems for the production of quality and healthy products in order to maintain the ecological balance of natural resources (Krasteva et al., 2024) [10]. ***This provokes us to formulate the purpose of this study***, namely to analyze various indicators influencing the environment. The main research tasks set by the authors are:

- a theoretical analysis of the sustainable development of agriculture in the context of the Common Agricultural Policy of the European Union is made.
- analysis of the state and monitoring of trends in the impacts of agricultural practices on the environment.
- outlining guidelines for reducing the adverse impact of agriculture on the environment.

In modern conditions, issues related to sustainable development are the subject of attention by a number of researchers worldwide. Characteristic of the national and European agricultural policy is the perception of sustainable agriculture as an important principle for achieving a balanced attitude with optimal use of resources. A number of definitions related to the concept of sustainable agriculture can be indicated.

The term "sustainability" in agriculture is beginning to spread and develop in different aspects - biological, economic, social. The most commonly accepted understanding of

"sustainability" is in relation to ecology, according to which, if an agricultural system has adverse consequences on the environment, it cannot be called sustainable (Hadzhieva, 2007) [7]. Sustainable agriculture outlines the need to function and maintain a balanced interaction between the main components of the agricultural system, providing fairer incomes to farmers. Sustainable development is development that meets the needs of the present generation without limiting the ability of future generations to meet and realize their own needs. The different emphases on the sustainability of agriculture can be combined into a broader definition, namely, sustainable agriculture is economically efficient, environmentally compatible and socially responsible, helping to provide the population with quality food products in the long term and providing an opportunity for a better standard of living in rural areas.

Sustainable development is the subject of attention in a number of European and national documents, as well as in many scientific publications. For example, a study by a team of authors states that sustainable agriculture is considered a complex concept, including environmental, economic and social elements.

Sustainable agriculture is perceived as the most important component of sustainable development for ensuring economic viability and social justice in the functioning of a modern agricultural economy (Ivanov, Radev, Borisov, &Vachevska, 2012) [8].

The issues of sustainability, limited natural resources, and the introduction of environmentally friendly practices are addressed in a publication by Nikolova, which emphasizes the need to create new approaches and sustainable production models to ensure a higher degree of sustainable development of the rural economy (Nikolova, 2024b) [15]. Another author focuses on strategic guidelines for achieving sustainable development of areas with the possibility of preventing environmental pollution (Elitsa, 2024) [4].

In his publication Mitov (Mitov, 2023) [11] tracks the trends of different types of indicators divided into several directions affecting the environment. In this regard, it is increasingly clear that it is necessary to take adequate measures and tools related to the policies implemented in the country to improve the training and training of specialists in the production of high quality products.

In 1992, an Action Plan /"AGENDA 21"/ was adopted which defined the necessary priority tasks related to achieving a balance between the main three segments related to sustainable development at national and international level [22]. The "Agenda for the 21st Century" program continues to clarify the essence of sustainable development for the implementation of the processes of balanced socio-economic and environmental development to meet the growing needs of present and future generations. States must comply with the conditions and adopted basic principles considering all aspects of sustainable development related to environmental protection, biological diversity and rural development.

The 2030 Agenda for Sustainable Development was launched in 2015, which creates a blueprint for a better sustainable future for all peoples of the world. It is based on five components and the included 17 sustainability goals. Each country must take active actions related to the protection of human rights, overcoming hunger and poverty, as well as issues related to providing a favorable environment for living in harmony with the environment and nature. The goals are integrated and indivisible and balance the three dimensions of sustainable development: economic, social and environmental.

The Recovery and Resilience Facility, as part of the Next Generation EU (2021-2024) component of the European Recovery Plan [18] will play a key role. It will support Member States in their efforts to address the economic and social consequences of the COVID-19 pandemic, as well as in their efforts to build more resilient public systems and national economies. To receive support, member states must prepare national recovery and resilience plans setting out their reform and investment programmes until 2026.

Sustainable development issues are also addressed in the National Development Program "Bulgaria 2030", which sets out the vision and general goals and priorities of

development policies in all sectors of government. The document outlines three strategic goals and groups 13 national priorities (National Development Program Bulgaria 2030, 2020) [13]. Special attention in this strategic document is paid to Priority 6 "Sustainable Agriculture". The main emphasis is placed on the processes of restructuring agriculture, establishing structural and sectoral balance between crop production and livestock production, and encouraging more and more young people to engage in agriculture to ensure food security for society.

In this regard, since 2007, the Common Agricultural Policy (CAP) has been implemented in Bulgaria, founded in 1962 with the important task of providing support to farmers and improving the conditions for the development of agriculture in rural areas. The COVID-19 pandemic continues to change the priorities and values of all people. We are increasingly thinking about what food we put on our table and how it affects our health. In modern conditions, the production of agricultural products is faced with a number of economic, social and environmental challenges to ensure the sustainability of farms, meet the need for environmentally friendly food with a reasonable use of natural resources in order to maintain a fair standard of living for farmers. The CAP is a proven mechanism and tool for managing the transition to a sustainable food system and for strengthening the efforts of European farmers to contribute to the EU's climate and environmental objectives [5].

The Farm to Fork strategy is at the heart of the Green Deal and focuses on innovative solutions for sustainable production practices to ensure the future of agriculture. (Draft National Action Programme to contribute to the achievement of the objectives of the Farm to Fork Strategy by 2030, 2023) [3]. The new CAP has been implemented since 1 January 2023, which is an innovative policy and seeks to provide reliable support to farmers and food security with an even higher degree of adaptation to new developments related to economic sustainability in the long term. It will be fairer, greener and more sustainable in terms of agricultural and rural development, contributing to the protection of the environment, climate and biodiversity (Krasteva, 2024) [9].

The CAP is a broad-based strategy and is built on three main objectives for achieving sustainability in agriculture: economic sustainability; environmental sustainability and social sustainability. To achieve them, all EU countries use large-scale actions and measures, each of which draws up a strategic plan. For the period 2023-2027, these strategic plans have an important role to play in supporting the transition of European agriculture towards a new sustainable model. In this sense, joint efforts are needed to support farmers' incomes and to ensure more active actions related to the modernisation of agricultural holdings in order to strengthen the competitiveness of the sector.

Each member state develops a CAP Strategic Plan, which defines various interventions related to increasing investments, promoting sustainable development and modernizing agriculture (Strategic Plan for the Development of Agriculture and Rural Areas for the period 2023-2027, 2023) [20]. The CAP promotes sustainable agricultural practices that are aimed at addressing climate change and protecting the environment [20].

It is also essential to strengthen the socio-economic structure of rural areas with the possibility of increasing jobs and improving the quality of life.

We can summarize that as a result of the studied literary sources and author's opinions on the topic under consideration, the challenges facing the agricultural sector are becoming increasingly significant in achieving sustainability of agricultural production and its impact on the environment. The implementation of sustainable agricultural practices leads to mitigation of the negative effects of climate change, stabilizes agro-ecosystems, protects water, soil, air, biodiversity and increases their resilience in rural areas.

In this context, the purpose of the paper is to analyze the impact of agriculture on environment in Bulgaria and Romania in the period 2007-2023 based on Eurostat data and making a comparison for identifying

similarities and discrepancies of the studied specific indicators.

MATERIALS AND METHODS

The data analyzed in this article are based on public information and official statistical data available by Eurostat. The study is based on an analysis of key indicators and units of measurement - areas with organic farming (hectares and % of the total utilized agricultural area- UAA), pesticide use (tons of active substances), harmonized pesticide risk indicator by categorization of active substances (index, 2011-2013, average =100), amounts of mineral fertilizers used (tons) and ammonia emissions from agriculture (tons).

Romania is a neighboring country of Bulgaria and the EU membership of both countries started on January 1, 2007, which gives us the right to conduct a comparative analysis of some leading indicators for Bulgaria and Romania under equal starting conditions.

General scientific research methods were used: literature research, logical analysis and synthesis, induction, comparative analysis, with part of the data presented in tables and graphs.

RESULTS AND DISCUSSIONS

Analysis of the impact of agricultural practices on the environment

The processes of industrialization have led to many environmental problems related to damage to soil fertility, air and water pollution, gases emitted into the atmosphere, and disruption of biodiversity. The role of the specific indicators considered is of great importance, with an emphasis on accelerating the transition towards achieving sustainable agriculture. In order to limit the negative impact on the environment, various actions and measures will be stimulated, agro-ecological practices related to the application of organic farming methods, precision farming, reducing the use and risk of chemical pesticides and fertilizers will be promoted. (Krasteva et al., 2024) [10]. Animal welfare practices can also be included. In this regard, in order to achieve higher sustainability of agriculture for rural development in Bulgaria, we will outline a more detailed analysis of the environmental impacts of agricultural practices on the environment for the period 2007-2023.

A key priority in the agricultural development policy is organic farming. For example, the National Plan for the Development of Organic Production continues to stimulate actions aimed at sustainable practices and it is indicated that by 2030 at least 25% of agricultural land will be occupied by organically grown crops (National Action Plan for the Development of Organic Production by 2030, 2025) [12]. Such sustainable agricultural practices are the starting point for the development of the food system related to the provision of clean and healthy food. According to Nikolova, in this line of thought, organic production is already applicable in Bulgaria an alternative economic agribusiness model with the possibility of achieving a multiplier effect in the development of modern farms (Nikolova, 2024a) [14].

An indisputable fact and as a good innovative example can be pointed out the choice of farmers who turn to organic beekeeping as another opportunity to start a business in small settlements (Stanev, 2018) [19]. Another author reveals and analyzes specific indicators and significant factors for the development of beekeeping in rural areas (Angelov, 2024) [1].

Therefore, we can emphasize that the transition from traditional to sustainable agricultural production has an important aspect, as it contributes to the preservation of soil fertility, reduces emissions into the atmosphere, minimizes harmful effects on the environment and produces quality products without artificial additives. Nikolova and Pavlov confirm in their publication that it is necessary to take adequate decisions by all stakeholders to reduce the ecological footprint in relation to the consequences of global warming (Nikolova & Pavlov, 2024) [16]. To achieve this goal, we will reveal the state and trends in the development of organic agriculture in Bulgaria and Romania for the period 2007-2023. From the official statistics of Eurostat the areas with organic agriculture in Bulgaria recorded the highest growth in 2016 - 160,620 ha, and the lowest areas were recorded in 2009 - 12,321 ha

(Table 1). If we follow the last completed reference period 2014-2020 for rural development and take 2014 as the base year, we can compare all analyzed years to find the change of each year compared to the base year (2014).

Table 1. Areas under organic farming in Bulgaria and Romania for the period 2007-2023 (ha)

Years	Country			
	Bulgaria	Compared to 2014 change	Romania	Compared to 2014 change
2007	13,646	-34,268	131,456	-157,796
2008	16,663	-31,251	140,132	-149,120
2009	12,321	-35,593	168,288	-120,964
2010	25,648	-22,266	182,706	-106,546
2011	25,022	-22,892	229,946	-59,306
2012	39,138	-8,776	288,261	-991
2013	56,287	+8,373	286,896	-2,356
2014	**47,914**	**St**	**289,252**	**St**
2015	118,552	+70,638	245,924	-43,328
2016	160,620	+112,706	226,309	-62,943
2017	136,618	+88,704	258,471	-30,780
2018	128,839	+80,925	326,260	+37,008
2019	117,779	+69,865	395,228	+105,976
2020	116,253	+68,339	468,887	+179,635
2021	86,310	+38,396	578,727	+289,475
2022	110,441	+62,527	644,520	+355,268
2023	147,798	+99,884	No data	-

Source: based on Eurostat data and author's calculations [6].

The table shows that the largest change in the area of organic farming compared to 2014 was +112,706 ha in 2016.

The total area of organic farming in Bulgaria continues to increase, and in 2023 it covers 147,798 ha of agricultural land, which is 33.83% more than in 2022 and 208.47% more than in 2014.

For comparison, the areas occupied by organic farming in Romania recorded the highest growth in 2022 - 644,520 ha, and the lowest values were recorded in 2007 - 131,456 ha. The largest change compared to the base year was +355,268 ha in 2022 or an 11.37% increase compared to the previous year 2021. The lowest value was reflected in 2012 compared to the base year 2014 -991.

The areas under organic farming in Bulgaria and Romania for the period 2007-2023, as % of the total utilized agricultural area (UAA) are presented in Figure 1. The share of the total organic area in relation to the UAA between 2014 and 2023 in Bulgaria increased from 0.96% to 2.94%. After Bulgaria's accession to the EU, the data show a relatively steady increase, with the highest growth being reported in 2016 – 3.2%. The share of organic farming in terms of UAA in Romania has a continuous increasing trend, rising from 2.09 to 5.08% between 2014 and 2022.

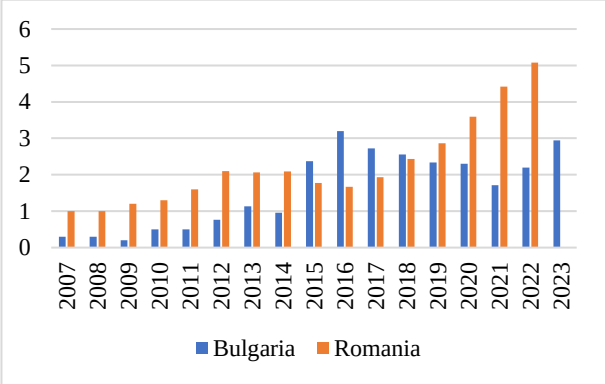

Fig. 1. Areas under organic farming in Bulgaria and Romania for the period 2007-2023 (% of total UAA)
Source: author's figure based on Eurostat data [6].

It can be noted that despite the increased land under organic production, the areas under organic farming reach only 2.94% of the total utilized agricultural area (UAA) in Bulgaria in 2023 and 5.08% in Romania in 2022. The strategic goal of 8% of the UAA being areas cultivated using the organic farming method in Bulgaria has not yet been reached (Nikolova, 2024a) [14]. However, this sector has potential for future development.

It is planned that by 2025 the areas under control system will increase by 5% (252,877 ha), and by 2027 to reach 6.98% (354,279 ha) of the UAA. It is necessary to strengthen the financial support of the measures of the Rural Development Program, which provide a wide range of support instruments to stimulate the development of organic farming in Bulgaria.

For a long time, under the influence of conventional agricultural practices, large doses of chemical pesticides and fertilizers have been applied in agriculture. This leads to disturbances in the ecological balance of nature and has irreversible consequences for human health.

A major source of environmental pollution is the improper use of plant protection products. Therefore, farmers need to make an informed decision on the correct application of pesticide

amount according to the regional level of each farm (Popescu et al., 2021)[17]. Therefore, it is necessary to create a framework to achieve sustainable pesticide use to restore and protect soil fertility and ecosystem services.

The use of pesticides in both countries for the period 2007-2022 is presented in the following figure 2, which is expressed in tonnes. In Bulgaria, for the period 2007-2014, there is a trend of a gradual decrease from 1974.75 tons to 1001 tons of active ingredients.

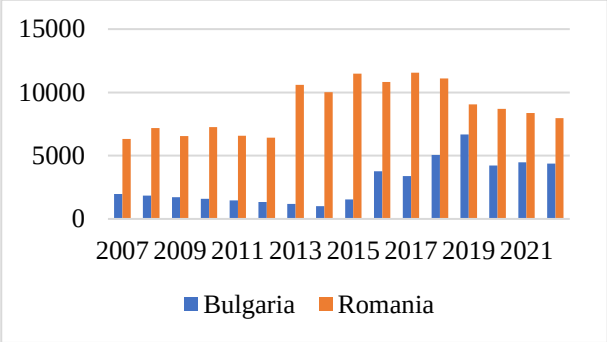

Fig. 2. Pesticide use in Bulgaria and Romania for the period 2007-2022 (tonnes of active ingredient)
Source: author's figure based on Eurostat data [6].

The published data for Bulgaria shows that for the period 2007-2014 there was a smooth and sustainable decrease in the use of pesticides - from 1,974.75 tons of active ingredients to 1,001 tons of active ingredients.

From the following year 2015, an increasing trend is observed, which continues until 2021 (from 1,541.9 tons to 4,484 tons). In the last year 2022, a slight decrease of 4,384.65 tons or -2.22% compared to the previous year 2021 was observed. In Romania, for the period 2007-2012, the data are relatively constant, varying from 6,314 tons to 6,418.7 tons. A drastic increase was observed in the following years for the period 2013-2018 (from 10,585.65 tons to 11,107.63 tons). From 2019-2022, a steady trend of decrease from 9,046.66 tons to 7,957.02 tons or -4.93% compared to 2021 was observed.

The harmonized pesticide risk indicator by active substance categorization in Bulgaria and Romania for the period 2011-2022 is presented in Figure 3. These indicators were created to measure the progress made in achieving the objectives of Directive 2009/128/EC on the sustainable use of pesticides. The indicator is presented as indices against a baseline of 100. The harmonised risk indicator is based on statistical data on the quantity of active substances in plant protection products placed on the market under Regulation (EC) No 1107/2009.

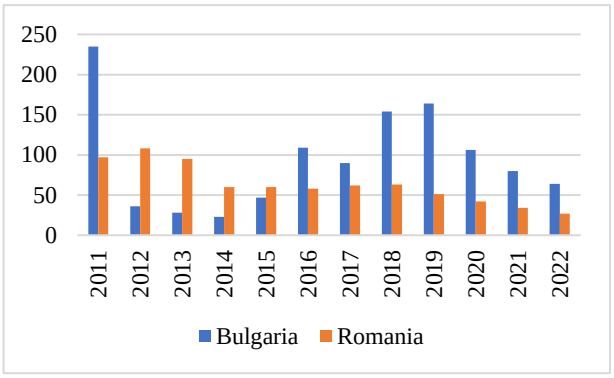

Fig. 3. Harmonized pesticide risk indicator by categorization of active substances in Bulgaria and Romania for the period 2011-2022
(index, 2011-2013, average =100)
Source: author's figure based on Eurostat data [6].

In Bulgaria, according to the published statistical data for the period 2011-2022, the highest risk from pesticides by categorization of active substances was observed in 2011 - 235, and the lowest risk was established in 2014 - 23. For the period 2016-2019, an increase was observed with values from 109 to 164.

From 2020-2022, the total risk from pesticides is reduced, reaching a value of 64 in 2022, but compared to the base year 2014, an increase of +178% was observed. For comparison, Romania has lower values of the harmonized pesticide risk indicator compared to Bulgaria. The highest value was measured in 2012 – 108, and the lowest value in 2022 – 27. In 2022, a decrease of -55% was observed compared to the baseline year 2014.

The correct use of pesticides and fertilizers plays an important role in modern agriculture. Fertilization with mineral fertilizers increases the reserves of nutrients in the soil and improves its physicochemical properties. The preservation of soil microorganisms enhances growth, increases yields and helps capture carbon dioxide. The frequent and excessive use of mineral fertilizers in agriculture leads to changes in soil acidity and structure, which disrupt the balance in ecosystems and have a negative impact on the environment. This is

confirmed in another scientific publication, in which uncontrolled application causes imbalance in the natural environment and is a risk factor for human health (Dinu et al., 2022)[2].

The following Table 2 presents current statistical information based on Eurostat data on the amounts of mineral fertilizers used in Bulgaria and Romania for the period 2007-2023. The table contains data on the total consumption of nitrogen (N) and phosphorus (P), measured in absolute volumes - tons. The highest amounts of nitrogen fertilizers used in Bulgaria were observed in 2016 - 365,913 tons, and the lowest were registered in 2008 - 173,917 tons. In 2023, 340,801 tons of nitrogen fertilizers were imported, which is 91.53% more than in 2007, 5.88% more than in the base year 2014, but 0.71% less than in the previous year 2022. With regard to phosphorus fertilizers, it is noted that in 2016 the highest quantities used were 36,050 tons, and in 2013 the lowest values were 11,656 tons. In 2023, 34,844 tons were used, which is 170% more than in 2007, 23.8% more than in the base year 2014 and an 8.75% increase compared to the previous year 2022.

After Bulgaria's entry into the EU, there was a gradual increase in the amount of mineral fertilizers used until 2016, when they reached their highest levels of 401,963 tons. After this period, a decrease was observed, reaching 375,645 tons in 2023. The relative share of the used quantities of mineral fertilizers for Bulgaria is calculated and presented in the table. The relative share in 2007 decreased compared to the base year 2014 by -45.50%, and in 2023 there was a slight increase by 7.28%.

Table 2. Amounts of mineral fertilizers used in Bulgaria and Romania for the period 2007-2023, tons

Years	Nitrogen (N)		Phosphorus (P205)		Allfertilizers		Relativeshare %
	Bulgaria	Romania	Bulgaria	Romania	Bulgaria	Romania	Bulgaria
2007	177,936	265,487	12,927	45,113	190,863	310,600	-45,50
2008	173,917	279,886	13,342	44,718	187,259	324,604	-46,52
2009	177,553	296,055	13,387	43,900	190,940	339,955	-45,47
2010	199,083	305,757	17,043	53,849	199,083	359,606	-43,14
2011	192,357	313,333	12,902	55,123	205,259	368,456	-41,38
2012	235,386	289,963	20,798	49,353	256,184	339,316	-26,84
2013	258,856	344,468	11,656	49,697	270,512	394,165	-22,74
2014	322,004	303,562	28,144	51,772	350,148	355,334	**St**
2015	341,608	357,352	27,573	57,921	369,181	415,273	5,44
2016	365,913	344,311	36,050	55,097	401,963	399,408	14,80
2017	351,120	381,342	29,562	63,253	380,682	444,595	8,72
2018	339,329	468,639	33,280	82,264	372,609	550,903	6,41
2019	352,486	455,964	33,501	87,904	385,987	543,868	10,24
2020	364,335	468,891	34,441	81,900	398,776	550,791	13,89
2021	342,890	510,802	31,836	103,728	374,726	614,530	7,10
2022	343,254	459,017	32,040	86,724	375,294	545,741	7,18
2023	340,801	463,657	34,844	91,649	375,645	555,306	7,28

Source: based on Eurostat data and author's calculations [6].

For comparison, in Romania, the highest levels of nitrogen fertilizer use were recorded in 2021 - 510,802 tons, and the lowest amounts were recorded in 2007 - 265,487 tons. Regarding phosphorus fertilizers, the highest use was recorded in 2021 - 103,728 tons, and the lowest value was recorded in 2009 - 43,900 tons.

The total amount of mineral fertilizers used is increasing, reaching its peak in 2021 - 614,530 tons, compared to the base year 2014, the increase is 73%.

From the data analysis thus considered, we can summarize that in Bulgaria for the last 3 analyzed years (2021-2023) a relatively stable decrease in the use of mineral fertilizers has been observed. This will immediately contribute to the retention of nutrients in the soil, limiting pollution processes for the benefit of the environment and the climate, which will undoubtedly accelerate the transition to more sustainable agricultural practices. The optimal use of mineral fertilizers is an important part of measures to reduce harmful emissions from agriculture.

The following Figure 4 shows the dynamics of ammonia emissions from agriculture in Bulgaria and Romania for the period 2007-2022.

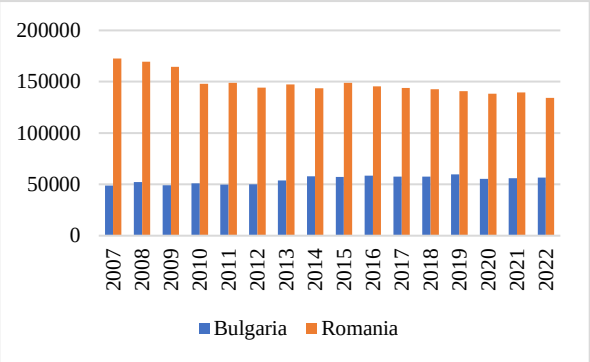

Fig. 4. Ammonia emissions from agriculture in Bulgaria and Romania for the period 2007-2022, tons
Source: author's figure based on Eurostat data [6].

This indicator measures ammonia (NH3) emissions resulting from agricultural production and is a result of manure management, application of inorganic nitrogen fertilizers and animal manure applied to the soil, as well as urine and manure deposited by grazing animals.

Ammonia emissions from agriculture in Bulgaria for the period 2007-2022 range from 48,775 tons to 58,435 tons in 2016, where the highest share of emissions was observed. In 2022, ammonia emissions amounted to 56,671 tons, which is an increase of 1.37% compared to the previous year 2021, and a decrease of -1.85% compared to the base year 2014. In Romania, for the period 2007-2009, the highest values (172,669 tons – for 2007; 169,555 tons – for 2008 and 164,386 tons – for 2009) of ammonia emissions from agriculture were observed. After this year, we must note its decrease, which continues until 2022 and reaches 134,286 tons. In 2022, the decrease is -3.86% compared to the previous year 2021 and -6.56% compared to the base year 2014.

It can be noted that agriculture is a leading source of ammonia emissions. Ammonia can have negative consequences, not only for natural ecosystems, but also harm human health. Therefore, it is necessary for all state and local institutions to have a responsible attitude and to invest joint efforts in carrying out a number of activities related to the achievement of a common goal, namely reducing the risk of using inefficient agricultural practices on the environment.

CONCLUSIONS

The analysis conducted provides grounds for drawing some specific generalizations and conclusions:

- The results of the research conducted in recent years show that the attention of the new challenges facing agriculture is increasingly directed towards the transition to a sustainable food system. The new CAP lays the foundation for fairer and more sustainable agricultural models of farming.

-In Bulgaria, in recent years, organic farming has been developing at a rapid pace and with great dynamics, with more and more agricultural land switching to organic production methods. The areas with organic farming recorded the highest growth in 2016 - 160,620 ha, and in 2009 the lowest areas were recorded - 12,321 ha. The total area for organic farming continues to increase, and in 2023 it will cover 147,798 ha of agricultural land, which is 33.83% more than in the previous year 2022. It is planned that by 2025 the areas in the control system will increase by 5% (252,877 ha), and by 2027 they will reach 6.98% (354,279 ha) of the UAA.

- The total use of pesticides in Bulgaria in 2022 was found to have a slight decrease of 4384.65 tons or -2.22% compared to the previous year 2021. For the last 3 analyzed years (2021-2023), a relatively stable decrease in the use of mineral fertilizers was found. In 2022, ammonia emissions amounted to 56,671 tons, which is an increase of 1.37% compared to the previous year 2021.

- It is necessary to initiate effective policies and measures to reduce the high risk of the impact of agricultural activity on the environment and climate. Undoubtedly, the implementation of sustainable agricultural practices is a priority opportunity to achieve long-term sustainability of agriculture and the development of the rural economy at regional and national levels.

REFERENCES

[1]Angelov, G., 2024, Status and trends in the development of the beekeeping sector in Bulgaria. Innovative development of agricultural business and rural areas. Fourth International Scientific Conference IDARA – 2024 Conference proceedings 3 – 4.10.2024, pp. 282-290, Sofia.

[2]Dinu, T.A., Popescu, A., Chirciu, I.A., Soare, E., Stoicea, P., Iorga, A.M., 2022, Study on the use and marketing of pesticides in Romania in the context of applying the farm to fork strategy. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 22 (2), 279-292.

[3]Draft National Action Programme to contribute to the achievement of the objectives of the Farm to Fork Strategy by 2030, 2023., https://www.mzh.government.bg/media/filer_public/2023/08/28/reforma_s6r1_programa_mzkh_-_proekt.pdf., Accessed on 25.01.2025.

[4]Elitsa, L., 2024, Strategic Guidelines for Sustainable Development of the North Central Region. Theory and Practice for Sustainable Management and Development of Rural Territories in Bulgaria, Publishing House: AI Tsenov, Svishtov, 31.05.2024 г., pp. 198-207.

[5]European Commission, Agriculture and Rural Development, Sustainable agricultural practices and methods,https://agriculture.ec.europa.eu/sustainability/environmental-sustainability/sustainable-agricultural-practices-and-methods_en, Accessed on 17.02.2025.

[6]Eurostat Database, https://ec.europa.eu/eurostat/data/database, Accessed on 17.02.2025.

[7]Hadzhieva, V., 2007, Sustainable development of agriculture in Bulgaria. // EconomicAlternatives, Issue 5., pp. 28-38.

[8]Ivanov, B., Radev, T., Borisov, P.,Vachevska, D, 2012, A methodological approach to assessing sustainability in agriculture. Agricultural Economics and Management, 57, 4, pp. 48-59.

[9]Krasteva, I., 2024, Promoting sustainable agricultural practices in agriculture. Innovative development of agricultural business and rural areas. Fourth International Scientific Conference IDARA – 2024 Conference proceedings 3 – 4.10.2024, pp. 230-238, Sofia.

[10]Krasteva, I., Nikolova, M., Yordanova, E., Angelov, G., Markov, T., 2024, Analysis and assessment of the use of pesticides and fertilizers in the rural territories of Republic of Bulgaria. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development., Vol. 24(2), 565-576.

[11]Mitov, A., 2023, Sustainable agricultural development in Bulgaria and the European Union. Economics and management of agriculture, 68, *2*, pp. 65-83.

[12]National Action Plan for the Development of Organic Production by 2030 , 2025., https://www.mzh.government.bg/bg/politiki-i-programi/politiki-i-strategii/nacionalen-plan_za_razvitie_na_bioproizvodstvoto/., Accessed on 03.03.2025.

[13]National Development Program Bulgaria 2030, 2020,file:///D:/Users/Windows/Downloads/bulgaria%202030%20(2).pdf., Accessed on 15.02.2025.

[14]Nikolova, M., 2024, Comparative Analysis of the State and Potential for the Development of Organic Farms in the North-West and North-Central Planning Regions in Bulgaria. Journal of Mountain Agriculture on the Balkans, 27 (4), 572-604.

[15]Nikolova, M., 2024, Sustainable development of rural areas - theoretical aspects, trends and challenges. Theory and Practice for Sustainable Management and Development of Rural Territories in Bulgaria, Publishing House: AI Tsenov, Svishtov, 31.05.2024 , pp. 9-24.

[16]Nikolova, M., Pavlov, P., 2024, Regional differences of greenhouse gases from agricultural activities in Bulgaria. Conference Proceedings "Innovative development of agricultural business and rural areas", 3 – 4.10.2024., pp. 35-46, Sofia: DOI: https://doi.org/10.37075/idara.2024.03.

[17]Popescu, A., Tindeche, C., Mărcuță, A., Mărcuță, L., Honțuș, A, 2021, Pesticides - a problem in Romania's agriculture? Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol. 21(4), 477-486.

[18]Recovery and Resilience mechanism, as part of the Next Generation EU (2021-2024) component of the European Recovery Plan https://nextgeneration.bg/1#two, Accessed on 20.01.2025.

[19]Stanev, Y., 2018, Entrepreneurship as a possibility for employment (self-employment) and development of small localities in Bulgaria. E-Journal "Dialogue" 4., pp. 36-48.

[20]Strategic Plan for the Development of Agriculture and Rural Areas of the Republic of Bulgaria for the period 2023-2027 (2023)., https://sp2023.bg/index.php/bg/. (n.d.)., Accessed on 12.02.2025.

[21]UN UN Transforming our world: The 2030 Agenda for Sustainable Development, https://sdgs.un.org/2030agenda. (n.d.).., Accessed on 21.02.2025.

[22]UN Transforming our world: The 2030 Agenda for Sustainable Development, https://sdgs.un.org/2030agenda. (n.d.).., Accessed on 21.02.2025.